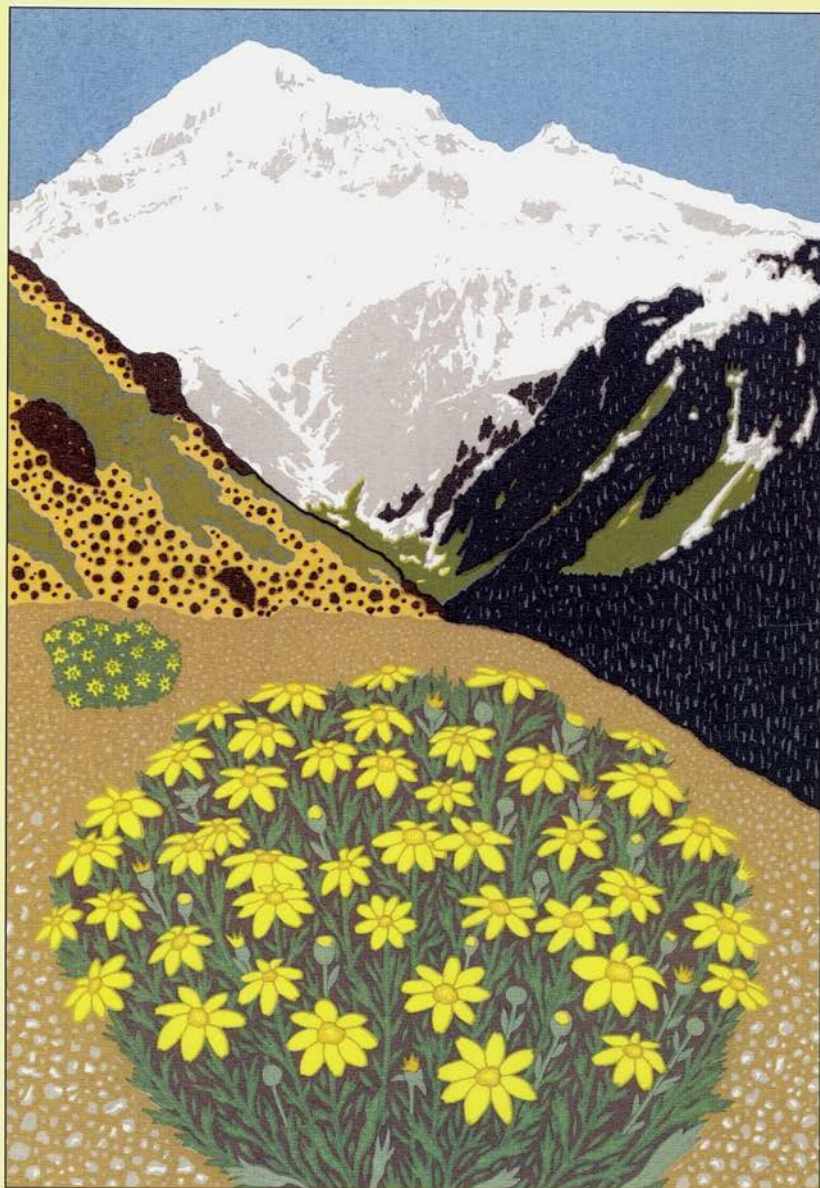


ROCK GARDEN *Quarterly*



Volume 59 Number 3

Summer 2001

COVER: *Eriophyllum lanatum* on Mount Hood, Oregon
Serigraph by Sue Allen, Brightwood, Oregon

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ROCK GARDEN

Quarterly

BULLETIN OF THE NORTH AMERICAN ROCK GARDEN SOCIETY

Volume 59 Number 3 Summer 2001

Contents

Fritillarias of California, DIANA CHAPMAN	155
In Search of Himalayan Lilies, CHRIS CHADWELL	165
Double Trillium: History of an Elusive Flower, JOHN AND JANET GYER	171
Solomon's Seal: <i>Polygonatum</i> for the Woodland Garden, GENE BUSH	195
The Botanical Traveler: Eastern Nepal and Kanchenjunga, DAVID HALE	200
Practicum: Seed Collecting and Cleaning, JANE MCGARY	205
PLANT PORTRAITS	
<i>Yucca nana</i> , BENNY MÖLLER JENSEN	208
<i>Agave utahensis</i> var. <i>utahensis</i> , ROBERT A. JOHNSON	210
<i>Eriophyllum lanatum</i> , JANE MCGARY	211
BOOKS	
Anderson, <i>The Cactus Family</i> , rev. by SEAN HOGAN	214
Irish and Irish, <i>Agaves, Yuccas, and Related Plants</i> , rev. by PANAYOTI KELAIDIS	215
Balzer, <i>The Prairie Rock Garden</i> , rev. by MARGARET BROWN	216
Goldblatt and Manning, <i>Wildflowers of the Fairest Cape</i> , rev. by JANE MCGARY	217
PLANT SHOW REPORT: Eastern Winter Study Weekend 2001, PANAYOTI KELAIDIS	220
NARGS Seed Exchange 2001: Directions	224



Fritillaria affinis. Drawing by Margaret Warriner Buck from *The Wild Flowers of California* by Mary Elizabeth Parsons (1907; reprinted, Dover, 1966).

Fritillarias of California

Diana Chapman

For the first several years that I was experimenting with growing California native bulbs, I must admit I showed scant interest in the genus *Fritillaria*, mentally dismissing them as “plants with brown flowers” and focusing my attention on the gorgeous palette of colors offered by *Calochortus* and the *Brodiaea* group. But then, on my first trip to Bear Valley in the Northern Coast Ranges of California, I was overwhelmed by seeing acres of the beautiful pink-flowered *Fritillaria pluriflora* in glorious bloom, and I returned home intent on reforming my prejudice. I have learned since then that several California fritillarias are brilliantly colored, and today I enjoy growing many of these beautiful species. I even like the brown ones.

The Jepson Manual: Higher Plants of California (University of California Press, 1993) lists 18 species of *Fritillaria* native to California (the only American species not found in the state is *F. camtschatcensis*). The range of habitats in which the different species are found vary widely: coastal grasslands where frost is infrequent and summers cool and foggy; inland mountain foothills with mild winters and blistering summers; and the high elevations of the mountain ranges, where winters can be severe and summers moderate. In the Mediterranean climate typical of most of California, summers are completely dry; all rainfall occurs in winter, usually between October and April. The exception is the higher parts of the many mountain ranges, which may receive precipitation from summer thunderstorms. It is not surprising, then, that most of the fritillarias found in California at mid to low elevations are winter-growers, coming into leafy growth when the rains commence in fall, blooming early in spring, and then going dormant in summer. Most of the lowland species absolutely require a warm, dry summer rest, making them difficult to grow outdoors in climates with summer rainfall. Those from the alpine regions produce their leaves as the snow melts, blooming and completing their growth cycle in the short alpine spring. Some of the mountain species can tolerate summer water as long as drainage is excellent and temperatures moderate.

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In this article, I have grouped the species according to their natural habitats, which should give some indication of the growing conditions they need, although this grouping does not represent their taxonomic relationships. Readers who live in California and those who visit our beautiful state should make every effort to view them in the wild. Aside from the sheer pleasure of seeing these beautiful plants where they belong, more can be learned from observation of their habitat than from any textbook or article.

Alpine species

These are the hardest of the California fritillarias, since they grow at high elevations. Although most of them experience summer rainfall from intermittent thunderstorms, this can be very unpredictable, and almost all grow in dry, rocky sites that provide excellent drainage. The smaller species are delightful in a pot, trough, or alpine house, and they are cold-hardy in all but the most severe climates.

F. atropurpurea is the most widespread of all the California fritillarias, growing at elevations up to 3,000 meters (10,000 feet). It is found from Oregon south throughout the California mountain ranges. Its range also extends east into that amazing area known as the Great Basin, between the Sierra Nevada and the Rocky Mountains. There it inhabits the numerous mountain ranges that rise up from the wide desert. It seems to prefer brushy slopes where it benefits from the light shade of shrubs, always in very dry conditions. Its height is extremely variable; some populations on the eastern slope of the Sierra Nevada are as short as 7.5 cm (3 in.) tall, while within just a mile or two, other populations can be at least 65 cm (24 in.) tall. The flowers are pendent, with tapering tepals that flare widely; they are usually cream marked with purplish brown, although form and color can also be quite variable, as one might expect from a species so widespread.

F. falcata is a rare and lovely species with only three known locales, in central California from Santa Clara County down to the San Benito Mountains, growing on serpentine at elevations of 300–1200 meters (1000–4000 feet). This species must have extremely sharp drainage, for it naturally grows on steep, unstable scree slopes. For this reason, it is reputed to be extremely difficult in cultivation. The plants are tiny, only about 3–10 cm (1–4 in.) tall, with glaucous blue-gray leaves clustered around the base. The star-shaped flower faces upward and out, exposing the beautiful inner coloring—a blend of cream, chestnut, and brown, although the different populations show some color variation. The curled anthers with their russet pollen add beauty to the flower.

F. glauca (photo, p. 178) is found in northern California and southern Oregon on exposed ridges at elevations of about 600–2100 meters (2000–6500 feet). This charming species often grows in close proximity to *F. purdyi*. *F. glauca* prefers the steeper, more sharply drained slopes, while *F. purdyi* stakes its claim to the more moderate terrain nearby, sometimes within 20 feet of its cousin. The

tiny plants, only about 7–15 cm (3–6 in.) tall, support very large, open bells that are usually deep yellow, marked inside with purple and brown. The color can vary: some populations have bronze or chocolate flowers, and others are pale greenish yellow.

F. purdica, with its nodding, bright yellow bells, is an enchanting species unique among the California fritillarias, since it appears to have no close relatives. Growing only about 7–13 cm (3–5 in.) tall, each stem usually supports one perfect flower, often sweetly scented, that ages from rich yellow to rusty orange (the “blush” from which it derives its species name). This hardy species comes from elevations up to 2000 meters (6000 feet), where it grows on dry, rocky slopes in the more arid northeastern regions of California. In fact, its range barely extends into California, but it is a very widespread species in the West, found in eastern Oregon and up into British Columbia, as well as being very common in Idaho and parts of the Great Basin.

F. purdyi is often found on serpentine ridges along with *F. glauca*, but the former seems to prefer flatter or gently sloping terrain that holds more moisture in spring (photo, p. 179). It occurs along the backbone of the Coast Ranges of California, from below the Oregon border to just north of San Francisco Bay. Tight rosettes of glaucous gray leaves give rise to a stem about 10 cm (4 in.) tall that can bear one to five semi-pendent flowers. Each exquisitely formed blossom is like an open bowl, with white translucent petals splashed with chestnut brown and maroon.

F. ojaiensis (pronounced “oh-hi-en-sis”) is closely related to *F. affinis*. This very rare species is known from only five locations in southern California, where it grows at low elevations of 300–600 meters (1000–1800 feet) on rocky slopes, south of the range of *F. affinis*. The flower color is quite distinctive: deep yellowish green with dark maroon spots. The flower is held outward from the stem. The tepals are rounded, and the overall appearance is quite unlike *F. affinis*. Stems can bear as many as 10 flowers and are generally 30–60 cm (12–24 in.) tall.

Grassland species

The grassland species are the most cold-susceptible of the California fritillarias, but almost all can tolerate at least a few degrees of frost. They make excellent subjects for the alpine house, and some—for instance, *F. biflora*—can be grown in the garden in suitable climates.

F. agrestis (photo, p. 179), though a very charming species, has the unfortunate common name “Stinkbells” because of its strange scent. It is not at all “stinky” to me, smelling somewhat like copper pennies, but others find the smell objectionable. This species usually grows in clay soils in the coastal hills of the southern two-thirds of California, but some populations occur right on the coastal bluffs, growing in thin soils that overlie sandstone. The flowers are large, fat bells; the tips of the tepals can either curve inward or gently flare outward.

The color is usually a mixture of purple, brown, and green, but a white-and-yellow form is also found. Plants grow about 15–65 cm (6–24 in.) tall.

F. liliacea, a beautiful and fragrant fritillaria, grows in coastal regions that are under enormous pressure from development, so it is increasingly rare in the wild (photo, p. 177). It grows naturally in dense soils in low-elevation grassland, usually preferring the crests of low hills. The sturdy flower stem that arises from a rosette of linear leaves holds several nodding or out-facing white flowers; the perianth flares widely, exposing the golden anthers. The scent varies from none to intensely sweet.

F. pluriflora, a stunningly beautiful plant, grows in dense clay in some inland valleys of California's Northern Coast Ranges, as well as in a few locales on the west side of the northern Sierra Nevada (photo, p. 178). It is possible that it once grew all across the northern part of the Sacramento Valley, but agriculture has now reduced it to about 20 isolated populations. *F. pluriflora* grows about 25–50 cm (10–20 in.) tall. Its stem holds as many as 12 out-facing, bowl-shaped flowers of gorgeous clear pink. The lanceolate, slightly glaucous leaves are clustered around the base of the flowering stem.

F. striata rivals the better-known *F. recurva* and *F. pluriflora* for sheer beauty (photo, p. 178). And if looks aren't enough, this species has an intense, heavenly perfume combining notes of spice and vanilla. From the Greenhorn Mountains of southern California, *F. striata* grows in dense clay soils at fairly low elevations around 600 meters (1,800 feet), restricted to just a few locales. The flowering stem is about 15–20 cm (6–8 in.) tall. The pendent flowers may be either glistening white or white tinted with pink, with a greater or lesser amount of fine purple striping (striation) inside. The tepals have a thick waxy texture and recurve gracefully at the tips.

F. biflora, also known as "Mission Bells," is a handsome species found from Mendocino County on the north coast down to southern California in a rather narrow band encompassing the coastal regions and lower elevations of the Coast Ranges below 1200 meters (4000 feet). Its preferred habitats are grassland and serpentine barrens. While the norm is two flowers, the stem can hold up to six. These are sometimes as dark as bittersweet chocolate, though they are more commonly bronzy shades of greenish purple or yellowish green, with green median stripes. The flowers, held on stems about 15–40 cm (6–16 in.) tall, have a rounded bell shape; the tepals flare gently at the tips.

F. roderickii (syn. *F. biflora* var. *biflora*, *F. grayana*; photo, p. 179) was once thought to be a natural hybrid between *F. biflora* and *F. purdyi*, but this is now discounted, although its exact taxonomic status is still in dispute. It is essentially a compact, floriferous *F. biflora*. The lovely clone *F. biflora* 'Martha Roderick' also belongs here. Found in a very few locations in Mendocino County, this is an extremely rare fritillaria. Its cream-colored, bell-shaped flowers are marked and splashed with red and brown, carried on stems 12–60 cm (5–24 in.) tall. The coastal populations are much shorter in stature than the inland ones, where I have seen it growing as tall as 60 cm (24 in.).

Woodland species

Although the following are described as “woodland” species, they are never found in dense shade; they occur most often in openings and on the edges of woodland, or in the forest of the more arid regions of California where the trees are widely spaced and undergrowth is scant or absent. *F. affinis*, *F. recurva*, and *F. eastwoodiae* can be grown in the garden in suitable climates, but the others are best grown in an alpine house or bulb frame.

F. affinis (syn. *F. lanceolata*; photos, p. 180) is an extremely widespread fritillaria of the West. It comes in a number of forms and flower colors and is found in quite a variety of habitats, including grassland, chaparral (dry scrub) and yellow pine woodland. It occurs in all the mountain ranges of California, most commonly in the foothills, but it can grow at elevations as high as 2000 meters (6500 feet). This highly attractive fritillaria has large flowers that are usually a squared-off bell shape, produced on stems 40–60 cm (16–24 in.) tall. Flower color is most often a mixture of green, purple, and russet, but there are forms with almost unmarked flowers of a beautiful jade green, as well as some that are almost black. *F. affinis* ‘Wayne Roderick’ has unusually large flowers of a very dark hue; *F. affinis* var. *tristulis* is a shorter form, only about 20 cm (8 in.) tall, also with very dark purple-black flowers. Both are sterile triploids (although one experienced grower of fritillarias states that his plants have produced viable seed) from a very restricted area just north of San Francisco Bay. Fortunately, they are well established in horticulture, since they reproduce readily from rice-grain bulblets.

F. pinetorum is given specific status in the *Jepson Manual*, although it may be listed elsewhere as a subspecies of *F. atropurpurea*, with which it can easily be confused. It grows in the mountain ranges of southern and central California on south- and west-facing slopes in open pine forest at elevations of 1800–3000 meters (6000–10,000 feet). The flowers face upward and are pale yellowish green with red-purple markings; the leaves are more linear than those of *F. atropurpurea*. As in *F. falcata*, the prominent anthers are well displayed and greatly enhance the beauty of the flower with their reddish pollen. Flowering stems are up to 30 cm (12 in.).

F. brandegei is quite unlike other California fritillarias. Its growth habit is rangy, and the star-shaped flowers have very narrow tepals, giving it a somewhat untidy look. However, its rarity makes it a highly desirable species. The flower color is pink to white; the nectaries and anthers are dark purple to black. *F. brandegei* is found in the Greenhorn Mountains of southern California at elevations of 1500–2100 meters (4500–7000 feet), growing in open forest in rocky soils. It is said that it produces no seed in the wild, possibly because of the depredations of browsing deer, but it does produce an abundance of rice-grain bulblets (more on this below).

