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CONTENTS VOL. 41 NO. 2 SPRING 1983

Primula Carniolica — H. Lincoln Foster	53
Primula Cusickiana — Irene Buckles	56
Primula Kisoana: The Hobo Primrose — Joan Means	60
Cornell Plantations — Tim Smalley	62
Calypso in a Swing — Edith Dusek	65
Plant Hunting in Sichuan, China: Part I — Carla Teune	67
Farrer, Cox and Kelley — Dr. Nickolas Nickou	75
Abronia Latifolia — George H. Nation	77
Book Reviews: Gardening with Native Plants of the Pacific	
Northwest — An Illustrated Guide by Arthur R. Kruckeberg;	
Alpines '81 — Report of the Fifth International Rock Garden	
Plant Conference and Show, edited by Alfred Evans	79
Rock Gardening in Newfoundland — Bernard S. Jackson	83
China — A Sentimental Journey — T. Paul Maslin	89
Of Cabbages and Kings	93

Cover Picture — *Primula carniolica* — Laura Louise Foster,
Falls Village, Connecticut

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Bulletin of the American Rock Garden Society



Primula Carniolica

H. Lincoln Foster
Falls Village, Connecticut
Drawing by Laura Louise Foster

Occasionally there turns up in the seed lists a species that has hovered for years on one's want list, not exactly the sort of plant one goes to extremes to acquire, just one of those plants one would like to see in the flesh. So it was about six or seven years ago there appeared in one of the seed lists (I can't now remember which) *Primula carniolica*, collected in Yugoslavia.

I always mark immediately on the lists good species collected in the wild, and since it was a primula I had never seen and from an area where I thought it was native, I double starred my list on the first go-through. I guess I probably underlined more than once in red its number in the sequence of squares on

my request form. I got the seed. How many seeds I received and how I handled them I cannot now remember. Because I have never disciplined myself, nor really found the time or the inclination, to keep scrupulous records of seeds sowed with all the attendant and valuable information, I now regretfully rely solely on an ancient, fallible memory.

I think there were three seedlings the spring after sowing, or was it the second spring? They were doubtless planted on in small plastic rose pots in my standard mix along with hundreds of others at that busy season sometime in June. They probably jostled along with other transplants for a week or so on the barn floor near the wide north-facing doors,

watered regularly and then were transferred to the long deep frame with plastic net shading.

I must admit that I don't remember them particularly during this routine and sometimes cursory procedure. I do distinctly recollect setting out two small plants of *Primula camiolica* from pots at the time in August about five years ago, when I constructed a small limestone bed near the back terrace to receive new saxifrage propagations, some good seedling ramondas and a few other specialties. There, I know I put one *Primula camiolica*, which flowered miserably the next spring. Another I set in a new bed in a wide deep fissure atop a big rock in the remote, upper, acid soil rock garden alongside some lewisia seedlings from Czech seed. There the Yugoslavian primrose did rather better. There were two rosettes and two rather spindly clusters of flowers, a rather fascinating plant because of its foliage, unique in the Auricula Section, rather narrow and long, without meal, and for its smoky vin rosé flowers, a bit more tubular than most auriculas and with a dust of meal in the white-ringed throat.

But the plant began to droop as the summer heat advanced and on sunny days it languished sadly. In the fall I decided to give this plant a do-or-die treatment. I potted it up in a good rich soil mixture, with good bottom drainage and, because it had an ample root system, into a ten inch pot. I carried it through the winter in the alpine house.

I did this not only because of its halting growth where it was but also because of a recollection of a visit to Keillour Castle garden in Scotland following the 1971 International Rock Garden Plant Conference at Harrogate. While we were there Mrs. Knox-Finlay, despite her quite reasonable annoyance that we had not come on the bus trip before the conference, graciously let us wander through

the garden and did rather proudly display in the alpine house a pot of *Primula camiolica* with two flowering stems — which, she announced, she was taking “up to London for the Rock Plant Committee” for an award, because she had discovered by going back through the records that it was a species that had never received an award and had probably never even been submitted before. As I remember reading later in the AGS *Bulletin*, she did get an award of merit.