F. micrantha (photo, p. 180) grows on the western slopes of the Sierra Nevada on dry brushy slopes at elevations of 300–1800 meters (1000–6000 feet). The small flowers are produced from the leaf axils, three or more on a stem 25–60 cm (10–24 in.) tall. They have a subtle beauty with their coloring of dusky reddish

brown. The form is an open bell, with the tips of the tepals tapering and flaring gently outward.

F. eastwoodiae (syn. *F. phaeanthera*), thought to have originated as a natural hybrid between *F. recurva* and *F. micrantha*, is an attractive species of the western foothills of the northern Sierra Nevada, with some populations occurring in southern Oregon. It grows in the light shade of dry woodland or chaparral, usually at around 500–1500 meters (1500–5000 feet). The view that it is of relatively recent hybrid origin stems from the extensive variation in the color and form of the flowers; however, the populations I have seen in the northern part of its range resemble *F. recurva*. The flower is somewhat cone-shaped with slightly flared tepals and usually colored a muted orange, although various shades of buff, tan, scarlet, and yellow are found. More southerly populations show a gradation of flower form, from the “recurva” type to the “micrantha” type, with many intermediate variations. It grows about 20–30 cm (8–12 in.) tall.

F. recurva is famous for its color, a dazzling scarlet unique in the genus *Fritillaria* (photos, p. 177). Native to lightly shaded woodland and chaparral, this is a widespread species, found throughout the mountainous regions of California and Oregon at elevations up to 2000 meters (6500 feet). In early spring, its brilliant flowers light up the shadows and lure the tiny migrating Rufous Hummingbirds with their iridescent plumage of green and flaming orange. Flower and bird are a perfect match. I have seen *F. recurva* growing three feet tall in the Feather River Canyon of the Sierra. The stem bears whorls of linear leaves, and the nodding flowers reach 2–4 cm in length. The tips of the tepals recurve strongly, and the inside of the flower is checkered with gold. The rare *F. recurva* subsp. *gentneri* (known in Oregon as *F. gentneri*), found only in a limited area in southern Oregon, is thought to be a tetraploid. Some writers claim that it sets no seed, but it does; however, it is usually browsed by deer before it can ripen. It has larger flowers that lack the gold checkering of the type. The shape of the flower is also different, with squared shoulders and tepals that flare but do not recurve at the tips, and it grows about 50 cm (20 in.) tall. *F. recurva* var. *coccinea* is a dark-flowered form that lacks the gold checkering; it is found in the Coast Ranges from north of the San Francisco Bay area up to Mendocino County.

F. viridea is another rare species from the dry mountains of southern California, where it is found growing in serpentine (ultramafic rock) areas at 200–1500 meters (700–5000 feet). The unmarked flowers of *F. viridea* are, as the name suggests, various shades of green, and the form is similar to *F. micrantha*.

Growing from seed

Seed of all the California fritillarias should be sown in fall in pots at least 15 cm (6 in.) deep. Some species need several months of cool temperatures to germinate, so sowing early is strongly advisable. Although emergence of the radicle (the underground part of the seedling) always occurs at cool temperatures, it has been shown that some species germinate more uniformly when exposed to

warm temperatures first. In California, this can be accomplished by sowing in the mild temperatures of October, although in some species no evidence of a leaf will be observed for up to five months. Sowing your seeds too late can either delay germination for a year, or it can induce germination at a time when seedling survival would be very poor because of high ambient temperatures. If you receive your seed from a seed source later than November, it really is better to store the seed in the refrigerator until the following season. Contrary to the old notion that fritillaria seed is of short viability when stored, I have found that seed of the *California* species stores well for as long as five years.

In temperate climates, seed pots of the alpine species, as well as most woodland species, should be exposed to winter temperatures, while those of the coastal regions and the grasslands should be kept just frost-free. Actually, all my fritillarias have experienced occasional frosts without detriment, but sustained freezing temperatures could kill seedlings or developing embryos of the more tender species, such as *F. liliacea*. In regions with mild winters, stratifying the seeds in the refrigerator can produce better germination, especially with species from higher elevations. This can be accomplished by placing the seeds in a plastic bag with some slightly damp peat or vermiculite, then placing the bags in the food compartment of the refrigerator. Bags should be checked weekly for signs of germination. When the radicles start to emerge, the seeds can be sown by scattering the entire contents of the bag on the surface of a sterilized potting medium, then covering the germinating seedlings with coarse grit. The pots can then be placed outside, exposed to the winter weather. I have found that covering the seed pots with agricultural fabric such as Reemay (or fleece) protects the pots from heavy rain, hail, birds, and other predators, and it provides a better environment for the developing seedlings. Seedlings should remain undisturbed in their pots, given an occasional application of weak liquid fertilizer while in growth, for two years before being transplanted into deeper pots or into the garden.

Propagation from bulbs

The production of many tiny “rice-grain” bulblets around the parent bulb is a feature of many California fritillarias and has probably evolved as a survival mechanism against predation by the numerous digging and burrowing animals in the West that relish the native bulbs. It is not unusual to see the tiny bulbs lying in the soil mounds left by gophers, the mother bulbs having probably been devoured. In those species that produce these tiny offsets, vegetative propagation could not be easier. The main bulb appears as a solid disk with the rice-grain bulblets clustered around the periphery. These can be removed without even uprooting the parent bulb and then sown like seeds. They will mature one to two years faster than seedlings and will be identical to the parent. It has been said that removal of these bulblets saps the strength of the parent bulb, thus preventing it from blooming the following year. Actually, these tiny bulbs provide

no sustenance for the parent, but if they are removed the parent bulb puts its energy into replacing them. If the bulb is not large enough, it may not bloom the following year, although I have found that large bulbs are unaffected by the removal of the rice grains. If you want your bulb to increase in size, do not remove the rice grains, for they will not sprout while still attached to the mother bulb, and your bulb will not go on producing more rice grains as long as they remain attached.

It has been thought that some California fritillarias “break up” into numerous bulblets in cultivation, especially after blooming. It is more likely that the parent bulb has died, leaving numerous progeny behind. This can be a natural process, the mature bulb having a finite life, but it is more likely due to environmental stress, something more likely to occur in cultivation. In the wild, I have seen individual plants of species such as *F. recurva* returning and blooming every year, and it would appear that the bulbs can be very long-lived.

Unfortunately for horticulturists, some of the most desirable species of California fritillarias, such as *F. pluriflora* and *F. striata*, produce no rice-grain bulblets, the bulb being composed of two or more thick scales. All these species produce some small offsets, however, and I have found that those species that do not produce rice grains make up for it by producing abundant quantities of seed.

Cultivation

Most California fritillarias have a reputation for being moderately to extremely difficult to maintain in cultivation, as well as being difficult to bring to flowering. This is probably due to the fact that some of the most dedicated collectors of this genus live in England, where the climate is radically different; but even in California, one can meet failure if the specific environment from which each species hails is not taken into consideration. I think it can be said with some certainty that these are not adaptable plants, so every effort must be made to understand and reproduce the climatic conditions under which they naturally grow. Although one or two species, such as *F. biflora* and *F. affinis*, can be successfully grown in the garden in suitable climates, most of the California fritillarias are better managed in a pot at least 20 cm (8 in.) deep. A two-gallon pot is roughly 20 by 20 cm (8 by 8 in.), and it will accommodate several bulbs. In many parts of California, potted fritillarias can be left outside if rainfall is not excessive, but in other regions it may be advisable to grow your plants in a greenhouse, bulb frame, or alpine house to protect them from hard frost or excessive winter rain and to provide the conditions they need during dormancy.

Although different species are found growing in widely varying soil types, from serpentine with high concentrations of ordinarily toxic minerals to the densest clay imaginable, all the California species will grow well in cultivation in a very gritty mix where water drains freely and air spaces are well distributed. A few species of the northern woodlands seem to enjoy more humus in their mix, but this is not essential.

All the species from the foothills, coastal regions, and inland valleys *must* have a long, dry summer rest. This means that as soon as flowering begins, no further water is given until fall. Flowering of many species occurs in March, so the bulbs must remain nearly dry for up to eight months. Resume watering in October to coincide with the season when the winter rains would normally commence in California. Gardeners in cool or humid climates must take care to ensure that the medium in which the bulbs grow becomes totally dry during their dormancy. In our cool coastal climate, large pots can retain a lot of moisture in summer, even without any watering or rain, so we place them in a warm greenhouse to dry thoroughly. Of course, there still is some moisture retained in potting soils that appear to be dry, and this is all that is needed to prevent desiccation of the fragile-appearing bulbs. I have never had any difficulties with bulbs becoming desiccated as long as they were left in their plastic pots, even when they were exposed to sustained summer temperatures over 100°F (38°C). In California's Mediterranean climate there is rarely any rain at all in summer, but on the rare occasions when some falls, the dense clay soil in which most of the lowland California fritillarias grow is quite impenetrable to precipitation once it has thoroughly dried. In their natural environment, these species would never experience significant moisture during the warm months, and allowing the bulbs to remain damp during this critical time will almost certainly result in fungal diseases. In addition to being dry, all the lowland California fritillarias must have a warm to very warm rest to ensure flowering. The failure of species such as *F. pluriflora* to flower in cultivation, assuming that the bulb has reached maturity, is most commonly due to excessively cool temperatures during dormancy. Maintaining them in pots at around 70–80°F (21–27°C) seems sufficient to ensure flower bud initiation, but even higher temperatures do not seem to hurt.

The alpine species are almost always found growing in very rocky areas, often on steep and unstable scree slopes where little water is retained. Some of them can be very challenging, and all need the sharpest drainage possible. It must be remembered as well that, although daytime summer temperatures in the mountains of California can be as high as 90°F (38°C), nighttime summer temperatures are quite cool. In contrast to the lowland species, these alpine fritillarias need a cold, dry winter, a fairly cool spring with frequent watering, and a dry, warm (but not hot) dormancy to mimic the conditions where they naturally grow. Maintaining the pots of dormant bulbs in temperatures around 60°F (15°C) seems adequate. Of the alpine species, *F. falcata* is notoriously difficult in cultivation, while *F. purdyi*, *F. glauca*, and *F. pudica* are more accommodating.

Conclusion

I hope that this brief article will encourage more lovers of alpine plants to try these lovely bulbs and not be discouraged by their reputation for difficulty. The American West has many beautiful native bulbs, most of which deserve wider recognition, and there are species of *Fritillaria* suitable for all levels of expertise.

No article on the California fritillarias would be complete without a tribute to Wayne Roderick, who has dedicated much of his life to our beautiful native bulbs. I also thank him for technical advice, photographs, and comments. Thanks are also due to Ed Rustvold for advice on habitat and distribution, and to Dave Lomba for expert proofreading.

Diana Chapman of Eureka on the northern coast of California is the proprietor of Telos Rare Bulbs, a supplier of Californian and other mild-climate bulbs.

Sources

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In Search of Himalayan Lilies

Chris Chadwell

As an English botanist by training, a conservationist by inclination, and an old-fashioned plant hunter by profession, I would like to share my knowledge of the popular genus *Lilium* as I have observed it in the wild. I have no “favorite” groups of plants, but I admit a penchant for those that inhabit the highest elevations where plants can survive. I have now undertaken seventeen journeys of exploration in various parts of the Himalaya, mostly as the leader of seed-gathering expeditions. This extensive field experience, combined with twenty years of research into the botany of the Himalayan flora, has given me a unique perspective.

I also want to take this opportunity to give some belated acknowledgment to a little-known American botanist, Ralph Stewart, who contributed much to our knowledge of western Himalayan plants. Readers will be pleased to learn that it was not just British botanists and plant hunters who undertook extended travels in the Himalaya during the 20th century.

According to *Flowers of the Himalaya* by Oleg Polunin and Adam Stainton (Oxford University Press, 1984), there are seven species of *Lilium* in the Himalaya. However, one of those records—*Lilium bakerianum*—is so doubtful as to warrant no further mention here, particularly since this species is quite large in stature and of borderline hardiness. I am also excluding *L. wallichianum* from this article because of its height (1.5 to 2 meters) and its lack of hardiness. During the time of the British Raj, the Indian colonial period, Sir Joseph Hooker in *Flora of British India* recognized six true lilies from the Himalaya, of which two species are now considered to belong in the genus *Notholirion*. Hooker treated what we now know as *Lilium oxypetalum* as a *Fritillaria*, and he felt that *L. nanum* was a doubtful species.

At the present time, *Lilium* is distinguished from related genera by its usually large, funnel-shaped flowers, either solitary or in a spike-like inflorescence, and by its bulbs, which exhibit fleshy overlapping scales without a protective tunic. I will describe five Himalayan lilies suitable for cultivation in rock gardens.

Lilium polyphyllum: The West Himalayan Lily

“Possibly due to picking this lily is nowhere abundant,” wrote Dr. Ralph Stewart, an American Presbyterian missionary who became principal at Gordon College in Rawalpindi, Pakistan, in his *Annotated Catalogue of the Vascular Plants of West Pakistan and Kashmir* (published as part of the Flora of Pakistan Project in 1972). Stewart’s doctorate was awarded by Columbia University for his studies on the flora of Ladakh, western Tibet, following his expeditions to the region in 1912–1913. The 1972 catalogue and checklist, a massive 1000 pages, represents a lifetime’s study and formed the basis for an up-to-date flora of Pakistan. Funding for this project came from the U.S. Department of Agriculture—the kind of foreign aid of which governments should be proud. Stewart spent the early years of his retirement as a research associate in the herbarium of the University of Michigan, Ann Arbor, and his summers at the Royal Botanic Gardens, Kew, England, checking his research against that premier collection. Grants from the U.S. National Science Foundation aided his studies.

I was delighted to meet Dr. Stewart at his retirement home in Duarte, California, east of Los Angeles, in 1983, when he was already in his nineties. He generously gave me his final, personally annotated copy of the 1972 catalogue, to which I have since referred literally thousands of times. A few years later, I was able to spend a few days out of a U.S. lecture tour in the herbarium at Ann Arbor, hosted by Dr. Tony Reznicek, and examine the specimens at first hand. (Many of these were collected by Walter Koelz, zoologist and plant explorer for the U.S. Department of Agriculture, and his associate Thakur Rup Chand from Lahoul.) Dr. Stewart made it to the age of 100, outliving two energetic wives, and he even attended an international conference in Karachi to celebrate his centennial. He read a paper at the conference, presided over its final session, and enjoyed a field excursion. I wonder if my own travels in the high Himalaya are likely to result in such longevity?

Dr. Stewart’s observation on the abundance of *Lilium polyphyllum* rang true during the Kashmir Botanical Expedition in 1983, when my team seldom encountered it, despite covering much suitable ground. Somewhat to our surprise, we spotted a small colony on an island in the Lidder River, just outside Pahlgam, the main staging post for a sizable annual Hindu pilgrimage to the Amarnath Cave. We returned two months later to gather some of the seed capsules. Sadly, when I returned to this spot just two years later, on a plant hunting trip with Magnus Ramsay (then deputy principal of the Threave School of Gardening in Scotland), a bridge had been constructed allowing vehicular access to the island. Nothing remained except short grass and wild strawberries—thanks, no doubt, to the local goats taking advantage of the fresh grazing. We drew a blank elsewhere in Kashmir, but seed of this lily was distributed to our shareholders thanks to a supplementary collection supplied through P. N. Kohli, an internationally known Indian nurseryman.

I managed to see *Lilium polyphyllum* again in the bordering state of Himachal Pradesh, while I was leading botanical tours up the Miyah Nullah Valley,

situated in the Tibetan borderland district of Lahoul. Here the lily is not uncommon in blue pine (*Pinus wallichiana*) forest. Those were my last sightings of it in the wild; my travels in the 1990s have concentrated farther east in the Himalaya, beyond the range of the West Himalayan lily. Nonetheless, I did pass through some promising localities, including Shimla, once the summer capital of British India. Disappointingly, no trace of *L. polyphyllum* could be found. Back in 1921, when the Britishers—as we are still known, mostly affectionately, by the Indians—ruled the Indian subcontinent, Colonel Sir Henry Collett of the Bengal Army, author of *Flora Simlensis*, observed that this lily was common in the woods around Shimla. Its former abundance and its attractiveness are exemplified by a full-page frontispiece line drawing in that flora by Miss M. Smith, artist at the Kew herbarium. Conservation-minded readers should note that the demise of *L. polyphyllum* around Shimla had little to do with overenthusiastic plant hunters, tourists on botanical holidays, or even locals plucking the blooms. The causes lie in a considerable increase in the population since Indian independence (1947), accompanied by tree felling, unregulated building, and poorly thought-out road construction. As a consequence, hardly any of its habitat, the once nearly pristine forest, remains close to Shimla.

Lilium polyphyllum is a tall, robust plant with handsome pendent flowers which are greenish white, dotted and streaked inside with red-purple. The stems may be 2 to 4 feet (60–120 cm) tall. The sessile leaves may be alternate, nearly opposite, or in whorls on the stem and are narrowly lanceolate to linear. The individual flowers are 2–3 inches (5–7.5 cm) in length and are broadly funnel-shaped, borne in early summer on pedicels in racemes of 3 to 10. The fruit is a capsule about an inch (2.5–3 cm) long, angled and 3-valved. Its habitat is forest and shrubby areas in the western temperate Himalaya from Kashmir to Kumaon at elevations of 2100–3000 meters.