My plant in the alpine house fattened up beautifully over the winter and in the spring began to shoot up flower spikes from all fifteen rosettes of smooth, fleshy leaves. The flowers began to open just in time for the Connecticut Chapter plant show on April 22. It took a second by popular vote, nosed out by a well grown white *Primula denticulata*. Of course I was a bit disappointed not to have the plant receive a first in the primula class, but I was myself definitely bewitched by the stalwart and, I thought, striking beauty of the flowering specimen. So I turned to my book shelves to read up about *Primula camiolica*.

Flora Europaea places this species among those of the subgenus *Auriculastrum*, between *P. marginata* and *P. auricula* amidst a group of species having a chromosome count: $2n=62$. Aside from the technical description, which matches my plant in all details, there is little information to hint at horticultural advice, except the curt phrase, “Pastures; shady rock in wet ravines. Slovenija. Ju.” Not even the usual observation of whether it is calcicole or calcifuge. The color of the corolla is described as “purplish-pink, white-farinose at the throat.”

All of this compacted information in *Flora Europaea* agrees precisely with the plants I grew from seed collected in Yugoslavia. What puzzles me, however, is that generally in the horticultural liter-

ature the plant is described as coming from the Maritimes and Julian Alps, or by Kenneth Corsar as hailing from the Maritime and Cottian Alps. Farrer was correct when he wrote "*P. carniolica*, one of the rarest and remotest of European Primulas, is confined to a few wooded hill-tops in the Idrian Alps just north of Trieste." How it jumped from the Maritimes and Cottians is one of those curious multiplied discrepancies that creep into horticultural literature.

Because Farrer described the blossoms as "a delicate, delicious soft rose", later authors saw it in the mind's eye as pink. Many authors don't even include it in their extensive lists of primulas in cultivation, a fact that does suggest it is a species still rare in horticulture. Farrer also says, "There has been known a lovely white form; it is only at this present hour, a 'Has-been'." Those authors who do include the species in their listings still mention the long-lost "white one", leading one to suppose that *P. carniolica* is better known in literature than in gardens.

Two of the many blossoms on my plant in the alpine house I had pollinated with a camel's hair brush; the others I did not. Only those two set seed and that seed I sent into the Seed Exchange at the tired end of the year when I said to myself that I just couldn't go on raising more and more seedlings. Now I wish I had reserved just a pinch, because here I am poring over the seed lists of all the exchanges and planting a whole new

round and I can't be sure that the stalwart plant of *P. carniolica* that I set out in a rich humusy bed along a path in the upper woods garden beneath tall pines will reward me in future springs as it did in the alpine house.

If it does, and I have all fingers crossed, I think I'll try crossing it with a true *P. auricula* and with others in the same section. There is a known natural hybrid between *P. carniolica* and *P. auricula*, recorded as *P. x venusta*. What we have in gardens today under that designation reflects what Farrer observed long ago: "*P. x venusta* is a natural hybrid between *P. auricula* and *P. carniolica* — a fertile parent itself, and most variable in form, differing from *P. carniolica* chiefly in the possession of meal, and from *P. auricula* in the rosy, crimson, purple, or brownish colouring of its flowers. It is invariably offered in catalogues, but the true primary cross is almost, if not always, there represented by secondaries or tertiaries — if indeed by anything that has even so remote a legitimate right to bear the style of *P. x venusta* at all, the name by now having become almost as blurred as that of *P. x pubescens*." He was frequently very acute and right. I have grown seed of *P. x venusta* once offered in an exchange and there was a vast range of forms, some indeed very splendid.

If that plant does bloom next spring I now am determined to go back to a primary cross and start again. §

Hardy — A plant is said to be hardy if it remains alive in a nursery long enough to be sold.

— *A Dictionary for Weedpullers, Slugcrushers & Backyard Botanists* by Henry Beard and Roy McKie

Primula Cusickiana

Irene Buckles

Seattle, Washington

Photograph by the author

The subject of *Primula cusickiana* pops up in conversation among primrosers, but only occasionally. There have been infrequent articles written about it and very rarely is a photo published. Very few people know anything about this native American primula and many have never heard of either the botanist Cusick or his "Wallowa Primrose", as it has come to be known.

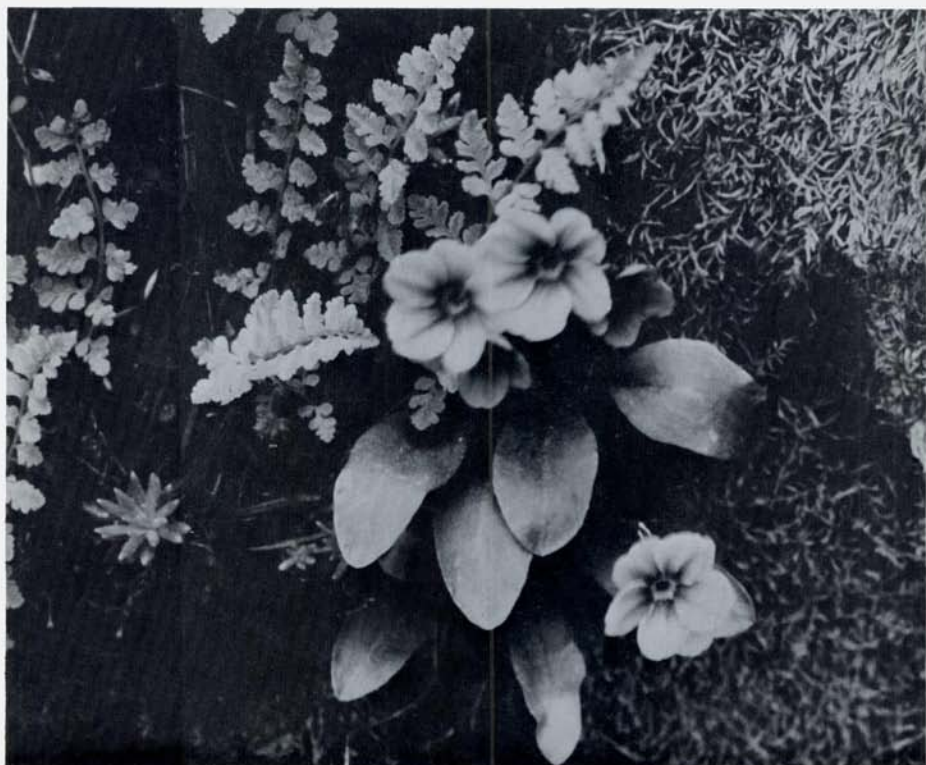
In the beginning, curiosity played the major part in wanting to find this elusive primula. In fact, knowledge of the Willowa Mountains was previously obtained (before our interest in primula) in search of *Lewisia columbiana* var. *wallowensis*. Only after gaining considerable knowledge about primroses and joining the American Primrose Society, was notice taken during discussions about an Oregon native primrose that no one seemed able to keep under cultivation any length of time. These conversations were generalizations, with no specific detail on either its location or cultural requirements. Articles on the subject gave good general information, such as botanical descriptions and general habitat, but it wasn't concise enough. We decided to find *Primula cusickiana* ourselves.

Everyone familiar with this primula knew that *P. cusickiana* grew on the road to Hat Point, located in northeastern Oregon, but it was apparent no one could (or would) describe to us a more specific location. Some said they had

found it in meadows hiding in the grass; many mentioned that it grew within the vicinity of Ponderosa Pine, while others said it grew on cliffs that you had to hang over in order to even see the plant and still others said the primrose grew on hillsides with running water. Only one road leads to Hat Point and it begins at Imnaha. This twenty-six mile stretch of extremely rough road runs along a sharp ridge top between the Imnaha River on the west and the Snake River Canyon on the east. When looking for a plant never actually seen, this becomes a lot of area to cover.