Lilium nepalense: The Nepalese Lily

I first encountered this lily in the form of fruiting capsules, which I found in the early fall of 1990 at around 2700 meters in the mountains surrounding the main Kathmandu Valley of Nepal. In fact, I have yet to enjoy viewing its flowers in the wild, since its early-summer flowering period does not coincide with our fall seed-gathering excursions.

Lilium nepalense grows 2–3 feet (60–100 cm) tall. The stem is smooth, its lower portion round. The lanceolate leaves, 4.5–11.5 cm (2–4 inches) long and 1–3 cm (0.5–1.3 inches) broad, have 5 to 7 nerves, or longitudinal veins. The solitary, drooping flowers are quite large—10–15 cm (4–6 inches) long—and broadly funnel-shaped, flaring from the base and recurving from about the middle. The base color is greenish or yellowish but the center of the flowers tends to be deep purple. It flowers in June and July and fruits in August and September on rocky, open slopes from Uttar Pradesh to Arunachal Pradesh, with an altitudinal range of 2300–3500 meters (7000–11,000 feet).

Lilium nanum: Dwarf Himalayan Lily

My introduction to *Lilium nanum* came in Bhutan, “Land of the Thunder Dragon,” a Buddhist kingdom nestled between northeastern India and Tibet. I had been appointed a consultant to the Royal Government of Bhutan in 1994 on the Conservation of Medicinal Plants for Traditional Medicine Project, financed primarily through the European Union. Bhutanese authorities wish to expand the use of traditional medicine, which remains the primary type of health care in their kingdom, but they are rightly concerned about the conservation aspects of increasing the quantities of material gathered directly from the wild. As a “high-altitude agronomist,” I was given the task of advising on the cultivation of Himalayan and Tibetan mountain plants. Although there is a long tradition within Ayurvedic medicine of growing lower-elevation (i.e., tropical and subtropical) species, hardly any plants from higher elevations have ever been cultivated in India, Nepal, or Bhutan. Nowadays, however, there is much interest in this practice in many parts of the Himalaya.

For the past century, plant hunters from the West have been exploring along the Himalaya and into Tibet proper in search of mountain plants likely to be both hardy and ornamental in our gardens. Before the 20th century, plant introductions from the East tended to be from tropical climes, requiring protection and, often, artificial heat for successful cultivation—for example, epiphytic orchids. Many of the Himalayan introductions were, by chance, also of medicinal value, though their early Western growers did not pay much attention to that aspect. Through the Sino-Himalayan Plant Association, founded in 1990, I have been accumulating information on the cultivation of such plants, based on the experiences of individual gardeners, botanic gardens, and specialist societies. This is an excellent way for other specialist gardening communities, including NARGS members, to “put something back” in the countries from which these plants originate—a not insignificant consideration these days.

Among the garden-worthy Himalayan plants introduced in recent decades is *Lilium nanum*, known to Tibetan doctors as *a-bi-kha*. The whole plant is utilized in Bhutanese medicine as a detoxicant, said to help join the parts of broken skulls! Readers should note that, although they might be naturally curious as to the uses of a particular plant, Tibetan herbal medicine involves formulations combining anywhere from 3 to 150 different plant species, acting in combination; hence, it is misleading to think in terms of a single “active principle” working in isolation.

Although actually quite common in the wild, *Lilium nanum* can easily be overlooked as it grows among shrubs or the luxuriant vegetation of alpine slopes, especially when it is not in full bloom. It is probably under-recorded in the wild.

This is a small plant with a solitary, drooping, distinctly bell-shaped flower that may range in color from dull purple to white (photos, p. 000). The elliptic tepals are 1.8–2.5 cm (up to 1 inch) long. The 10–12 leaves are sessile, alternate, linear with obtuse tips; the uppermost leaves overtop the flower. The stems may be anywhere from 10 to 30 cm (4–12 inches) tall. The bulb has lanceolate scales.

It inhabits shrubby areas and alpine slopes at elevations from 3300 to 4300 meters (11,000–14,000 feet), ranging from the Himachal Pradesh to southwestern China.

Two Lilies of the Tibetan Borderlands

I have been able to make a number of seed collections myself and have had seed gathered by local collectors from the aforementioned species. The two species discussed below, however, have so far escaped the attentions of present-day plant hunters. Their descriptions will surely whet the appetite; reintroductions are warranted as soon as formal expeditions are allowed into the areas where they grow. In the meantime, we must admire them from a distance—or in Scotland, where populations have been maintained in cultivation from the initial introductions in the late 1930s.

Lilium oxypetalum: The Central Himalayan Lily

Lilium oxypetalum is a much-desired leafy species with a showy bloom. It was once placed in the genus *Nomocharis*. It occurs on open slopes and moist alpine meadows from Himachal Pradesh through Garwhal and Kumaon into western Nepal. The main reason for the scarcity of reintroductions in recent times is the fact that the most promising sites have largely been out of bounds to foreigners owing to their proximity to the Tibetan border.

Frank Smythe had no such difficulty in the 1930s. He wrote in *The Valley of Flowers* (London: Hodder and Stoughton, 1938, repr. 1947): “A steep scramble and we stood on a wide shelf littered with boulders and there grew a plant which is one of the rarest and most beautiful of its family, the lily-like *Nomocharis oxypetala* [now *L. oxypetalum*]. In colour this nomocharis is very different to the *Nomocharis nana* [now *L. nanum*] which grows in the Bhyundar Valley; the latter is blue, the former a creamy yellow.”

The solitary flowers are pale yellow to cream and are cup-shaped, the tepals spreading outward from the base and not curved. They are almost stalkless, borne among the upper leaves of the stout stem, which rises 30–45 cm (12–18 inches). The tepals are ovate-acute, 4–5 cm (about 2 inches) long, with hairs above the nectaries. The numerous elliptic-lanceolate leaves are 4–8 cm (2–3.5 inches) long. It inhabits rocky areas and open slopes at 3300–4000 meters (11,000–13,000 feet) from Himachal Pradesh to western Nepal, flowering in June and July.

Lilium sherriffiae: Sherriff's Lily

This rare lily was named for Elizabeth Sherriff; her husband, Major George Sherriff, and his trained local collectors—often accompanied by Frank Ludlow—found many plants of horticultural value along the Tibetan frontier. *Lilium*

sherriffiae boasts glorious reddish brown flowers checkered with gold inside. (It is the only “tessellated” lily species, in this feature resembling many fritillarias.) It has been recorded from Nepal on only one occasion but enjoys wider occurrence within Bhutan.

Unfortunately, the present sensitivity in Bhutan regarding any form of even scientific collecting—let alone horticultural exploration—makes it essential that all visitors abide by the rules and do not surreptitiously remove material of this rarity, or any other plant, for that matter. Such restrictions apply equally to tourists on botanical holidays and to people like myself who enter Bhutan in an official capacity. It costs a great deal to trek in Bhutan, where the authorities restrict the number of Westerners allowed to enter their kingdom each year and levy a daily fee (which can run from \$200 to \$250) for the privilege, but paying it does not entitle visitors to do as they wish.

Lilium sherriffiae bears a single pendent, campanulate flower with tepals about 6 cm (2 inches) long. The leaves are linear-lanceolate, pointed or tapering to a blunt apex. The flowering stem ranges from 30 to 60 cm tall (1–2 feet). Its habitats include sandy soil among willows near streams, rocky and sandy grassy hill-sides, and damp, humus-rich slopes in *Abies* (fir) forest. It blooms in May and June at altitudes from 2700 to 3700 meters (8500–13,000 feet).

A Note for the Future

In a future issue of the *Rock Garden Quarterly*, I will examine these Himalayan lilies in cultivation. To help with this, I would like to invite readers to contact me directly with their experiences growing any of these species, especially in North America; however, records from any part of the world are welcome and will be put to good use. Informal notes are fine.

Chris Chadwell has conducted three lecture tours in North America. He is founder and secretary of the Sino-Himalayan Plant Association (see address below), which offers bi-annual color-illustrated newsletters on cultivation, conservation, botany, plant hunting, ecology, and travel, as well as a seed exchange and UK meetings. His company, Chadwell Seeds, offers unusual seed from around the world.

Sources

Sino-Himalayan Plant Association, 80 Parlaunt Road, Slough, Berks. SL3 8BE, England; tel/fax 0044-1753-542823. Newsletter and seed exchange; annual dues, US \$18, UK L10.

Species Lily Preservation Group, Maureen Barber, Membership Secretary, 336 Sandalwood Rd., Oakville, Ont. Z6L 3R8, Canada. Bulb sales; annual dues, \$7.

Scottish Rock Garden Club, Harry Layock, membership secretary, Solsgirth, Dollar, Clackmannanshire, Scotland FK14 7NE; dues US \$25. Seed exchange rich in Himalayan plants.

Ardfearn Nursery, Bunchrew, Inverness IV3 6RH, Scotland, UK. Bulbs and plants.

Double Trilliums

The history of an elusive flower

John and Janet Gyer

One spring day in 1864, Emilie Zimmerman walked through her woodland to a place she called “Pine Hill,” near Buffalo, New York, to pick trillium flowers. In those days, the large white-flowered *Trillium grandiflorum* grew abundantly in the wild; it still does in some favored places, where it forms a nearly complete groundcover in deciduous woodland. As Mrs. Zimmerman walked, a different flower caught her eye: instead of the usual three petals, it had many—so many that it looked like a white carnation. She dug the rhizome and brought it into her garden, the first double-flowered trillium recorded in horticulture.

The discovery of this double trillium is recorded in a letter to the editor of *Meehan's Monthly* (vol. 4, 1894). The letter was sent in response to a feature article that mentioned a woman in Escanaba, Michigan, who had recently brought a double-flowered trillium into her garden. Since the late 1800s, a number of double forms have been transplanted from the woods into gardens, but only a few clones form the basis for the small (and expensive) commercial supply.

All fully double forms of *Trillium grandiflorum* are sterile. They produce no seed and must be increased by rhizome division, a very slow process and one that does not offer the possibility of seedling variation from the original flower form. We reasoned that if a double-flowered plant was found in nature, then some plants near it should carry the genetic trait for doubling. Since single trillium flowers produce seed, the offspring of plants carrying the doubling trait might produce double forms. In fact, this seems to happen in nature. We found a 1944 report of a scattered group of 13 double-flowered trillium plants in a small section of a much larger population. At least one single-flowered plant with the doubling trait must have produced the seed that grew into the 13 doubles. With that encouragement, we set off on a continuing adventure of discovery. We have not yet found a natural colony with fully double-flowered plants, but we have observed a lot of the odd habits of trilliums, and we have met, too often only through their writings, the people who began the cultivation of double trilliums.

The Exploring Postmaster

The steep hills around the high valley that cradles Erin, New York, were heavily forested at the turn of the 20th century, and Erin thrived from the lumber trade. It was a time when many people lived near a forest and wandered through it to study or collect wildflowers. James Smith, the postmaster of Erin, loved such outings to forests where trilliums grew in abundance. In May 1924, during a walk with his children, he came upon a plant with fully double flowers. He took it back to his garden, where it grew and increased. Smith wrote a regular column for the *Elmira Star Gazette*. In 1956, its Sunday supplement, the *Courier Magazine*, published his poem "Discovery," which commemorates his find (we must assume that he was a better gardener than poet—*Ed.*):

In nineteen twenty-four,
We went afield with eager eyes
The woodland to explore.—
As we came into a copse
What a sight before our eyes!
A sea of trilliums, snowy white
Beneath the cloudless skies.—
As I stood there gazing
In wonderment and awe,
I hardly could believe 'twas real
The rare flower that I saw.

Upon arrival home that day
The neighbors came to see,
The double trillium we found
And all exclaimed in ecstasy.

So extra care it did receive
Through season after season.

And now that plant of bygone years
Has increased into many,
And they are planted here and there
In many a nook and cranny.

James Smith propagated his double trillium by division and ultimately recorded his find both photographically and with a pressed specimen deposited in the Bailey Hortorium at Cornell University. This herbarium holds a number of other pressed double-flowered trilliums, but only Smith's is known to have been propagated and widely distributed to other gardeners.

During the time James Smith and his son, Stanley—who later became curator of botany for the New York State Museum—were actively studying their local

flora, William Smith, his wife Mary, and their children were establishing Robin Hill Arboretum at Lyndonville, west of Rochester, New York. Their successful canning company gave them time to enjoy outings in the local woods, where they occasionally found and brought into their gardens interesting variants of native species, especially trilliums. William Smith assembled a large collection of trilliums and published articles on their use as garden plants. Among the trilliums he propagated at Robin Hill was James Smith's double (photos, pp. 181, 182).

William Smith corresponded with numerous gardeners and botanists, including Henry Teuscher, curator at the Montreal Botanic Garden. He gave Teuscher a double trillium, probably the one from James Smith. (Teuscher records a slightly different history in *American Horticulturist*, April 1976, 56.2:28–29). Marion Smith, William's daughter, remembers that during his collecting her father never found a double himself, but his sister did, and that too grew at Robin Hill; Marion Smith remembers it as fuller than James Smith's form. Teuscher successfully propagated his gift and is said to have distributed it to many gardens, and William Smith gave plants to others as well. One went to Harold Epstein, late president emeritus of the North American Rock Garden Society, who propagated it and passed it on.

The now widespread presence of this clone in gardens is due to its initial propagation by the observant postmaster of Erin and its distribution by the founder of Robin Hill Arboretum. But even armed with this information, we were no closer to finding a native colony that spontaneously produced double forms. We needed more clues.

The Gardening Doctor

The large lot at 206 Rugby Road in Syracuse, New York, had a very steeply sloping back yard. Dr. James Burlingham, who lived there with his family in the 1930s, willingly accepted the gardening challenge posed by the slope and turned it into an exquisite rock garden. One of his glorious plants was a double trillium given him by Otis Bigelow, who had found it on his farm north of Syracuse. The plant grew well and was awarded a "Special Prize" at the National Exhibition of the American Rock Garden Society and the Horticultural Society of New York in May 1937.

Dr. Burlingham's son, Jim, an active member of the Delaware Valley Chapter of NARGS, told us that his father's garden eventually passed into the custody of the Men's Garden Club of Syracuse. When they could no longer care for it, it was turned over to the city of Syracuse. Neglect rapidly deteriorated the garden until a few remaining Men's Garden Club members removed some choice plants to save them. One of them, Frank Griffiths, moved a plant of the double trillium to his garden. He and his wife, Eleanor, carried it with them when they retired to Grafton Pond in New Hampshire, where the plant thrived, protected from pine mice and deer. The trilliums were moved from the heavy clay soil of central New

York to a soil composed of leafmold and granitic sand. Ordinarily trilliums do not like sandy soils, which drain too fast and are too warm and dry unless carefully managed, but they approved of the long, cool, moist springs by Grafton Pond. They multiplied well and provided Frank with the numerous rhizomes he gave to friends and donated to plant auctions of the New England NARGS group. Shortly before he died in 1989, he and Eleanor dug more than 50 rhizomes which they sold to White Flower Farm as stock for propagation.

The Watertown Mystery

Because they must be vegetatively propagated, double-flowered *Trillium grandiflorum* plants are rarely offered in nurseries. In 1946, however, Fred Abbey offered 10 double trillium plants in his Gardenside Nursery catalogue. His daughter, Betty Royce, remembers the plants as coming from a person in Watertown, New York. Marion Smith remembers that her father tried unsuccessfully to purchase double-flowered trilliums from a man in Watertown, but his name has been lost and his source is undocumented. Henry Francis DuPont, who oversaw the creation of the famous Winterthur gardens, saw the Gardenside catalogue and ordered all ten trillium plants, but Abbey returned his check. He felt that such a rare plant should be distributed to as many gardeners as possible and allotted DuPont one plant for the year. Over the next several years, DuPont purchased several additional rhizomes and planted them at Winterthur. They survived for a time, but being sterile, they could not develop by self-sowing into a massed display like the beautiful sweeps of single flowered trilliums that now grace Winterthur's Azalea Woods.

Fernwood Nursery in Swansville, Maine, has a double trillium with flowers that look different from either the James Smith or the Burlingham form (photo, p. 182). The owner, Rick Sawyer, got plants from Mildred Seaver of Needham, Massachusetts, who got hers from Ruth Carpenter, but there the documentary trail stops. Although proof is lacking, Ruth Carpenter's plant may have come from Gardenside Nursery, which operated in New England during the 1940s. If so, it could be identical to that from the mysterious supplier in Watertown. Watertown is just across the St. Lawrence River from Canada, where a certain Father Louis-Marie was actively publishing on the variations found in the genus *Trillium*. In 1940, he published *Trillium grandiflorum*, forma *petalosum* in "Entités systématiques nouvelles" in *Revue d'Oka*. The sketch of the plant he collected on May 12, 1935, at La Trappe, Quebec, looks similar to the present-day Fernwood form.

Recent Discoveries and Old Standbys

Although the double-flowered *Trillium grandiflorum* clones now in horticulture were all discovered before 1950, wild populations still exist that spontaneously

produce double forms. Don Jacobs, in *Trilliums in Woodland and Garden: American Treasures* (self-published, 1998), states that Fred and Roberta Case, authors of *Trilliums* (Timber Press, 1997), know of a population that contained more than 37 separate double-flowered clones; however, they do not mention this in their own book. Such a population should be a prime site for extensive seed collection to preserve the genetic trait that leads to doubling. One selection from it, in fact, is being vegetatively propagated at the Mt. Cuba Center for the Study of Piedmont Flora. The Cases named it 'Pamela Copeland' in recognition of Mrs. Copeland's longstanding interest in trilliums and her work toward preserving native plant habitats.