One helpful person was found, Mrs. Tewinkel of La Grande, Oregon, who had collected *P. cusickiana* seed. It was late in May when she wrote back indicating it would be too late to find the primrose blooming. Starting out anyway in June 1981, so sure of success, it was quickly discovered Mrs. Tewinkel was right. There had been an early spring and no traces of *P. cusickiana* were found.

This last spring we decided to outwit Mother Nature by starting this search in early May. Unfortunately, it had been a very late spring, and snowed in the mountains the night before we arrived in Imnaha. Part of the road had been plowed, allowing the journey to continue up the mountain. The farther we went, the higher the snow banks became. We were finally forced to stop where the



Primula cusickiana

snowplow had stopped — fifteen foot high piles of snow were on both sides of the road.

Bound and determined to find the “Wallowa Primrose”, Hat Point was again attempted on June 16, 1982. Even in mid-June a lot of snow was found. We began going through small patches of snow until finally we were brought to a halt by a drift that was impassable. Figuring the vehicle would be able to go through easily enough with a little shoveling, we decided to walk first farther up the road to see how much snow lay ahead. On the way back to the truck a detour was made to walk along the ridge, looking for plants growing down the bank. About one hundred feet off the road, just over the edge of the

ridge, we found our treasure! This trip must have been the third time charm. Here was a large patch of the most gorgeous blue flowers we had ever seen. We knew instantly that this was *P. cusickiana* even before getting close enough to correctly identify it. The excitement was indescribable — an elation — a joy — that probably only someone who has had a similar experience can understand. After seeing *P. cusickiana* in nature, we finally understood why people were so reluctant to divulge its location.

Now the real work began — photographing, taking notes, measuring. Most of the flowers were a deep violet-blue with a gold eye, slightly farinose. No white or rose forms were found, and only a couple of pale blue plants. The

flowers had four to six petals, mostly five; most petals notched and ribbed, 1.3 to 2 mm. across, with one to seven flowers per scape, mostly three. An interesting observation — both thrum and pin-eyes were found. *P. cusickiana* has a bright green rosette formed of smooth, non-mealy leaves 1.2 to 1.8 mm. wide and 5 to 8 mm. long. A faint violet fragrance was noticed, but it was not overwhelming. In fact, we had to put our noses right close to the flowers before detecting any odor at all.

Two patches of plants were found growing quite close together, yet they were separate distinct colonies. The first patch was in full bloom on this June 17th, growing on a large southwest facing rock outcropping. Large evergreens farther down the slope provided early morning shade, while other evergreens on the top of the ridge gave late afternoon shade. The entire outcropping was carpeted with moss (*Tortula* spp.). Intermingled with the primroses were *Erythronium grandiflorum* (dog-tooth violet), Rubiaceae spp., foliose lichen, sedum and a small growing fern, all indicators of spring wetness and summer dryness. The second patch was facing south, without trees close by, but with a constant stream of water running through the primulas. The *P. cusickiana* were growing either on top of small rocks or on mounds of soil, keeping the plants high enough so their crowns were out of the water, but their roots constantly wet. This colony was almost out of bloom and had started forming seed pods.

The seed capsule itself is unique with five vertical stripes of pronounced farina (meal). As the seed capsules develop the leaves begin to die down. One seed capsule was collected at this time, after trying to find the one appearing the most mature. As an experiment, the seeds were planted in a pop-bottle terrarium,

placing the container in the refrigerator, removing it for a couple of days, and then returning it to the cold. So far none of the seeds in the terrarium have germinated.

According to available information — growth, flowering, seed production, and final disappearance occur within a period of five months. This seems to be about right from what could be observed by returning late in August to collect seed. Everything was baked dry at this time. Although the plants had not disappeared entirely, it was difficult to collect as large a quantity of seed as hoped. As the seed pod dries, the cap falls away, leaving an "urn" of seed to be knocked out and scattered by the strong gusts of wind blowing down the canyon. The first part of August would have been a better time to collect seed.

Two other locations of *P. cusickiana* were pointed out by Marvin Black of the American Rock Garden Society. These two areas certainly didn't have easy access. The terrain had a most rugged appearance, with the altitude a bit higher. The plants were in full sun, shaded only by the overhanging rocks. Collecting seed here was a challenge, requiring a person to lie face down on an overhang while reaching down into the crevices for the seed pods. Here a collector would be looking straight down to the river several hundred feet below.

Lewisia columbiana var. *wallowensis* was found growing among the primroses, an unlikely combination. Another surprise, *P. cusickiana* was not found growing near any Ponderosa Pine (as some finders had written). The few seeds that were collected on this last journey will be planted in December or January in the hope that nature will take over and allow some seedlings to sprout.

Even after three of these nine-hour drives from Seattle, Washington to Imnaha, Oregon in search of the *P. cusic-*

kiana, both in bloom and to collect seed, there was not enough time to learn many details about the plant. Many more hours of investigation are needed. Observations indicate that *P. cusickiana* doesn't grow just anywhere in the Wallows, but where it does grow it usually forms large patches. A soil sample from the first colony tested out at a pH of 5.8.

Further investigation and research on the Wallowa Primrose is just beginning. A challenge would be to find it in the Wallowa foothills in Union County, Oregon where the species was first located and collected by William Cusick. It is also reported to grow in northern Nevada and in western Idaho. Sources indicate it also grows in the Blue Mountains, which extend into southeastern Washington. It would be exciting to find *P. cusickiana* in these locations and record differences or similarities with the Oregon plants, also variations in terrain, weather and soil conditions. Being able to grow and flower this lovely primula in cultivation and then to enter *P. cusickiana* in a show would be the ultimate satisfaction.

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The following additional note about P. cusickiana was excerpted from an article, "Little-Known Plants of the Wallowa Mountains" by Marvin Black and Dennis Thompson of Seattle, Washington, which appeared in Vol. 43, No. 4 of Pacific Horticulture.

Primula cusickiana is a delicate,

fragrant primrose with flowers of luminous violet, but on the blue side, quite unlike other American primroses we have seen. The stems, three to five inches tall, hold aloft showy flat flowers slightly under an inch in diameter. We reject Art Kruckeberg's appraisal, "rather insignificant little primulas" in favor of that of his University of Washington colleague C.L. Hitchcock, who found the plant "a beautiful little perennial desirable for the moist rock garden, but very difficult to establish." Here is a primula to challenge the keenest expert. Dug plants will surely die; one must start from seed, which may be collected from wild plants in July, but can occasionally be found in the seed exchanges of specialist societies.

Orval and Ivanel Agee of Milwaukie, Oregon succeeded in bringing this primrose into flower for years in a boxlike planter. It was on the shaded side of their house, but open to light from the sky. The key to their success appeared to be that in fall and winter they moved the box back under the eaves overhang, for the plant demands a long dry dormancy. It required sharp drainage and copious moisture in the spring until flowering. Surprisingly it is found by the thousands, with such things as balsamorhizas, in Wallowa's flat meadows that bake absolutely dry in summer after snowmelt. Roads to many of the growing sites are still blocked by snow when it blooms in June, reinforcing its reputation for elusiveness. §



Have you introduced a friend to ARGS this month?

Primula Kisoana — The Hobo Primrose

Joan Means
Georgetown, Massachusetts
Photograph by H. Lincoln Foster

Plants which are rare in nature may also be rare in sophisticated gardens for three main reasons: they may be difficult to propagate; miserably miffy to grow; or simply so dowdy that only a specialist can love them. None of which explains the strange case of *Primula kisoana*. This lovely Japanese woodlander of the *Cortusoides* Section, first described in 1967 and nearly extinct in nature is now proving as easy to grow as a strawberry plant on this side of the Atlantic. Though it is by no means common, in another decade it could be. It hasn't traveled as well to England, where it has behaved rather badly. I've been trying to find out why.