One clone traveled through decades and twice across the Atlantic before it returned to American gardeners. Alan Bloom has long grown a double *Trillium grandiflorum* at Bressingham Gardens in Norfolk, England. A skilled propagator, he had sufficient stock to export a few rhizomes back to a nursery in the United States. The North American source of his clone has not been traced, but, from the plant characteristics, it may be the one that James Smith discovered.

Herbaria record a variety of double and fasciculated forms. (In *Trillium*, fasciculation results in an apparent bundle of several stems and their flowers into one stem and flower.) For instance, the Bailey Hortorium at Cornell has one fasciculated specimen in which all the parts are multiplied by five. Louis-Marie recorded a similar form in his 1940 "Essai de classification des variations mineurs du Trille."

The discovery and loss of an interesting form of *Trillium grandiflorum* is recorded on herbarium sheets 1735019 and 1786868, Plants of Virginia, at the Smithsonian National Herbarium in Washington, D.C. On May 6, 1938, a group of friends from Washington were climbing Old Rag Mountain when Theodore B. Ruhoff found a double-flowered trillium growing beside the trail in sandy loam. It and another found nearby were dug, one for the National Herbarium and the other for a garden. Titus Ulke wrote that the herbarium plant had 15 petals of greenish white, but its rhizome broke off before it could be pressed and was planted near the other plant. The two rhizomes persisted until the discoverers died. Because it was not propagated, this attractive form with relatively narrow petals eventually disappeared. Its only traces are a dried specimen, a yellowing photograph, and a letter to the herbarium curator detailing its discovery.

Trillium grandiflorum is not alone

Double or many-petaled flowers result from mutation in the genetic system that controls the differentiation of sepals, petals, stamens, and ovaries from the tip of a growing stem. These mutations are seen most often in *Trillium grandiflorum*, but beautiful double forms of other species are known. In 1954, Albert de Mezey of Victoria, British Columbia, found a colony of *T. ovatum* that contained about two dozen double-flowered plants. He later found other scattered colonies with

some double flowers. Seed collected from these colonies should help to isolate the genetic trait that leads to double flowers in this species. Unfortunately, as de Mezey related in the American Rock Garden Society *Bulletin* (April 1972), collectors removed all the doubles from the first site, and urbanization threatened the others. Edith Dusek noted in the Fall 1988 ARGS *Bulletin* that one colony with double-flowered *T. ovatum* had already become a parking lot. Some of these doubles, however, are in cultivation; one is named 'Edith' for Mrs. Dusek. Don Jacobs describes another lovely double form of *T. ovatum* which grows in Oregon gardens under the name 'Barbara Walsh' and in England as 'Kenmoor'. Propagation of these clones has been slow and very few are available.

The Academy of Natural Sciences in Philadelphia has a fine herbarium specimen of double *Trillium erectum* collected near Allentown, Pennsylvania, in 1915. In a 1940 issue of *Revue D'Oka*, Father Louis-Marie mentioned a "forme Peta-loide" collected in 1906 near Chelsea, Quebec. He also mentions forms of *Trillium undulatum* with 4, 6, 8, or 9 petals.

William Smith recorded that sometime before 1944, Mrs. G. Latta Clement of North Carolina found a fully double *Trillium vaseyi*. This form persisted for a time in a few gardens, including that of Mary Henry in Gladwyne, Pennsylvania (ARGS *Bulletin*, April 1956). Unfortunately, these plants have not been propagated and distributed to gardeners, so they are lost to horticulture.

Since double forms of trilliums result from changes in the genetic blueprint for their flower structure, other mutations may cause reversion to the single form. In double *Trillium grandiflorum* such reversion is rare, but in 1996, Leah Burt reported on the Internet discussion list Alpine-L that reversion has happened. When her double trillium was moved, it reverted to single flowers for two years and then produced double ones again. Two years ago, we found a partially double form in which the stamens had become petaloid, but last year it reverted to single flowers (photo, p. 181). Such revertant plants could be a source of seed that contains the genetic tendency for double flower formation.

Green-flowered forms

Fred Case has shown that green-striped flowers and various anomalous forms of *Trillium grandiflorum* are a result of infection with a mycoplasma, an organism that lies somewhere between a virus and bacterium. The mycoplasma seems to disrupt the activities of genes that control plant and flower development. The disruption can result in various double-flowered forms. These have not found their way into general horticulture and probably should not, because of the possibility of transmitting the mycoplasma to normal plants in the garden or the wild.

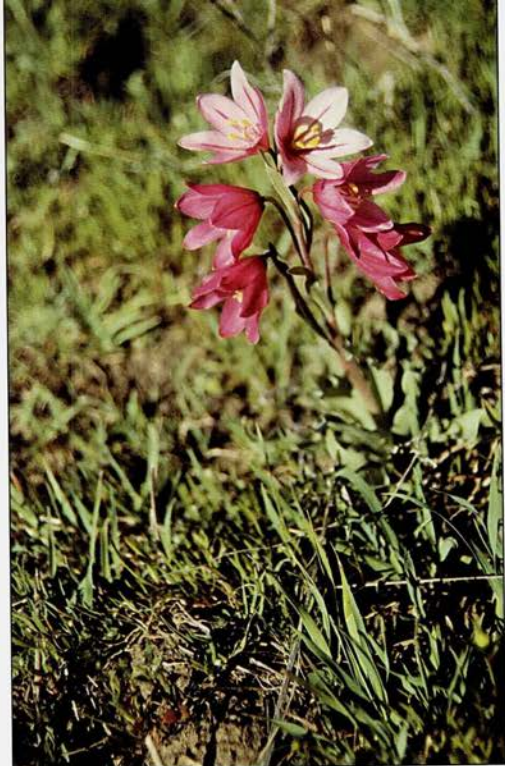
Nevertheless, the literature records a number of green doubles. In 1901, John M. Holzinger reported one from Winona, Minnesota (Smithsonian no. 211424). In a more detailed account in the ARGS *Bulletin* (October 1954), Carleton Worth stated that, around 1924, Charles O. Rhodes found a double-flowered *T. grandiflorum* with green-striped petals near Groton, New York. It grew well for years,



Two color variants of *Fritillaria recurva* (p. 160): left, at Mendocino Pass; right, near Shingletown. (photos, Wayne Roderick)

Fritillaria liliacea (p. 158) in the wild near Nicasio, California.





Above left, *Fritillaria pluriflora* (p. 158) in Bear Valley near Colusa, California (photo, Wayne Roderick). Above right, *Fritillaria striata* (p. 158) in cultivation (photo, Jay Lunn). Below, *Fritillaria glauca* (p. 156) in typical scree habitat on Black Butte, northern California (photo, Wayne Roderick).





Above, *Fritillaria purdyi* (p. 157) in coastal northern California. Below left, *Fritillaria agrestis* (p. 157) near Coulterville, California. Below right, *Fritillaria roderickii* (p. 158) in cultivation. (photos, Wayne Roderick)





Three forms of *Fritillaria affinis* (p. 159): above left, typical dark form near Nicasio, California; above right, variety *tristulis* with broad, square flowers, on Point Reyes; below left, variety *gracilis* in Buttes Canyon. Below right, color variations in *Fritillaria micrantha* (p. 159) are displayed against a helpful hiking companion's shirt. (photos, Wayne Roderick)





Double *Trillium grandiflorum* growing at Robin Hill Arboretum, Lyndonville, New York, in May 1991.
(photos, John Gyer; p. 173)

Partially double *Trillium grandiflorum*, showing petaloid stamens;
the same plant produced single flowers the following year (p. 176).





Fernwood form of double *Trillium grandiflorum* (p. 174) in the garden of Mike and Jan Slater, Mohnton, Pennsylvania. This form has fewer and smoother petals than the form at Robin Hill. (photos, John Gyer)

Double *Trillium grandiflorum* growing with *T. cuneatum* and sweet woodruff at Robin Hill Arboretum.





Polygonatum × *hybridum* 'Striatum' (p. 199), young foliage and flowers. (photos, Gene Bush)

Polygonatum curvistylum (p. 199) features lavender flowers and very narrow leaves.





Left: Pang Pema Camp below Wedge Peak, Chang Himal, in northeastern Nepal. Below: *Gaultheria trichophylla* (p. 201) near the Simbua River, eastern Nepal, 11,700 feet elevation. (photos, David Hale)





Eriophyton wallichii (p. 202) near Mergen La, northeastern Nepal, c. 15,000 feet elevation.
(photos, David Hale)

Leontopodium monocephalum (p. 202) above Ramze, northeastern Nepal, 15,900 feet elevation.





Saussurea gossypiphora (p. 203) near Mergen La, northeastern Nepal, c. 15,000 feet elevation.
(photos, David Hale)

Gentiana urnula (p. 203) near Pang Pema, northeastern Nepal, 18,000 feet elevation.





Gentiana depressa (p. 203) growing near a waterfall on the Ghunza River, northeastern Nepal, 13,300 feet elevation. (photos, David Hale)

Gentiana ornata (p. 202) above Ramze, c. 15,000 feet elevation.





Yucca nana (p. 208) in cultivation. (photo, Dave Sierer)

Agave utahensis (p. 210) in the wild. (photo, Robert Johnson)





PHOTO CONTEST, EASTERN WINTER STUDY WEEKEND, RYE, NEW YORK, JANUARY 2001: Above, *Eritrichium nanum* on Mount Evans, Colorado, photographed by Jim McClements. First prize, Class II (single alpine plants in habitat). Below, *Trillium rivale*, picotee form, photographed by Jim McClements. Third prize, Class III (alpine plants in the garden).





PHOTO CONTEST, EASTERN WINTER STUDY WEEKEND, RYE, NEW YORK, JANUARY 2001: Above, *Erythronium montanum* at Paradise on Mount Rainier, Washington, photographed by John H. Zabkar using a Canon Ftb camera with Tamron 28-70 macro lens and Fujichrome Sensia 100 ASA film. First prize, Class I (scene of alpine plants in the wild). Below, *Castilleja parviflora* near Burroughs Rim Trail, Mount Rainier, Washington, photographed by John H. Zabkar (details, above). Second prize, Class II.



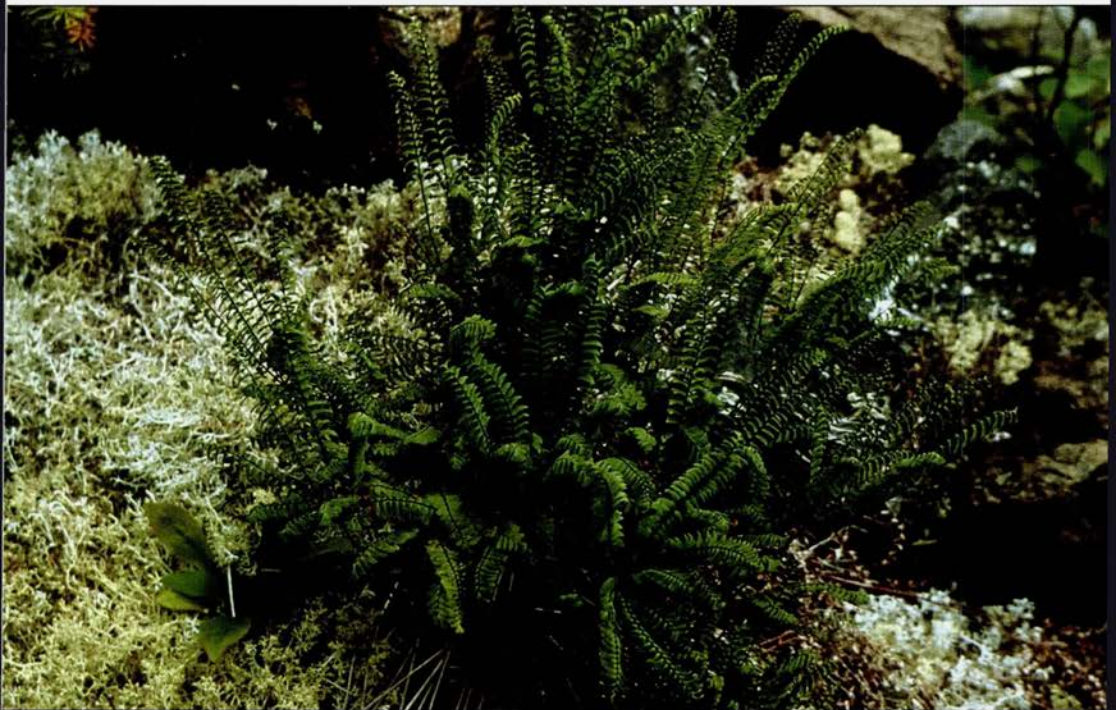


PHOTO CONTEST, EASTERN WINTER STUDY WEEKEND, RYE, NEW YORK, JANUARY 2001: Above, *Iris setosa* subsp. *canadensis* on Cape Freels, Newfoundland, photographed by Todd Boland using a Canon T-70 camera with Canon 50mm lens and Kodachrome 64 film, 1/60 second, F-8. Third prize, Class I. Below, *Primula auricula* cultivar, photographed by Todd Boland using a Canon T-70 camera with Canon 50mm lens and Kodachrome 64 film, 1/125 second, F-16. First prize, Class III.





PHOTO CONTEST, EASTERN WINTER STUDY WEEKEND, RYE, NEW YORK, JANUARY 2001: Above, *Coryphantha vivipara* var. *arizonica*, photographed by Michael Pedens using a Minolta X370 camera with Kiron 28-85 macro lens and ASA 200 film. Second prize, Class III. Below, *Adiantum pedatum* var. *calderi* on Mount Albert in Canada's Gaspé Peninsula, photographed by Margaret B. Taylor using a Zeiss Contaflex Super camera with Zeiss Tessar f/2.8, 50mm lens. Third prize, Class II.



and some was moved to the garden of Neil Morton, where the clump eventually produced 30 to 40 blooms. Worth was given a rhizome, and it thrived in his garden. Although it may still persist in someone's garden, it has never been commercially available.

Other green-flowered doubles have a gay disorder in their dress. Often the petals are long, narrow, and numerous, like those in photographs I've seen of a "mop-headed" population in northern Ohio. In others, the petals are white with a narrow green stripe, like an attractive form photographed near Baldwinsville, New York.

Garden culture and propagation

Although understanding of trillium seed germination and growth is increasing (see the works by Case, Jacobs, and Gyer in the References, below), a minimum of 4 to 6 years is needed to grow a flowering plant from seed. Because double-flowered trilliums do not have to spend energy on seed production, they tend to form rhizome offsets. These are best divided in early fall when the plant is most nearly dormant. Because offsets grow to flowering size in 1 to 3 years, gardeners can increase their plantings in a reasonable time. Both Don Jacobs and Fred Case suggest that the number of rhizome offsets can be increased by wounding the rhizome. Mabel Burlingham, Dr. Burlingham's widow, discovered this effect by accident in 1941, after a mouse damaged the rhizome of her prized double trillium and increased the number of stems from 3 to 13 in a single season. We are not so fortunate in our garden; when New Jersey mice attack, the plant dies.

In the garden, trilliums require summer shade; moist, cool, well-drained soil; and freedom from predation by voles, rabbits, squirrels, and deer. The soil that William Smith recommended to Dr. Burlingham in 1939 still produces fine growth on most trilliums: plenty of leafmold mixed to a depth of a foot with the soil under a tree or in the shade on the north side of a building, in an area that can be kept moist from early spring until the plants go dormant in midsummer. We would only add to this a good quantity of $\frac{3}{4}$ -inch crushed stone or coarse gravel to reduce the ease with which voles can tunnel to the trillium rhizome. Leafmold is available in many areas from municipal leaf-composting operations. Composted sewage sludge or peat moss should not be used. An annual layer of chopped leaves will hold moisture in summer and keep down weeds. Weeds can also be controlled with attractive low groundcovers such as partridge berry (*Mitchella repens*) or sweet woodruff (*Asperula odorata*). Taller companion plants like false Solomon's seal (*Smilacina racemosa*) and the true Solomon's seal (*Polygonatum* spp.) can help provide the needed summer shade.

The eighth edition of *Gray's Manual of Botany* says that *Trillium grandiflorum* is "our handsomest, most fickle and sporting species with many scores of aberrant forms." This gives us hope that we may yet find the elusive trillium colony that freely produces double-flowered plants. Eleanor Griffiths calls our search a quest. Like the quests of old, it is an adventure that has introduced us to new

friends and new plants that populate our garden. At one point, we asked Mabel Harkness if she knew someone named Smith who grew trilliums. She did, and we were quickly welcomed at Robin Hill Arboretum, where we learned its role in the horticultural origin of double trilliums. We were also welcomed at other gardens, libraries, and herbaria where our searches have given us happy days when we tell ourselves that this is what retirement is all about.

Acknowledgments: This search for the origins of the double trillium was greatly assisted by many people not mentioned in the article. We particularly thank Kitty Schanbacher of the Erin Historical Society, Mabel Harkness of the North American Rock Garden Society, Dr. Harrison Flint, Dr. Richard Lighty, and James Burlingham.

John and Janet Gyer garden at Fern Hill, where they raise Dr. Martin Pole Lima Beans for seed and tend an extensive wildflower garden. They share their garden with NARGS members through articles in the *Quarterly* and with members of the Pennsylvania Horticultural Society through their numerous articles in the *Green Scene*. John has served as chairman of the Delaware Valley Chapter of NARGS. The Gyers have received the Certificate of Merit from the Pennsylvania Horticultural Society and the NARGS Award for Service.

References

- Case, Frederick W., Jr., and Roberta B. Case. *Trilliums*. Portland: Timber Press, 1997.
- Gyer, John. "Trillium Tricks." *Rock Garden Quarterly*, spring 1997.
- Jacobs, Don L., and Rob L. Jacobs. *Trilliums in the Woodland and Garden: American Treasures*. Self-published, 1997. Eco-Gardens, P.O. Box 1227, Decatur, GA 30031.
- TRILLIUM-L@NIC.SURFNET.NL is an Internet discussion group for enthusiasts of trilliums and other woodland plants. It gives access to resources like Carl Denton's excellent, up-to-date list of trillium forms and cultivars and Susan Farmer's page of pictures and a complete bibliography of trillium literature.

Sources of double *Trillium grandiflorum*

- Fernwood Nursery, RR3 Box 928, Cross Road, Swansville ME 04915 <fernwood@acadia.net> (no mail-order)
- Garden in the Woods, 180 Hemenway Road, Framingham, MA 01701 (508-877-7630) (no mail-order)
- Wayside Gardens, 1 Garden Lane, Hodges SC 29695-0001 (1-800-845-1124)
- White Flower Farm, Box 50, Litchfield CT 06759 (1-800-503-9624)

Solomon's Seal

Polygonatum for the Woodland Garden

Gene Bush

The sturdy stems of Solomon's seal—plants of the genus *Polygonatum*—rise from duff on the forest floor rather stiffly until the top third of their mature height, then form a graceful arch. The leaves are set on the upper side of the stem, curving outward and down like lance-shaped wings of deep green. The foliage makes me think of a ballet dancer who began lessons a bit late in life: graceful though they are, they somehow retain a touch of awkwardness I find endearing. This poise makes them excellent plants for formal shade gardens or more casual woodland ones.

The blooms are bell-shaped, composed of six segments (similar petals and sepals, often called “tepals”); they hang from the underside of the arched stem in stemmed clusters of two or more, arising from the axils where each leaf joins the stem. The American Solomon's seals all have white or greenish white flowers.

Until recently, *Polygonatum* was classified as belonging to the lily family (Liliaceae). Now, however, it is placed in one of the many smaller families derived from the broader Liliaceae: the family Convallariaceae, where in the past I sought lily of the valley.

Name and history

The rhizomes of Solomon's seal are white and starchy, branching into a T or Y when mature. The current year's stems form on new rhizome growth. The scar left where the previous years' stems joined the rhizome reminded early herbalists of the six-pointed star, or seal of Solomon.

In the past, the ground roots were used to heal fresh wounds, broken bones, and bruises. The new shoots were cut and then boiled to be eaten much as asparagus. The rootstock was also cooked and eaten. The berries and the seeds within them, however, are poisonous, causing vomiting and diarrhea if ingested. Solomon's seal is still used by herbalists in many parts of the world today; a quick search on the Internet turned up a Chinese site selling the rhizome at \$2 for eight ounces.

Cultivation

Very few perennials are easier to grow in the shade or woodland garden than Solomon's seals. They are easily transplanted and adaptable; withstand the competition of tree and shrub roots and require a minimum of soil preparation and care. A good-sized colony forms after only a few years. Right on schedule, whatever the local weather has to offer, blooms appear from May into June, depending on the species and the location of the garden.

Plant Solomon's seal in an exposure similar to the forest edge these plants favor in the wild, with plenty of bright light but protected from the hottest rays of the sun. An eastern exposure is ideal. To prepare a bed for transplanting, work the soil to a depth of 8 to 12 inches (20–30 cm). I usually dig in a good amount of fine hardwood mulch and rotted leaves to provide humus, keeping the soil loose. Garden compost is another source of rich humus.

Plant the rhizomes shallowly, only 2 to 4 inches (5–10 cm) below the soil line. Water them in well, mulch, and stand back to watch them grow. The rhizomes can be transplanted in spring or fall, but my preference is in the fall after the plants enter dormancy. My favorite companion plants for Solomon's seals are ferns for background and contrast in texture, European wood anemones (*A. nemorosa*), and creeping forget-me-not (*Omphalodes verna*).

Exploring the genus *Polygonatum*

The gardening literature on the genus *Polygonatum* is woefully inadequate. My two major references, for instance, say there are "about 30 species" of Solomon's seal. The *Flora of China*, however, lists 39 species in that country alone, excluding cultivars and forms.

Botanical research based on DNA analysis has drastically altered the plant-person's world over the past 3 to 5 years. DNA studies are rapidly shifting not only species but also family classifications. Much of the updated information can be found in Internet databases, available almost instantly to anyone with access to that resource. The major databases represent the combined efforts of many countries and institutions. Overwhelming amounts of new research available with a click of a mouse.

One database I checked on the Internet lists 168 species of *Polygonatum*. Another—that of the Missouri Botanical Garden, which includes every known name in the literature, lists 273 species, cultivars, and forms. Not every name is valid, and following up on individual names discloses a fascinating history.

The World Wide Web has opened lines of communication among gardeners, nurseries, seed houses, and collectors worldwide. Five years ago, I would not have known through print media nine-tenths of the people I correspond with today. I have electronic contact daily with hundreds of gardeners, many of them specialists. I can locate and contact small specialty nurseries like mine the world over. Plant explorers, too, have new horizons. China has admitted

plant expeditions not only by botanical institutions but also by nursery owners, who bring back new species and families to the garden trade.

Europeans have long collected and cultivated the various species and forms of *Polygonatum*, and their nursery catalogs may list many that are little known in the United States. Those markets are now opening up to North America. In addition to introductions by visitors to China, the Chinese are opening their own web sites and selling plants to gardeners directly. The Japanese market remains largely untapped, since only a few nursery owners have learned to navigate the trade waters of that country. *Polygonatum* species once scarcer than buckteeth in a barnyard rooster are quickly becoming available to U.S. gardeners.

A word of caution is in order about ordering *Polygonatum*: there is a great deal of confusion regarding their identification. Nurseries have to trust their suppliers until they are able to verify mature plants. For instance, most plants sold as *P. falcatum* in the United States are actually *P. odoratum* 'Variegatum'. Improved communication via the Internet should help to resolve these problems. In particular, you should be aware that *Polygonatum* plants shipped from China are likely to be collected in the wild. You may order as many as one wants of any species from China, but you will receive whatever is available, and sometimes it seems that the names have been applied to the plants to match the order form, not the identity. Orders may not be received at the proper planting time, resulting in severe and sometimes fatal checks to growth. I have heard both horror stories and praise for the quality of the plants received. An order from any Chinese source of which I am aware is a roll of the dice, and, as usual, the house odds are against you. The cheap prices are the big attraction, but no matter how little you pay, a dead or misidentified plant is not a bargain.

The Locals

Here is a list of favorites that have performed well in my garden for some years, roughly in order of the ease of obtaining them. Solomon's seal is fairly easy to see in our local Midwestern woodlands; there are three species, one common and the other two more difficult to find.

P. biflorum, the smooth Solomon's seal, is the species we are most likely to find during a walk in the woods. It and a second Midwestern species, the hairy Solomon's seal (*P. pubescens*) are very similar. Both reach around 30–36 inches (80–95 cm) in height. They have the same arching stems with leaves that are broadly lance- or egg-shaped. The "smooth" has flowers borne singly or in pairs, while the "hairy" has one to four. The hairy Solomon's seal has tiny hairs along the veins on the underside of each leaf, which require a magnifying glass to be seen.

Polygonatum canaliculatum, *commutatum*, and *giganteum* have all now been swept under the carpet of *P. biflorum*. Here I am strongly inclined to disagree: there may indeed be a range of variability in the size of *P. biflorum* that blurs the distinction between *biflorum* and *giganteum*, but the giants are out there, and, in my opinion, they deserve separate status. One in my garden is over 9 feet

(3 meters) tall and, by season's end, reaches close to 11 feet (3.3 meters). The great Solomon's seal leaves little doubt as to its name when found in mature stands. Its flowers are borne in clusters of 2 to 10, hanging beneath leaves that are large in proportion to the tall, heavy stems. The berries are the same color as those of the other two species, maturing from dark blue to blue-black.

The out-of-towners

After the two eastern North American natives, *P. odoratum* 'Variegatum' is probably the best known and most readily available at garden centers and in nursery catalogs. The arching stems reach around 2 feet (60 cm) on this showstopper. The emerging stems somewhat resemble asparagus in form and are watermelon-red. As the stems mature, the red color is carried upward, fading to green. Each leaf has a creamy edge and streaking. The blooms are white bells. I have yet to see berries on mine. Some forms to look for are 'Gilt Edge', with a slight gold margin; 'Grace Barker', with bright-white striped leaves; and 'Flore Pleno', with double blooms.

P. humile, the dwarf Japanese Solomon's seal, is not much larger than its name, reaching only about 6 inches (15 cm). The stems are stiffly upright with no arching of the top portion. The white, bell-shaped blooms are all in a line down one side of the stem and about the same size as those of the larger species. The leaves are egg-shaped. It eventually forms an open colony, rambling among larger shade perennials. Mine enjoy the company of hellebores. *P. hookeri* is another rock gardener's dream, only 4 to 6 inches (10–15 cm) tall, with lilac flowers.

P. multiflorum, the European Solomon's seal, much resembles the smooth Solomon's seal in overall appearance, though I think it arches a bit more gracefully. It has the same vigorous growth habit as the native species. The white bells hang in clusters of 3 to 5, making a somewhat better show.

P. × hybridum is a cross between *P. multiflorum* and *P. odoratum*, described above. It is a pretty diverse group in appearance. Several forms are beginning to appear in nursery catalogs, although I have yet to see it at a local garden center. The flowers are generally borne in groups of 4 or more and are larger than those of other species. It is a sterile hybrid, so no berries are produced later in the season, and plants can be propagated only by division.

P. verticillatum has no common name, to my knowledge, but that should change before long; I think it will soon become popular in the U.S. nursery trade. It has been available in European nurseries for many years. Its distinctive characteristic is its foliage. The stems are angular rather than arched. The leaves join the stems in whorls of 4 or 5 per node. The berries are red instead of blue-black. This species needs a bit more shade in hot-summer areas than do others, preferring cooler conditions, along with more consistent moisture and extra humus to ensure a long life. This environment would be perfect for such companions as shade-loving primulas.

Some of the other species and forms I have growing in my woodland garden are *P. × hybridum* 'Striatum' (photo, p. 183), *P. × falcatum* 'Silver Striped Selection', *P. cirrifolium*, *P. oppositifolium*, and *P. curvistylum* (photo, p. 183). My polygonatum wish-list, however, is long indeed.

Polygonatums are like potato chips: no one can be content with just one. Once you come to appreciate their many charms as shade perennials, you will want to add new species and forms. At least half the fun of gardening is the hunt for that next plant, and this is a genus you should be able to enjoy for a long time.

Gene Bush gardens in southern Indiana and operates Munchkin Nursery.

Sources:

Asiatica, P.O. Box 270, Lewisberry, PA 17339; catalog \$4; <<http://www.asiatica-pa.com>>.

Collector's Nursery, 16804 NE 102nd Ave., Battle Ground, WA 98604; <<http://www.collectorsnursery.com>>.

Echo Gardens, P.O. Box 1227, Decatur, GA 30031.

Fraser's Thimble Farms, 175 Arbutus Rd., Salt Spring Island, BC V8K13A, Canada; <<http://www.thimblefarms.com>>.

Héronswood Nursery, 7530 NE 288th St., Kingston, WA 98346; catalog \$5; <<http://www.héronswood.com>>.

Munchkin Nursery & Gardens, 323 Woodside Dr. NW, Depauw, IN 47115; catalog \$3; <<http://www.munchkinnursery.com>>.

Paul Christian Rare Plants, P.O. Box 468, Wrexham LL13 9XR, UK; <<http://www.rareplants.co.uk>>.

Eastern Nepal and Kanchenjunga

David Hale

In 1991, the government of Nepal opened up an area of northeastern Nepal that had previously been closed to foreigners. Provisionally, they began to allow 400 people a year to trek in this area. In 1992, a friend who arranges “adventure travel” trips set up a trek for a small group of us into this area.

Bruce Kleppinger began his career as a pharmacist, then graduated from medical school, but he then found that in his avocation acting as an adventure travel guide, he was having too much fun to practice medicine. He is an active member of the Wilderness Medicine Society and thus is well qualified to attend to medical problems in the wild. In addition, he is arguably the most experienced adventure travel guide in North America, having worked with Mountain Travel of Berkeley, California, for 20 years before founding his own company, Ibex Travel. Well connected in Nepal, Bruce was able to obtain one of the first permits to enter the newly opened area in the northeastern region of that country. He engaged a crew of porters, commonly known as sherpas (with a small *s*), as well as kitchen staff and assistant guides.

Like most organizers of adventure travel, Bruce is not a botanist. If getting there is your main concern—as it is mine—the botanical knowledge usually can be worked out later. However, if your principal desire is to be guided to specific plants and told each one’s name, then a botanical tour such as those offered by the Alpine Garden Society or a private ecotourism firm is a better choice, although it limits you to a small range of destinations in any given year.

Handbooks such as the Lonely Planet series are very helpful for choosing trek guides if you wish to set up a tour of your own. Be sure to select a prominent, well-known organization recommended in good guidebooks, and inquire among your gardening acquaintances for references and pointers.

In October 1992, we landed in Kathmandu, which is situated at approximately 6000 feet (2000 meters) elevation at the upper, northern end of the Kerai, the fertile crop-growing region of Nepal. We spent several days acclimatizing and visiting what was then a remarkable city. In many countries of the developing world, one-half to one-third of the population lives in the capital, creating huge slums. At that time, Nepal’s population was about 18 million, of whom

only 180,000 lived in the capital city. I understand that this proportion has changed considerably since then, resulting in a deterioration of conditions in Kathmandu.

A walk in any direction throughout the city displayed all the aspects of a varied culture. There were colorful markets offering foods and merchandise of all types. This was one of the many festival times, and the local people were dressed in all of their finery. I was brutal with my telephoto lens, showing no mercy.

We flew to Biratnagar in eastern Nepal and drove north for a day and a half, finally camping at 6000 feet in a tea plantation, where we learned about how this crop is processed. To get to the northeast, we had to walk north. All the mountain valleys here run east to west, so for the next few days we crossed them: down to 2000 feet, up to 4000, down to 3000, up to 5000, and so on. Even in October, the lower elevations were steamy, and we used umbrellas to shade ourselves from the sun. Soon a wintry weather front swept over us, and we were using them to keep off the rain. Higher up, it soon turned to snow.

At these elevations, we were always in the forest—at first tropical, and later temperate with huge trees of *Abies densa* and the tree rhododendron *R. barbatum*. Under foot were tightly budded *Primula gracilipes* at 9500–10,000 feet (3000–3300 meters). More interesting plants began to appear: *Rhododendron hodgsonii*, a large-leaved species; and *Gaultheria pyroloides*, with leaves almost identical to those of *Salix reticulata* but with the bonus of lovely berries.

The western end of the Himalayas is fairly dry, especially in summer. Farther east, the summer monsoon appears, and eastern Nepal is the wettest part. Through Sikkim and Burma to the east, even more rain falls.

Along the trails we had been meeting people and had passed through a few small towns, but now we were beyond habitation of any sort. The people were very friendly, the women shy and unused to foreigners. They stared as much as we did. No begging took place; visiting foreigners had not encouraged this by passing out candy, cigarettes, or pens. There are many agencies to which those wishing to fund improvements here can donate money that will be put to good use; in fact, the second highest item in Nepal's national income is foreign aid.

At some points the trails were badly degraded by the passage of yaks, large, unruly, and somewhat dangerous and unpredictable beasts. To cross the gorges and ravines, we used suspension bridges—which were also very unpredictable. Some were in good repair, but most were not. They usually sagged deeply in the middle and often tilted sharply to the side. Missing boards didn't make the crossings any more pleasant. The supporting cables of the suspension bridges could be used as handrails but were too high to reach at the ends of the bridges, and in the center they were only a few inches above the surface of the bridge. Still, the porters—laden with 80–100 pounds—made light of these bridges, shaking them to see if they could dislodge their companions!

When we reached about 13,000 feet, we began to follow the Simbua River up toward the south side of Kanchenjunga. This is the lower end of the zone where we can expect to find plants hardy in most temperate North American gardening areas. One we enjoy in the Pacific Northwest is *Gaultheria trichophylla* (photo,

p. 184). Ron McBeath, then with the Edinburgh Botanic Garden, had been kind enough to give us his plant list for this area, so we could assign names with fair accuracy most of the time.

We were a group of six, three fairly fit and three rapidly becoming so. We had about 15 porters, including kitchen staff, a cook, and four or five native guides. As we ate our way through the food, the food porters would drop out and return to Kathmandu. Although “roughing it” in a sense, we were also cared for very well. Tea was delivered to our tents at daybreak, wash water next, and then breakfast. We stopped at noon, having been passed at a gallop by the kitchen porters, and were served a hot meal. The dinners were amazing. Often we were served Western and Eastern delicacies at 14,000 to 16,000 feet: baked bread, pizza, and curries of goat or yak.