In my Massachusetts garden (U.S.D.A. Zone 5) *P. kisoana* romps where polyanthus dies. Furry as a high alpine, the leaves shrug off water, reach a foot at maturity, and are ignored by red spiders, the scourge of most primulas in our hot, dry summers. The flowers (a lavender-mauve in the type, but I also have a clear pink) appear in profuse umbels in the spring, borne well above the leaves, and another autumn flush of bloom is common. Seed set seems sparse, but, apparently alone among primulas, an established *P. kisoana* spreads by thread-like underground stolons. In deep acid leaf-mould, new plants pop up as far as two feet from the parent, grow new roots and are ready to detach by late summer.

Does this sound like the plant described in the December 1981 issue of the *Quarterly Bulletin of the Alpine Garden Society* as "a beautiful little Japanese primula... a rarity in cultivation... [there are] doubts about its hardiness"? According to the AGS Bulletin, "the only practical means of propagation is by careful division of the short rhizomes just before growth commences in late winter."

The occasion for the above description was the conferring of an Award of Merit to a fine *P. kisoana* plant grown by Mrs. Lionel Bacon of Winchester in the south of England. Her plant was the rare white form, 'Shikokiana Alba'. Another plant of the same clone had been the object of much covetousness when the Japanese delegation showed it at Alpines '81 in Nottingham.

Now Mrs. Bacon is one of England's premier plantsmen, but brushing shoulders with the great at Alpines '81 had given me courage. "Why", I wrote her, "should a plant, which has proven vigorous in several Northeastern U.S. gardens, be considered rare and doubtfully hardy?"

"I presented *P. kisoana* to the Joint Rock Garden Committee as a plant which I had only grown in a frost-protected alpine house, so that I could express no opinion as to its hardiness outdoors," Joyce Bacon very kindly replied. "This applies to the type plant as well



Primula kisoana

as the white form; I presented both to the Committee, but the type form had already had an Award of Merit, prior to 1965, I think."

And then Mrs. Bacon delivered a stunning observation. "I wonder," she wrote, "if *P. kisoana* varies in more than colour. You refer to it as being stoloniferous. I see that Lincoln Foster, from whom you obtained your plant, does the same, but I have not been able, in the literature available to me, to find any other suggestion that it is stoloniferous. My plant, which came from Dr. Rokujo, has shown no sign of forming stolons, and when I broke it up it came apart in the same way as *P. vulgaris* does. . . The question must arise whether you or we do not have the correct plant, or whether there are stoloniferous and non-stoloniferous forms."

Heavy, and heady, stuff. I turned to two experts on this side of the Atlantic.

Kristian Fenderson, who grows a stoloniferous *P. kisoana* among the frosty hills of central New Hampshire (U.S.D.A. Zone 3), is working on a book about primulas suitable for U.S. gardens. He confirmed that stolons seem absent in the literature (Pax, 1905; Balfour, 1913; Takeda, 1914; Smith and Forrest, 1928; Ohwi's *Flora of Japan*, 1967). For that matter, said Kris, stolons are also absent in the dried material of the species that he has examined. Just the same, he is sure that the *P. kisoana* of Northeastern U.S. gardens is, indeed, *P. kisoana*. "I believe the presence of stolons is characteristic of the species, but it is a characteristic that is often invident or easily overlooked in dried specimens," he told me. "If you dig plants most come up as separate plantlets with no strong or well developed umbilical cord."

The source of most of the *P. kisoana* appearing in gardens of the Northeast is

H. Lincoln Foster, the only author to mention stolons. At Millstream in the Berkshire foothills of northern Connecticut (U.S.D.A. Zone 4) Linc started growing *P. kisoana* from seed some 20 years ago. "The various seedlings were typical in foliage and flower form, but all a rather dingy mauve in color. All set underground stolons," Linc told me. "Some individual plants have perished, of old age I suspect; none from lack of hardiness.