Finally, we camped at Ramze at 14,800 feet (4550 meters). The next day was a “day off.” We would stay here two nights and hike with lighter packs to an area near the south base camp of Kanchenjunga. At 28,146 feet (8660 meters), it is the third highest mountain in the Himalayas, one of fourteen mountains over 8000 meters high. It is a hulking mass surrounded by many other high, beautiful mountains. So far, however, we hadn’t been able to see the mountains, even though we were among many.

The morning dawned completely clear, with a heavy hoarfrost on our tents. We had camped the night before on a bed of *Gentiana ornata* (photo, p. 187) amid fields of *Primula capitata*. We hiked to 15,500 feet (4770 meters), surrounded on all sides by spectacular peaks. Although there was an abundance of ripe seed, there were still many flowers in bloom. There were many more *Gentiana ornata*, as well as an *Anaphalis* species and several species of *Leontopodium*, including the famed *L. monocephalum* (syn. *L. evax*; photo, p. 185) with fluffy yellow bracts like creamed honey in color, prostrate along the trail. At a small summit where we turned back were the traditional Tibetan prayer flags. This corner of Nepal lies almost on the border of Sikkim to the east and Tibet to the north. On the way down, we were able to photograph a group of blue sheep.

We next crossed the ridge to the next alpine valley, running northeast to the north side of Kanchenjunga and displaying a different flora. After the first night, we had perfect weather for the rest of the trip. A friend told me later that he had made this trek twice without ever seeing a mountain!

We had been “dry” now for about a week, so it was time to try the local *chang*, or millet beer. Millet is a grain that can be grown at very high altitudes. The millet is cooked with just enough water to wet it through and cooled; then yeast is added, and it is allowed to ferment. The product appears to be just dry millet. However, when boiling water is added to it, the alcohol is leached out and can be drunk through a wooden straw with small perforations that prevent the millet from entering the straw. So here you have dehydrated beer: just add water. Its effect is quite mild—probably imaginary.

Crossing to this valley, we had seen a nice variety of plants: *Gentiana tubiflora*, a lovely fall-blooming gentian; *Aconitum hookeri*, a dwarf species; *Eriophyton wallichii*, growing in clusters that appeared to me like a group of cowed monks

walking downhill (photo, p. 185); and one of the legendary and ungrowable Himalayan saussureas, *S. gossypiphora*, with its gigantic woolly, snowball-like heads (photo, p. 186).

Walking up this Ghunza (or Hunza) Valley, we passed a nice group of *Meconopsis paniculata* rosettes huddling down for the coming winter. The leaves are absolutely golden, they are so well covered with hairs. Beside these were large patches of *Gentiana depressa*, a lovely one with short flowers (photo, p. 187). Unlike most others, this fall gentian grew only on the drier, more exposed areas, often on vertical south-facing embankments. As we neared 16,000 feet (4920 meters), we found another snowball saussurea: *S. simpsoniana*, smaller than *S. gossypiphora* but no less white and puffy, and maybe just a little bit growable, for a year or two.

This part of the Ghunza Valley is lined on both sides with starkly beautiful mountains. Most of those here rise abruptly, jutting from their bases straight up to heights from 20,000 to 25,000 feet, often with fluting on their steeper sides, a feature characteristic of certain places in the Himalayas and the Andes.

Our highest camp was at Pang Pema, at 16,800 feet (5170 meters; photo, p. 184). No one suffered from altitude sickness. We had followed the rules and adjusted gradually, but this is certainly no guarantee; people have died who were in wonderful physical condition and who had frequently been at high altitude before without experiencing altitude sickness. While we were settling in here, another group arrived—the first people, foreign or otherwise, whom we had seen in days. They were a group of Swiss climbers with their sherpas and guides. Among them was the only sherpina (woman porter) whom we saw. She was slightly built, as are most Nepalese; this woman, probably weighing 100 pounds or less, carried her 80-pound load with no apparent distress at nearly 17,000 feet, smiling as she passed us, and wearing a nylon wraparound skirt and rubber flip-flop sandals!

We spent one day at Pang Pema, exploring the hills around our camp up to 19,000 feet. I was lucky enough to find the legendary *Gentiana urnula* (photo, p. 186), somewhat past its peak bloom but with plenty of seed. The seed germinated freely but was very difficult to grow on. I distributed it to several skilled growers but received no encouraging comments.

Now it was a simple walk down the same valley to Taplejung, where a plane would fly us back to Kathmandu; however, the climb of 2000 vertical feet (680 meters) from the town center to the “airport” took us by surprise. The airstrip was a downward-sloping field ending at a cliff. The airplane was a STAL, a somewhat unsettling acronym that stands for “short take-off and landing.” But it whisked us back safely.

This trek was listed as “advanced” and lived up to its description. We climbed approximately 80,000 vertical feet (up and down) and walked about 120 miles (192 km) in three weeks. Of course, there is a wide variety of treks available, from very easy ones at lower elevations to more strenuous ones up higher. Even a city-based tour of Nepal gives interesting glimpses of its life and scenery, and good plants can be seen on day trips from Kathmandu itself.

The morning of our departure for Bangkok, we scheduled a Himalayan tour flight. It took us through crystal-clear air along the greater part of the Himalayan chain, first at a short distance in one direction, then reversing at a much closer distance, often passing among the peaks, while the stewards explained their names.

Some of the world's rarest alpine plants exist as relic populations on isolated mountaintops. This note from the United Press "Earthweek" feature hints that global warming induced by human activities may soon eliminate these refuges. The arctic limit of tree growth has also been reported to be advancing northward for several decades. —Ed.

Australia's alpine regions are shrinking so rapidly because of global warming they could completely disappear within 70 years, according to John Morgan of La Trobe University. Morgan reported, "In Australia we could have the complete loss of the alpine ecosystems within the next 70 years." He said his study found that subalpine trees in the Snowy Mountains have begun growing 130 feet higher upslope than they did 25 years ago. He explained that Australia's mountains are low by world standards. Many of the country's slopes have only 330–660 feet between the timberline and summit.

Collecting and Cleaning Seeds

Jane McGary

This issue comes with the donor's form and with instructions on contributing seed to the Seed Exchange, perhaps the single most attractive feature of NARGS membership for many, especially those who garden in areas remote from chapter activities. This practical note is intended to help those new to participation in this popular annual event.

Before becoming editor of the *Quarterly*, I managed the intake (Phase I) portion of the Seed Exchange for three years, so I got to see how hundreds of donors selected and packaged their seeds. Some were beautifully cleaned, neatly packed in small, firmly closed envelopes, and clearly labeled—and some were not. Like most gardeners, I like to think my own approach is exemplary, so here it is.

Collecting seeds

In most cases, you will want fairly large envelopes or even small paper bags in which you can place entire capsules. People who collect a lot in the wild sometimes use small cloth drawstring bags, either home-made or purchased from scientific or geological suppliers. The cloth bags will not fall apart if exposed to moisture, and they allow the plant material to “breathe” and dry naturally. Do not place seeds in plastic bags; they are likely to mold and rot.

Label your envelopes carefully as you collect them. The commercial bags may have a label attached; otherwise, insert a slip of paper with the data written *in pencil*—ink may run as it absorbs moisture. Include the name of the plant, place and date of collection, and any other information you think pertinent. Serious collectors often carry altimeters and record the elevation. If you cannot identify the plant in the field, take a sample of the foliage and any other part that might be diagnostic so you can go over it once you return to your reference books.

The botanical description may even clear up the problem of whether you have seed in the first place. Don't laugh; various other parts of the dried inflorescence show up in “seed” donations. I had to read up on *Eriogonum* the first time I collected its seed in order to puzzle out how to extricate it from the cap-

sules. Material sent to the exchange as composite seed is often devoid of true seeds. The seeds are the plump, sometimes rather hard bits attached to the disk; the bits above them are chaff. If you're not sure, look at the material with a good magnifying lens: the actual seeds are regularly shaped.

Never take more than a small portion of the seed you find at a given wild site. Some collectors also plant seeds near the parents to help protect the population from nonhuman seed predators. In most wild populations, very few of the seeds produced are able to germinate and produce mature plants.

Even when you collect seed from the garden, don't rely on your memory to hold the identity. When I don't have time to clean and package seeds right away, I place the capsules in a small dish to dry and immediately label an envelope, placing it in the same container. Once the seeds are off the plant, they must have a written name attached somehow!

I learned from David Hale, author of the "Botanical Traveler" columns in this journal, that it is possible to collect seeds that don't appear to be mature, and they will still ripen further and germinate well. This is particularly true of composite (Asteraceae) seeds, which can be rather green and still viable as long as they are plump. Some seeds never really look "ripe"; for example, the short-lived seeds of fall-blooming *Kirengeshoma* should be planted while soft, white, and wet.

Whether you collect the seeds in far Bolivia or in your backyard, clean them as soon as possible. Many insects spend all or part of their lives inside seed capsules, busily devouring the seeds, and they will keep doing this until you destroy their happy homes.

Cleaning seeds

Because nature has given rise to so many different kinds of seeds and seed capsules (or "pods"), there are many different approaches to proceeding from the mass of vegetable matter you have collected to the seeds pristinely tidy enough to store, plant, or exchange. Some are simple: when you split the capsule with a little pressure, they simply fall out with no extra bits attached. Empty this type into a clean dish—a white porcelain bowl with sides about 2 inches (5 cm) tall is useful—and take it outdoors on a day that is not too windy. Blow *very gently* onto the seeds to remove the light chaff (waste material). This is a good way to separate viable from nonviable lily seed, since the bits without embryos are lighter and fly away.

Some capsules are more retentive. The nutlike capsules of many penstemons are designed to hold onto the seeds until the following spring and then release them when conditions are right for germination. I break these open with needle-nose pliers, since many of them have sharp processes which are hard on fingertips. Pliers or long forceps are a necessity for collecting and cleaning the seeds of *Morina* species, which are guarded by ferocious spines. A well-aimed boot can remove the fruit of a cactus, and then all you have to do is extricate the hard seeds from the pulp, which in some species is really disgusting.

Some growers clean seed in sieves, but I don't think it is a good idea to rub the material on the grating of a metal sieve because it may damage the seed coats. However, a fine-mesh sieve can be helpful in separating very fine seed, such as that of campanulas, from the larger chaff. Note that some seeds are fairly fragile; *Corydalis* specialists, for example, may pack their exchange seeds in little padded boxes so they won't be broken in transit.

The showy seedheads of pulsatillas and clematis tempt many seed donors, as any seed exchange worker knows who has dealt with the great sacks of this stuff that arrive. Part of cleaning these seeds is cutting off the "tails." If it seems like too much work, you've collected too much seed!

In rare instances, it may be best to leave the seed in its capsules. Several years ago I did this after collecting the minute capsules of the remarkable *Saxifraga eschscholzii* on Alaska's Seward Peninsula. I felt that any grower who got them would be more than willing to extract the seeds on arrival.

Seeds that are enclosed in fleshy fruits present a special problem. The fleshy material should be removed before the seeds are stored or sent off; sometimes it contains a germination inhibitor and must be removed even before they are planted at home. If the pulp is watery (e.g., *Vaccinium*), I crush the fruits lightly and leave them out to dry on paper towels for a day or two. Fleshy seeds like those of arisaemas can be soaked in water at room temperature for a few days, then rolled in a cloth, rubbed gently, and washed in a sieve.

It is advisable to wear rubber gloves when handling the broken pulp of arisaemas and other aroids, many of which contain strong irritants. Hellebore seeds also cause skin inflammation in many people.

Jane McGary, editor of the *Rock Garden Quarterly*, has also worked with the Seed Exchange and is a regular donor to and beneficiary of that noble institution.

Plant Portraits

Yucca nana

A remarkable dwarf, hardy yucca suitable for the rock garden, this is also one of the more recently described members of its genus (photo, p. 188). It first appeared in the literature in an article by Rod Haenni in the American Cactus Society's publication *Cactus and Succulent Journal* (vol. 57, p. 170, 1985). In January 1985, Haenni, a resident of Denver, Colorado, and Allan Taylor of Boulder, Colorado, made a plant-hunting trip to the northern part of Arizona and adjacent Nevada and Utah. In southern Utah, south of Moab, they discovered a dwarf form in the genus *Yucca*; the largest rosettes were no more than 18 inches (45 cm) across and only 4–6 inches (10–15 cm tall). A few of the oldest specimens formed clumps almost 3 feet (1 meter) across.

This species was not given a name until 13 years later. In the mean time, Fritz Hochstaetter had also found the plants on one of his many trips in search of *Pediocactus* and *Sclerocactus*. He published this species in the Dutch journal *Succulenta* (vol. 77(2):72, 1998) and deposited the type specimen, collected south of Moab, in the University of Idaho Herbarium in Boise. Hochstaetter did not provide the exact location of the collection in order to protect the species from massive collection—always a problem for cacti and succulents—and even from extinction, since there are not many plants at the type location. He has, however, offered seeds from the type location on his seed list since 1998 (see “Sources” below). I would like to thank him as well for his advice as I prepared this article. He offers seeds of many species of yuccas and cacti, as well as a CD-ROM with more than 1000 photos of yucca plants.

Yucca nana is endemic to desert areas in southern Utah at elevations from 1600 to 2075 meters (about 4800 to 6300 feet). The plants grow on gravelly or sandy slopes in open pine woods, in the sagebrush vegetation community, dominated by the genera *Artemisia* and *Atriplex*. Here *Y. nana* grows along with *Sclerocactus parviflorus* and species of *Echinocereus* and *Opuntia*. Its distribution is apparently very restricted; most of the known plants grow in Glen Canyon on the Colorado Plateau. Hochstaetter plans more expeditions here and in the nearby area to map the further distribution of this nice little dwarf species.

The rosettes may be solitary or clustered, up to 26 inches (65 cm) or occasionally as much as 32 inches (80 cm) across. The central rosette produces plantlets or offsets and does not have a stem above ground level. The rootstock is a rhizome system that spreads laterally. The leaves are stiff and erect, up to 8 inches (20 cm) long, convex (bending outward), dark green, and smooth, with many fibers along the margins. The leaves, less than 1 cm wide at the base, taper a bit toward the tip, which ends in a brownish spine.

The inflorescence is a raceme, normally borne upright on a succulent, unbranched stem more than 3 feet (100 cm) tall. There are usually about 20 flower stalks or "branchlets" per raceme, each with 1 to 3 flowers. The white flower is bell-shaped and about 1½ inches long, the outer segments longer than the inner ones. The style, shorter than the perianth, is cream-colored, and the anthers white, cream, or almost greenish. The ovary is superior and colored cream to greenish. The globose to ovoid seed capsule is green until ripening, when it becomes woody and splits open. *Yucca nana* belongs to the "dehiscent-fruited species" of the genus (Section Chaenocarpa). The flat, black seed has a rugged surface; it can remain viable for years. Flowering time in habitat is late April to June.

This plant's closest relative is *Yucca harrimaniae*, which grows rather near it but differs in having longer leaves (more than 20 cm) and a shorter raceme (less than 100 cm). The flower color is also somewhat different: pure white in *Y. nana*, but off-white to cream or even brownish in *Y. harrimanniae*.

Since it is rather new in cultivation, I have not yet had the opportunity to experiment extensively with growing this little dwarf yucca. However, I have sown seeds from all the known locations: Mill Creek area, Utah; the type location at 2075 meters in southern Utah; Muddy Creek, Utah, at 2110 meters; Limestone Cliffs, Utah, at 2040 meters; and Sanpete County, Utah, at 2000 meters.

Judging from the elevation at which it grows, I expect it to be hardy inside my unheated greenhouse, and perhaps also in a sheltered place in the garden in a bed protected against moisture during winter. By 2001 I expect the seedlings to be large enough that I will dare try some in my protected garden bed. If *Yucca nana* proves to be hardy in Denmark, it will be a plant that everyone who grows alpine or hardy cactus will want in their garden.

In the next 10 years or so, I hope to be able to collect seeds from my own plants, so it will not be necessary to collect seeds in the wild. We must remember that "propagation is conservation." It is also likely that this nice dwarf species can be employed in creating dwarf hybrids to increase the selection of small garden yuccas.

BENNY MØLLER JENSEN
Hjørring, Denmark

Information and references

The author's website: <<http://www.bennyskaktus.dk>>.

Source

Navajo Country, P.O. Box 510 201, D-68242 Mannheim, Germany; or Navajo Country, Hamlyn Valley, Modena, Utah 84753; website, <<http://hometown.aol.com/fhnavajo/index.htm>>. Seed.

Agave utahensis var. *utahensis*: The hardiest agave?

Agaves are indigenous to the Americas, found from the state of Utah south to Central America, with the greatest concentration of species in central Mexico. Inasmuch as *Agave utahensis* var. *utahensis* (photo, p. 188) has the most northerly range of any species, one might suppose that it is the hardiest, and I believe this is true. There are, however, two more that seem to be equal to it in hardiness: *Agave utahensis* var. *kaibabensis*, which grows on the north rim of the Grand Canyon at 7000 feet (2150 meters) elevation; and *Agave parryi* from the area of Flagstaff, Arizona, at 6000 feet (1850 meters). There may be still others equally as hardy, such as *Agave neomexicana*.

Agave utahensis has proven hardy in USDA Zone 5. Agaves are wonderful accent plants for any garden, especially in a xeriscape or group of winter-hardy cacti. They have long been prized as specimens in rock gardens, as well. Agaves, like palms, symbolize a warm climate. They break up the monotony of any garden, whether placed among herbaceous perennials or cacti. Planting them singly or in groups makes a bold impression on visitors. All of the cactus display areas in my arid garden contain numerous agaves.

Agave utahensis var. *utahensis* is found on the southern slopes of the Beaver Dam Mountains of southwestern Utah. It also occurs along the middle levels of these mountains at approximately 5000 feet (1500 meters). These higher elevations receive abundant snowfall during winter, and therefore the agaves that grow there are much larger than those along the southern slopes. I have seen clusters of *A. utahensis* 6 to 8 feet (2–2.6 meters) wide in canyon bottoms where moisture is abundant, and individual agaves 2 feet (60 cm) wide and approximately 18 inches (45 cm) tall. The agaves on the southern slopes of the Beaver Dam Mountains are much smaller because they receive less moisture and hotter summers.

Agave utahensis is also found in the Pine Valley Mountains, about 35 miles (56 km) northwest of St. George, Utah. There are a few at lower elevations, but the majority grow on cliffs high up on the mountainside, quite inaccessible. This area is probably the northernmost extension of the species' range. Other populations are found 20 miles (30 km) west of the Beaver Dam Mountains in the state of Nevada.

Agave utahensis offsets readily, and numerous "pups" grow next to the main body of a plant. I have even seen small plants only a few inches tall with offsets. The root system is fibrous, wide-spreading, and long; when many offsets are present, their roots intertwine. The leaves are generally long and narrow, 2 to 3 inches (5–8 cm) wide and up to 18 inches (45 cm) long. Numerous teeth occur

on the leaf margins, and a short brown spine at the apex of the leaf. These spines can be quite sharp, so some caution must be exercised when handling the plants.

Agave utahensis is very tolerant of moisture—much more so than most cacti. I know gardeners who have planted their agaves in the middle of their lawns where sprinkling systems water them all summer; they are growing rapidly, with offsets. However, I recommend good drainage in a porous soil containing a good proportion of sand and gravel.

The most remarkable thing about the agaves is their inflorescence (flower head). They are often called “century plants” because people suppose they bloom every 100 years. Of course, this is not true. So when do they bloom? Perhaps when they are good and ready. I have seen agaves just a few inches tall in flower, and many large ones without flowers. The smallest *A. utahensis* inflorescence I have seen was 5 inches (12 cm) tall, and my largest one was 22 feet (7 meters) tall, growing at the rate of 5 inches per day! No wonder the plant dies after blooming, having spent all its energy forming the inflorescence.

You can tell by observation when the inflorescence is forming. Suddenly the central leaves come together at the apex of the rosette, and the spines form into a tight cluster. Several days later, the scape (flowering stem) with its buds makes its way through these tightly knit spines, which probably protect the tender buds from browsing animals. The blossoms themselves are yellow and insignificant. It has been suggested that as soon as you see the inflorescence, you cut it off to keep the plant from dying. One friend of mine did this, but it died anyway.

The only good thing about the death of an agave is that you are rewarded with many seeds; however, I don't know if losing a 20-year-old specimen is a good trade-off for seeds. The seeds germinate readily, and the seedlings are not difficult to transplant and grow on in 4-inch pots until they can be placed in the garden.

ROBERT A. JOHNSON
Kaysville, Utah

Source

Intermountain Cactus, 1478 N. 750 E., Kaysville, UT 84037
Rocky Mountain Rare Plants, 1706 Deerpath Rd., Franktown CO 80116-9462. Seed.

Eriophyllum lanatum

The cover of this issue features *Eriophyllum lanatum*, a low-growing composite found in the wild throughout much of western North America, from British Columbia south to California and from the Coast Ranges east to western Colorado. It is one of the later-flowering plants in the subalpine and mid-alpine zones, likely to be noticed by summer visitors, particularly since it favors disturbed, rocky soils such as roadside gravel. In at least part of its range, its common name is “Oregon sunshine”—perhaps a sly comment on the lack of the real thing for much of the year.

Plants may be entirely herbaceous or somewhat woody at the base (“suffruticose”). I have not observed them to be deciduous, but they may be in colder climates. The silvery foliage for which the genus is named is divided into many rounded lobes, and the mounding plants are attractive even before they produce their deep yellow, daisylike flowers. The size of the flowers varies among populations and subspecies; the best are about 5 cm (2 in) in diameter. The plants bloom profusely over a relatively long period in early to late summer, depending on elevation.

Eriophyllum lanatum is the most widespread member of its small genus; the others occur primarily in the American Southwest. It is also likely to be the most cold-hardy and adaptable to cultivation. In the wild, it generally grows above the winter snow line, but it persists fairly well at lower elevations, even in wet winters, provided drainage is excellent.

Many variants formerly recognized as species (largely by P.A. Rydberg, a well-known “splitter”) have been sunk into *E. lanatum*, which now has 12 recognized varieties. The most common in cultivation is the largest-flowered one, variety *lanatum* from the Pacific Northwest. Variety *integrifolium*, found from the eastern Cascades to the Rockies at higher elevations, is a shorter plant with leaves mostly unlobed. The more southerly variety *alchemilloides* has smaller flowers. From time to time, especially dwarf plants have been found and introduced into cultivation; Randy Alanko, who gardens in eastern Oregon where there is plenty of real sunshine, reported that such a form he found near Echo Peak in the Sierra Nevada of California came true from wild-collected seed but did not persist as well as the forms indigenous to his area. David Hale grows a form from the Siskiyou that is only 2.5–5 cm (1–2 in) tall—“so small it is almost unidentifiable,” though he was able to key it out to variety *lanceolatum*.

Not a miniature gem, *Eriophyllum* typically forms low mounds or mats 30–60 cm (1–2 feet) across, making it a plant for the larger rock garden or very well drained border. It is at home among such small perennials as *Origanum*, *Veronica*, and *Teucrium* and is especially well suited to following bulb displays. The later-flowering *Allium* species contrast attractively in both foliage and flower.

Anecdotal reports from correspondents on the Internet forum Alpine-L disclose that *Eriophyllum lanatum* is one of the most adaptable western species. In mild Devon, England, it flourishes in Diana Dark’s garden. John Good in rainy Wales writes, “I use it as a front-of-border plant, spilling over the edging stones, where its silvery foliage is seen to advantage before disappearing under a duvet of yellow daisies.” It has also found homes far north and east of its range in North America: Andrew Osyany in Ontario says, “It is successful everywhere.” According to Todd Boland of St. John’s on the cold, wet shore of Newfoundland, it has survived 6 months of snow and ice, leaving the “top growth rotted into a black sodden mass, but now the plants are sending up numerous new shoots from the base—indeed a very tough plant and highly recommended!” Gunne-Bert Wedell, in Sweden, finds that it spreads a bit too enthusiastically. Rhonda Williams grows it on a ledge in her rock garden near Anchorage, Alaska, where it remains “small and compact.”

Siskiyou Rare Plant Nursery offers a select form as container plants. Seed is usually available in the NARGS seed exchange and is offered by many commercial suppliers, especially those specializing in western American plants. It germinates quickly in warm conditions, either outdoors in spring or in the greenhouse. The seedlings can be transplanted as soon as they have true leaves and grown on for about 6 weeks, then set out in their permanent positions; alternatively, they can be held in pots until the following spring. This pioneer plant is not naturally long-lived and should be renewed regularly from seed. Where well suited, it usually self-sows mildly, appearing to germinate and grow best in freshly disturbed, gravelly sites. It is also possible to propagate it from basal cuttings taken in early spring; plants in sandy, gravelly soil tend to layer naturally. Even mature plants seem to transplant readily, no doubt an adaptation to its preferred habitat of mobile screes.

JANE MCGARY
Estacada, Oregon

Books

The Cactus Family by Edward Anderson. Portland: Timber Press, 2001.
776 pp., 1008 color photos, 8 maps. ISBN 0-88192-498-9. \$99.95.
Available through the NARGS Book Service.

I had known Ed Anderson for many years and was always in awe of his vast knowledge of the Cactaceae, so I was excited to learn of the publication of his long-awaited book, *The Cactus Family*. This work might have been either a dry monograph filled with electron microscope images, or solely a popular encyclopedia—but it has the best features of both, with some cultural history as well.

Anderson begins by explaining the features that make these wonderful organisms what they are, and the great diversity of forms and adaptations that arose with the world's first truly dry, hot climates. Some of these features—spination, mimicry, and various water-saving devices—are the very things that have not only made cacti attractive to students but have also made them one of the most popular horticultural subjects the world over. Indeed, for many growers, they are a gateway into the world of rare plants in general.

After explaining just what a cactus is, Anderson gives us a tour of another of his passions: ethnobotany. Cacti have been and remain integral to many cultures, used as medicine, food, fuel, and religious and artistic symbols. Anderson addressed this subject in two of his earlier books, *Peyote: The Divine Cactus* and *People of the Golden Triangle*. In the present book, he also discusses cultivation and the increasing need to protect and conserve cacti's fragile habitats.

The section on classification is particularly interesting. Changes in nomenclature have been rapid in recent years, and the book's updates and its historical synopsis of the chronology—what came when, and who proposed it—are a good prelude to more recent cladistics, the statistically based science of grouping related species.

I was slightly disappointed in the encyclopedic section that makes up the main body of the book. Although the descriptions are more than adequate and background information abounds, distribution and habitat information is next to nil. Details of ecology, including elevation, climate, soil types, and plant

communities, are a primary tool for learning about a plant. These details can be related without giving away location information that may endanger plant populations by guiding unscrupulous collectors to them, a serious concern for cacti. But even a publication as grand as *The Cactus Family* can't offer everything, and it is a pleasure to read about so many rarely seen cacti, illustrated with good color photographs throughout. Much of the new taxonomy used, however, will take years to comprehend.

Sadly, this great plantsman passed away only a few months after the book's release. We can only assume that he would have produced much more fine work had he lived on. His love of the subject, combined with his years of studying these plants—from jungle epiphytes to driest desert survivors, and many of them superb rock garden plants—led Ed Anderson to leave us a great work that anyone who gardens in the sun will want to own.

SEAN HOGAN
Portland, Oregon

Agaves, Yuccas, and Related Plants: A Gardener's Guide, by Mary Irish and Gary Irish. Portland: Timber Press, 2000. 312 pages, 100 color plates. ISBN 0-88192-442-3. \$34.95. Available through the NARGS Book Service.

Yuccas, agaves, nolinias, and some even more obscure succulent monocotyledonous genera of North America—for instance, *Beschorneria* and *Beaucarnea*—are practically all plants of low or mid-elevation desert and steppe. At first blush, alpine gardeners might balk at growing such flagrant xerophytes, particularly since many or even most of these are positively gargantuan in scale. Why bother to review a book on these outlandish, ostentatious, and somewhat ludicrous plants in the *Rock Garden Quarterly*?

Rocks and rock gardens are hardly restricted to alpine turf. Few landscapes combine plant form and rocky outcrop more magnificently than the American Southwest, where these flamboyant monocots often take center stage. Perhaps in homage to Claude Barr, many North American rock gardeners create a xeric corner in the rockwork. The terrible symmetry of yuccas and agaves provides the sort of drama or focal point a garden needs to elevate such a vignette from the mundane to the sublime.

Mary and Gary Irish (she is the writer, he the photographer) have provided a meticulous and thorough guide to every every species of Agavaceae native to the United States and Canada, and a good many more southerly sorts that can be found in commerce. They include the distantly related Nolinaceae, a group that would otherwise never receive book-length treatment and that contains a handful of outstanding landscape plants.

The plant descriptions are precise (both in feet and down to the centimeter) and consistent. Hardiness estimates are only slightly conservative. The book might be faulted for having a rather dull descriptive text with not enough of the vivacity that characterizes this lively couple in person. The drawings and

pictures are useful, and much of the information contained in this book is otherwise only found in very bulky, expensive monographs, many of them now out of print.

PANAYOTI KELAIDIS
Denver, Colorado

The Prairie Rock Garden by Donna Balzer. Prairie Garden Books series. 2000. Calgary, Alberta: Red Deer Press. 176 pages, 120 color photographs, 7 line drawings. ISBN 0-88995-195-0. Distributed by Raincoast Books, Vancouver, B.C. U.S. \$14.95, Canada \$16.95. Available through NARGS Book Service.

This is a welcome addition to the bookshelf of the alpine and rock gardener. It fills a niche that was largely unoccupied: how to cope with rock gardens and their plants in the climate of the central prairies of North America. Climatic conditions are extreme in the prairies, particularly in the so-called Chinook zone. Temperatures may be very cold or very hot—sometimes in rapid succession; the sunlight is brilliant most of the time; drying winds and lack of rainfall can blast garden treasures or hail buffet them; sparse snow cover can fail to preserve them through winter; and limy soils are inhospitable to many. The orientation suitable for an alpine garden in the prairie region is different from what one would choose in the cool temperate West or the humid East. Winter wet is not our problem! Yet success has been achieved here, and Donna Balzer documents this success and explains how and why gardeners must adapt information from elsewhere to suit local needs.

This is a useful guide for seasoned alpine gardeners who suddenly find themselves living in the prairie region, where some of their accumulated knowledge does not work so well. A quiet afternoon reading this small book will help with the adaptation process. Beginners will also be well served by this book if they follow the recommendations regarding soil mixes, rock use, and plant suggestions.

Balzer focuses on a geographical area that includes the Canadian prairies of Alberta, Saskatchewan, and Manitoba and extends south to the U.S. states of Montana, Wyoming, the Dakotas, Nebraska, and Minnesota. She has distilled much experience from successful prairie alpine gardeners and has made it available in concise and very readable form. I am going to keep copies of this book on hand to give or lend to people who admire my rock gardening efforts and want to do something similar. If only this had been available to me when I was first smitten with a love of rock gardens, it would have saved me several years of fumbling.

There are a few details to criticize in the book. *Gentiana septemfida* is referred to as lime-intolerant, but we find it lime-tolerant and easy. I suspect that the author may have intended to speak of *G. sino-ornata*, which is definitely acid-loving and a problem on lime soils. The photo of *Tulipa tarda* may be misidentified.

The photographs are attractive and inspiring. I did notice a petunia in one, but why not? Especially useful are photographs of named types of grit and organic materials so that a reader can find local equivalents.

There is a clear and helpful description of how to calculate the amount of soil mix one will need, an area of mathematics that some of us find a bit problematic. There is also a quick reference chart which enables one to estimate at a glance the amounts needed to cover 500 square feet for depths from 2 to 12 inches. Several successful gardeners in the Calgary Rock and Alpine Garden Society have shared their usual soil mixes, and Balzer also includes advice on generic mixes. She recognizes that there are almost as many soil formulas as there are gardeners.

One section deals with the many forms of rock arrangement and how to make them meaningful within a specific garden design. The author considers the prairie and mountain landscapes and encourages the garden builder to go and look carefully at outcrops of various rocks to understand how to proceed. Once one has decided on the rock, it is difficult to decide how much to order. This is dealt with in some detail, along with the likely costs and complications of hiring heavy equipment. The aesthetic of the garden in winter is considered; comments on and the use of prairie-hardy small evergreens are very helpful.

By following the recommendations in this book, a gardener in the prairie region can conceive and build a successful and beautiful alpine garden the first time around. Then the fun can begin—the personal experimentation and the discovery.

MARGARET BROWN
Calgary, Alberta

Wildflowers of the Fairest Cape, by PETER GOLDBLATT AND JOHN MANNING.

Cape Town: Red Roof Design and National Botanical Institute, 2000.

ISBN 0-620-24787-8. 315 pp. North American distribution by Timber Press, Portland, Oregon. Paperback, \$34.95 (discount available through NARGS Book Service).

Peter Goldblatt, curator of African botany at the Missouri Botanical Garden in St. Louis, is probably best known to readers for his scientific work on the Iridaceae, on which he has authored scores of papers and several monographs. In the present volume he has collaborated with John Manning, a staff member of South Africa's National Botanical Institute and the famed Kirstenbosch Gardens in Cape Town, to produce a book intended for the enthusiastic non-specialist.

Wildflowers of the Fairest Cape contains a brief introductory section and thumbnail text descriptions of the plants, with a glossary of botanical terms and an index. The main body of the book consists of 221 good-sized color photographs, arranged by family and keyed by number to the plant descriptions. The region covered is a portion of the Western Cape of Good Hope extending from Her-

manus in the south to the Bokkeveld and Niewoudtville in the north. Since the flora of this remarkable area comprises nearly 6,500 species, coverage in this book is highly selective: according to the Preface, “the most common or conspicuous wildflowers.” Thus, we may assume that the book is intended as a manual for people out to enjoy the roadside flowers and learn a bit (or more than a bit) of traditional botany in the process.

The introduction describes the climate—which is Mediterranean, with mild, wet winters and hot, dry summers—and the plant communities, including fynbos (scrub), renosterveld (more widely separated shrubs interspersed with grasses, bulbs, and annuals), kloof forest, and the arid karoo scrub. A section titled “Wildflower Routes” points out some accessible areas where especially fine displays of flowers can be seen by tourists, with some helpful hints (“Beware of the baboons”), seasons of flowering, and a road map which unfortunately lacks a distance scale. The serious plant enthusiast—especially one who has traveled from abroad—would want much more than the seven pages allotted to this section.

In lieu of the key to families sometimes included in books of this genre, the authors provide a “flow chart” intended to guide the reader to the right place. Some of the diagnostic features are distinctive, but many of them require judgment calls: For example, how is one to decide whether a flower is “inconspicuous” or “more or less showy”?