"About ten years ago, I got from Dr. Rokujo a plant he labeled *P. reinii*, which I had asked for. It turned out to be a vivid-colored, vigorous form of *P. kisoana*, which I began to propagate from its prolific, vigorous, and wide-ranging stolons. It has not set seed for me. There is just a chance that it is a hybrid of some kind and therefore may be sterile."

Linc, too, has a 'Shikokiana Alba', received in 1979 from Dr. Rokujo. "It is certainly not as vigorous as the type, or the clear pink form, but it too has made stoloniferous offsets, though closer to the main plant. It did set seed, and I produced one seedling and lost it."

Like Kris and Joyce Bacon, Linc went burrowing in his bookcases. "Ohwi in *Flora of Japan* merely says 'rhizomes short'," Linc noted, adding that Ohwi described *P. kisoana* as "rare in the

wild," and may, in fact, have described it from herbarium sheets. Another classic, Roy Green's *Asiatic Primulas*, may also have lacked the comfort of a living specimen. "Roy Green concludes his description, "*P. kisoana* has from time to time been in cultivation in Britain but always transiently.... It is doubtful if the species still remains in cultivation," Linc noted. To which he added, "Ha! Ha!" To which many gardeners in the Northeast U.S. can add, thanks to Linc, "Amen!"

Why the huge trans-Atlantic difference in *P. kisoana*'s behavior? Until the experts settle the question, a beginner can only hazard a few guesses. One might be that few English gardens duplicate the conditions of a deciduous forest — deep leaf mould overlaying a rocky soil — in which many woodland plants revel. The English tend to substitute the peat garden for the more nourishing woodland garden, and not all woodland plants like it.

On the other hand, *P. kisoana* may simply be the victim of too much sophisticated gardening. Not all plants will stand for the caviar treatment of alpine-house cossetting — the normal treatment for new and rare plants. Like the legendary hobo, *Primula kisoana* may languish unless given a simple, independent life, free to travel where it pleases. §

Cornell Plantations

Tim Smalley
Ithaca, New York

Cornell University has an inspiring setting of great natural beauty and scientific interest. The variety of terrain within the campus and environs offers an enormous range of opportunities for

study and experimental work in botany, horticulture, biology, zoology, geology, nature study, and natural resources. Louis Agassiz, the great Swiss zoologist of the 19th Century, said after an ex-

tended visit to Cornell: "I was never before in a single locality where there is presented so much material in so many branches of Natural History as here in this beautiful valley."

The objectives of the Cornell Plantations are to preserve, maintain, and restore these teaching and learning materials for programs in the natural sciences, and to stimulate an awareness of the value of the environment among members of the Cornell community and others. The Plantations maintains, develops, and interprets Cornell's great outdoor laboratory, a facility of such astounding diversity that most people on the campus, let alone in the Ithaca community, are unaware of the separate entities that comprise the Plantations.

In 1933 a writer from New York City, with hyperbolic enthusiasm, urged visitors to Ithaca to tour "perhaps the largest rock garden in the world." Cornell University is sandwiched between two gorges that are under the management of the Plantations. No evidence of planting done in the 1930's remains, but the gorges are frequently used as an outdoor museum of botany, zoology, and geology. Visiting the gorges is like taking a field trip to the Adirondacks because the north facing slopes provide shelter for plants, insects, salamanders, and birds which are atypical for Ithaca. The gorge waterfalls are frequent subjects for calendar photos and the gorges are heavily visited for their scenic splendor and hydrologic majesty.

In addition, the Plantations manages approximately 1300 acres of natural areas throughout Tompkins County. These areas are noted for their glacial topography, rare plants and animals, abundant wildflowers, and unusual plant communities. South Hill Swamp is one of the twelve areas. It is perhaps the northernmost example of a coastal prairie association, and closely resem-

bles the coastal plain of New Jersey. Another, McLean Bog, is a registered Natural Landmark that has been under study and protection since 1919. This area has both alkaline and acid bogs, supports rare boreal plants and is characterized by glacial topography and typical marsh and bog plant species. Other natural areas contain classic examples of typical forest associations such as birch-beech-maple, or oak-hickory.