The placement and predominance of the photo section implies that many users will employ this book in the time-honored manner of roadside wildflower viewers, flipping through the pages until they reach a picture that looks something like the plant before them. This will, in most cases, at least get them to the right genus. If they want to check the species, they can then turn to the text descriptions, which specify botanical details and known ranges. Distinctive features of some species are pinpointed by being printed in italics, a helpful convention. The descriptions use some basic botanical terms (defined in the glossary) but substitute ordinary language where this is feasible, as in “heart-shaped” instead of “cordate.”

English names are affixed to every species, and some of them may actually be in common usage, though many appear to be the typical kind of coinages produced when exasperated botanists are forced to cater to linguistically challenged wildflower hobbyists. Conspicuous by their absence are names in indigenous African languages or in Afrikaans.

The photographs that form the heart of the book are all by the authors and appear to have been taken in native habitat, though some may portray plants grown at Kirstenbosch. I found them disappointing for several reasons. First, the reproduction—the book was printed in Cape Town—is not state-of-the-art, and a few pages appear to have suffered from separation or register problems. Second and more serious, far too many of the photos are dark or out of focus; they are adequate documents of the plants’ appearance, but most are not enjoyable in themselves. There are exceptions, of course; for example, on p. 69 is a shot of *Brunsvigia bosmaniae* as a great colony of spherical pink inflorescences

that appear to have popped out of bare sand on their short, stout stems, ranged from the foreground to a distant horizon of ancient stony hills. This is one of the few illustrations that made me think, "I want to go *there* and see *that*."

Only a minority of the photos display the entire plant, while most show only the flowers. This is another device catering to the roadside wildflower watcher, but it is annoying to the reader who would like to know how a given plant might appear in the garden, the use to which most readers of this review are likely to put this volume.

My climate is too cold for most of the plants depicted, but if I were gardening in California, I would certainly peruse the photos carefully for inspiration. Some intriguing species are *Petalacte coronata*, a composite with thick silver leaves; the shrub family Bruniaceae (*Berzelia*, *Brunia*, *Staavia*) with interestingly textured foliage; *Arctopus monacanthus*, a very peculiar development in the parsley family; the floriferous annual *Polycarena* species; *Monsonia speciosa*, a perennial with large, crepelike white flowers; the bright blue, white-eyed crucifers of the genus *Heliophila*; and a sampling of the vast bulbous and succulent flora, some of which can surely be found greenhouse space even in cold climates.

I recommend this book to travelers who plan to visit the Western Cape and to gardeners in mild climates, especially those who are interested in growing South African plants from seed. It gives a good visual introduction to the range of the flora and the typical flower forms. However, those who collect plant books for aesthetic pleasure or encyclopedic reference will want to search further for works on this unique floral region.

JANE MCGARY
Estacada, Oregon

Eastern Winter Study Weekend 2001

Panayoti Kelaidis

Imagine the snowstorm blowing outdoors, and the camaraderie of 200 rock gardeners in the heart of a New York winter. What could warm our winter-weary eyes and uplift our spirits more than the flashing color of alpines? Contestants who were daring enough to cart their entries through the storms to the show are to be congratulated, and the many attendees milling in front of the brilliant display showed their appreciation through the entire weekend.

Class 1. Primulaceae except Cyclamen

Primroses can be expected at a late winter show, and several fine representatives were coaxed into full bloom. Stonecrop Gardens are to be commended for their many fine entries: their two ample *Primula allionii* selections were studded with dozens of buds and blossoms. The second prize entry had particularly fine farina on the foliage, with an unusual pale ivory color.

1. *Primula allionii* 'Maiden's Blush', Stonecrop Gardens
2. *Primula* × *pubescens* 'Wharfedale Village', Maria Galletti (Sutton, Quebec)
3. *Primula allionii* 'Cloud Flight', Stonecrop Gardens

Class 2. Cyclamen

The cyclamen class was very strong—all of the specimens were outstanding, with tremendous numbers of flowers. The 4 specimens of *Cyclamen coum* represented a fine range of foliage form and variegation, and the full range of flower color available in the species. The first place entry had brilliant magenta flowers gracefully balanced among the silver leaves. The huge second place entry had especially ample flowers and trim foliage with a "Christmas-tree" pattern. The unusual near-white entry was also notable, though still rather small.

1. *Cyclamen coum* 'Silverleaf', Stonecrop Gardens
2. *Cyclamen coum*, 'Christmas Tree' Type, Mark Mazer
3. *Cyclamen coum* 'Album', M. P. Bowditch

Class 3. Narcissus

The narcissi were every bit as brilliant as the cyclamens, nicely balancing the bright pink with cool yellow. All three prize pots were superbly grown at the peak of blossom. The petunia-like form of 'Julia Jane' was so perfectly balanced that there was no question of its supremacy in this class (and indeed the show), but its floriferous sisters were not far behind.

1. *Narcissus romieuxii* 'Julia Jane', Stonecrop Gardens; Best in Show
2. *Narcissus romieuxii* subsp. *albidus* var. *zaianicus* f. *lutescens*, Stonecrop
3. *Narcissus romieuxii*, Stonecrop

Class 4. Ferns

The dryland ferns of the southwestern United States have been a subject of growing interest over past decades, from the time Pacific Northwestern aficionados staged a superlative exhibit of these at the first Interim International Rock Garden Plant Conference. Despite the midwinter season, the exhibitor is to be congratulated for coaxing this difficult fern into full spring growth.

1. *Cheilanthes lindheimeri*. Tom Stuart

Class 5. Sempervivum

A fine specimen of the cobweb houseleek was rather lonely on the bench: I suspect quite a few attendees regretted not bringing one from home to give it company and a bit of competition!

1. *Sempervivum arachnoideum*, Stonecrop

Class 6. Sedum

The sedums fared much better: the first-place pot of *Sedum humifusum* cascaded gracefully around its pot, flushed with winter red. Although this Mexican sedum is generally regarded as tender, a well-grown specimen like this looks perfect on a showbench. It was a pleasure to see healthy plants of two rarely encountered species keeping the Mexican pixie company.

1. *Sedum humifusum*, Stonecrop
2. *Sedum furfuraceum*, Mazer
3. *Sedum montanum* 'Varietatum', Lola Lloyd Horwitz

Class 10. Natural cushion

One of the best classes in the show; every specimen was outstanding, including the fine *Eriogonum ovalifolium* that just barely missed an award. There was a bit of discussion about whether the first-place *Saxifraga valdensis* might not actually be *Saxifraga cochlearis* var. *minor*, but there is no question that this sizable mound with dozens of tight rosettes constituted an outstanding cushion. The many brilliant white blossoms unfortunately obscured the cushion on the purported *Saxifraga scardica*, which some thought might actually be a hybrid. It was unques-

tionably a fine plant, as was the especially large aggregation of rosettes of the rather infrequently encountered *Orostachys minuta* from the Far East.

1. *Saxifraga valdensis*, Stonecrop
2. *Saxifraga scardica*, Stonecrop
3. *Orostachys minuta*, Mazer

Novice Class (any bulbous plant)

The same exhibitor won both prizes in this class, and any novice would be pleased to have fine pots of these two species coaxed into full bloom in January.

1. *Crocus chrysanthus* 'Gypsy Girl', Rebecca Batchie
2. *Lachenalia aloides* 'Pearsonii', Rebecca Batchie

Class 9. Collection of three containers

This class was so strong that the containers were considered separately from the individual plants. The elegant, mossy, saxifrage-encrusted monolith that won first prize was simply too effortless and artful to be passed over. The two immense, extremely handsome troughs that won the other prizes had outstanding selections of well-grown plants. Some of the European plants were already nearing bloom. The American specimens in the other trough were fascinating for their healthy foliage in midwinter, especially since so many were dryland plants. As a westerner, I am repeatedly impressed how some growers along the eastern seaboard have so little problem growing these well.

1. *Saxifraga* on tufa, Larry Thomas
2. Trough with European cushion plants, Michael Peden (*Aethionema oppositifolia*, *Androsace* 'Millstream', *Armeria caespitosa*, *Asperula gussonii*, *Saxifraga frederici-augustii*, *Saxifraga hostii*, *Saxifraga paniculata* 'Minutifolia', *Saxifraga* 'White Hill', *Saxifraga* × *hornibrookii* 'Ariel', *Saxifraga* × *irvingii* 'Jenkinsii')
3. Trough with American cushion plants, Michael Peden (*Lewisia cotyledon*, *Penstemon davidsonii* subsp. *menziesii* 'Microphyllus', *Penstemon laricifolius* var. *laricifolius*, *Penstemon* sp., *Saxifraga bronchialis*, *Saxifraga ferruginea* var. *macounii*, *Senecio* 'Slumgullion Pass', *Senecio* spp., *Yucca* sp.)

Class 10. Group of bulbous plants

All three winning entries were outstanding in their own way. The snowdrops were in peak form, symmetrically staged and impeccably poised. But the vibrant color in the South African *Oxalis versicolor*, with its unusual subshrubby habit, and the lusty foliage of the great Moroccan buttercup caught the eye of many who walked past. If only the large, pearly white bud of the buttercup had been open just a little more! Even the flashy colors and graceful deportment of the exotic lachenalias cannot upstage challenging classics on their best behavior!

1. *Galanthus elwesii*, *Galanthus* 'Mrs. Backhouse #12', *Galanthus nivalis* 'Blewbury Tart', Stonecrop
2. *Ranunculus calandrinoides*, *Narcissus* 'Nylon', *Oxalis versicolor*, Jim Jones
3. *Lachenalia pallida*, *L. bulbifera*, *L. reflexa*, Mazer

Editor's Note: The Eastern Winter Study Weekend also featured both traditional and digital photo contests. The winners of the former appear on pages 189–192 of this issue, and a feature on the latter will appear in the Fall 2001 issue.

NARGS Seed Exchange 2001 Directions

How the Seed Exchange works

Donors send seed to the Intake Chapter at the address printed on the Seed Donation Form:

**234 Crawford Road
Hillsborough, NC 27278, USA**

The items donated are entered into a computer database which is used to produce the seed list. Each donor is assigned a donor number.

The last date for acceptance of seed is **1 November 2001**. After this date, the seeds are sent to the Packaging Chapter. The finished packets are then sent to the Order-Filling Chapter, which receives the order forms and sends out the seed. A copy of the seed list is sent to every NARGS member; it is not necessary to request the seed list separately. The order form is printed in the seed list. Orders will be filled from early January 2002 to late February.

Advantages of participating as a donor

Donors are defined as members who contribute at least 5 different items, as determined by the Intake Chairman. Donors receive 35 packets of seed, while non-donors receive only 25. Furthermore, orders from donors are filled before those from non-donors. Finally, donors receive the recognition and gratitude of their colleagues!

Packaging seeds for donation

Please use paper or glassine (not plastic/polythene) envelopes. Suitable envelopes may be purchased from the NARGS Book Service (see advertisement in this issue).

Print in very clear characters of adequate size on every envelope the following 3 pieces of information: (1) botanical name of the plant; (2) collection site, if from the wild (from nature, spontaneous); and (3) your surname.

Be sure that the envelope does not leak! Very small seeds should be wrapped in a piece of waxed paper before being placed in the envelope. Enormous amounts of seed leak out of envelopes that are not properly sealed.

If any seeds are unusually moist—aroids and *Paeonia* are particular problems in this regard—enclose them separately in plastic to prevent their moisture from ruining the rest of the seeds.

Donors of fern spores should separate them into individual portions and pack them in small envelopes. The spores are so small that they cannot easily be handled by the Packaging Chapter.

NARGS cannot provide special storage conditions for fragile or ephemeral seed. Seed that must be refrigerated to retain viability may be sent in close to the deadline, but even then, it will be stored without refrigeration for at least 2 months.

Seed Donation Form

A donation form is enclosed with this issue of the *Quarterly*. It will be used by the cataloguer when your donation is entered on the computer. If you do not have a blank donation form, please enclose a clearly written or typed list of the seeds you are donating. Do not submit your donation list by e-mail; it must accompany the actual seed. (In addition, seed orders will not be accepted by e-mail.)

It is not necessary to fill out all parts of the form. Only the botanical names and wild collection sites (if any) are needed. The other spaces (height, flower color) should be used **only** if the item is (a) new or rare in cultivation in the Northern Hemisphere, or (b) unusual in size and color (e.g., pink *Gentiana asclepiadea* or 4-cm-tall *Campanula rotundifolia*). The column “Authority/Reference” should be used if you believe the item is new to cultivation and has not previously been listed in the seed exchange; a very brief citation such as “Fl. USSR” or “Smith 1996” is adequate. If you are submitting an item under a very recently revised name, it is also helpful to cite the authority.

Fill out the Seed Donation Form, **printing the names in clear letters of adequate size**. Arrange the seed envelopes in the same order as they appear on the form and secure each bundle of 5 to 10 envelopes with a rubber band.

PLEASE do not tape or staple the seed packets together or to a sheet of paper! Use rubber bands!

Place the seed envelopes, Donation Form, and a **mailing label** with your own name and address in a strong mailing envelope or box; padded or cardboard envelopes are best. If you cannot get a strong envelope, wrap the seed envelopes in some kind of padding inside the envelope. To avoid damage, do not put loose seed packets inside large envelopes.

(If all this seems to have a slightly hysterical tone, please be assured that it results from many years of sad experience on the part of the exchange staff.—*Ed., a former Intake Chairman*)

Sending the seed

Mail your donation to the address on the Donation Form as early as possible. **Do not send seed to any other address.** Overseas donations should be mailed by October 10, Canadian by October 15, and U.S. by October 25. No item can be added to the Seed List after November 1. Seed that arrives too late to be listed will be sent out as substitute items and distributed to chapters.

Late donations

If you are sure you will send particular late-ripening items after November 1, you may send a list to the Intake Chairman for inclusion in the Seed List and mail the seed at any time up to December 1. This special service may be used only for late-ripening or wild-collected seed; it is not intended to provide donor numbers for procrastinators.

Special collections

We are delighted to assist in the distribution of large collections from botanical expeditions. Collections of more than 50 items from a single region can be listed in separate sections of the Seed List with abbreviated site information. If you expect to donate such a collection, please inform M.K. Ramm at the intake address as soon as possible so we can plan for your list.

What to send

The most frequently ordered items in the Seed Exchange are small, highly ornamental alpine plants, especially those collected in the wild. Very unusual items, especially from temperate climates, are also much desired. There is also a certain demand for easily grown garden standards, but in this regard, see comments on the list of **Unacceptable Seed** below. American members in particular are urged to collect seeds of alpine plants in the wild, bearing in mind that such collection is forbidden in national parks and certain preserves, and in populations of endangered species.

Unacceptable seeds

See the NARGS web site <<http://www.NARGS.org>> for a complete list of (1) validated names, (2) noxious weeds prohibited by law from import and distribution in the United States, and (3) most requested seeds.

Although the Seed Exchange is charged to include "plants suitable for rock gardens," in practice it offers opportunities to obtain unusual plants of many kinds. However, certain items are not desired; some of these will be discarded if received, and others will simply cause useless work and be discarded after the orders are filled. In general, the following kinds of seeds should not be sent to the Seed Exchange:

Noxious weeds

Common trees and large shrubs, unless wild-collected

Annuals available from commercial seed catalogs

Plants taller than 1 meter requiring frost-free culture

Horticultural hybrids of common genera such as *Hemerocallis* (daylily) and *Hosta*

Wild-collected seeds of federally listed or CITES listed endangered species (must be discarded if received)

Aquatic plants

Food plants of little ornamental value

Seed of any species of *Lathyrus* from outside the U.S. (agricultural quarantine)

Plants prohibited from distribution by the U.S. Dept. of Agriculture

Large quantities of seed of large plants such as *Clematis*, *Eryngium*, or *Eupatorium*

More information

Direct questions about submitting seed to M.K. Ramm at the address at the beginning of this article, or by e-mail: <mkr@cs.duke.edu>. Send general comments and administrative correspondence to the Seed Exchange Director: Tom Stuart, P.O. Box 517, Croton Falls, NY 10519; e-mail <tstuart@westnet.com>.



NARGS COMING EVENTS

Eastern Winter Study Weekend: "Noah's Ark: Conserving Plant Diversity," January 25-27, Falls Church, Virginia. Host: Potomac Valley Chapter. Contact: Alice Nicolson, 3435 S. 8th St., Alexandria VA 22204 <taxonomy@aol.com>

Western Winter Study Weekend: "Weekend in the Siskiyou," February 22-24, Medford, Oregon. Host: Siskiyou Chapter. Contact: Ruby Reed, 310 Brandon St., Central Point OR 97502 <imrareed@connpoint.net>

2002 NARGS Annual Meeting featuring field trips to the mountains of Alaska, June 11-14, Anchorage, Alaska. Host: Alaska Chapter. Contact: Frank Pratt, 7446 E. 20th Ave., Anchorage AK 99504-3429 <akkrafts@alaskakrafts.com>

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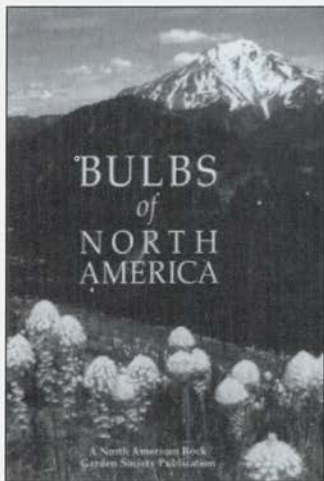
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