The venerable L.H. Bailey (1858-1954) coined the name, Cornell Plantations, after he envisioned a number of activities that should be unified under one administrative umbrella at Cornell. He thought we should begin with a master plan, a long-range scheme tying together all the varied resources that were interesting to the general nature lover and were also essential for specialists who studied the flora, fauna, geology, and ecology of the region. He did not consider a botanic garden a park, but rather an integral part of the scientific, educational, and artistic communities. Nonetheless he knew it could provide limitless satisfaction to the people who use it.

Most of Bailey's concepts have been brought to fruition at the Plantations as an aggregate, and in many of its separate units such as the Robison York State Herb Garden which J.P. Baumgardt, a horticultural consultant and writer, described as one of the finest in the United States. It contains more than eight hundred herbs important in the history of botany and medicine, as well as plants used as foods, flavoring, teas, fragrance, ornament, dyes, and poisons. The garden has a regional upstate appearance that was created through the use of garden walls of native stone, rustic wrought iron gates, and split rail fencing. Eighty-five species of roses and old shrub roses have been planted in beds outside the herb garden, and on a slope beyond the

garden that has been planted with large shrubby materials that have herbal significance.

Adjacent to the herb garden is the Young Cutting Garden, which consists of plants grown specifically for the foliage, flowers, or seed heads which are prized for use in potpourri, culinary blends, vinegars, and decorative arrangements. Featured in the Young garden is a huge stone water trough fed by an old pipe, typical of springs in this area.

The American Peony Society Garden was built on land given to the Plantations because farming equipment was damaged constantly on its bony soil. The herbaceous and tree peonies have thrived under the ideal drainage conditions of this spot. The peonies have been placed in geometric beds edged with landscape tiles. The garden is a teaching tool as each bed has a theme that demonstrates particular features such as fragrance, differing heights, various flower and foliage types, and differing blooming periods. In one of the beds peonies are interplanted with other perennials and flowering shrubs as in a typical border.

The Rhododendron Collection of the Cornell Plantations is named for the late Clement Gray Bowers, an authority on rhododendrons and author of *Rhododendrons and Azaleas*. Dr. Bowers was associated with the Plantations for eighteen years and directed the initial development of this collection, which includes rhododendrons that can withstand temperatures of -20°F . Blooming extends here from April 1 to August 1 with the peak about Memorial Day.

Tucked into a small area along Plantations Drive as it circles Comstock Knoll is the Hoesley Rock Garden, which is used for teaching rock garden design and ecological principles. Initial planting of only alpine plants which grow above the tree line was done in the spring of

1982. This is a textbook rock garden in that no corners were cut in providing for proper design, drainage, irrigation and growing mediums. Ecology classes use the garden in studying how plants have adapted to the extremes of an alpine environment.

Native and naturalized plants of the Cayuga Lake Basin are featured in the Mundy Wildflower Garden. Designed to provide many different native plant habitats, the garden includes open deciduous woods, a backwater marsh area, a summer meadow, and a north facing slope. Plants are labelled as they bloom and fruit.

The Muenscher Poisonous Plants Garden is nestled next to the College of Veterinarian Medicine at Cornell. Because New York State requires veterinary applicants to identify poisonous plants on State certification tests, Cornell offers courses that teach vet students how to recognize poisonous species. Listed on the plant labels in the garden are the parts of the plant that are poisonous and how the poison affects livestock.

Most Cornell students come from warmer environs than Ithaca, and in many campus greenhouses and in some fields plants native to tropical habitats are grown experimentally. Likewise, the Plantations grow some tender plants in a very protected garden so students can learn a wider range of plant materials than those grown here normally. *Skimmia*, *Sarcococca*, *Parrotia*, *Franklinia*, *Abelia*, and *Abeliophyllum* are a few of the genera found in the Deans Garden of the Cornell Plantations.

Arboretum plantings were begun at Cornell almost as soon as the school opened its doors in the 19th Century, but it wasn't until the mid 1930's that the University formally established a place it called an arboretum, and it wasn't until 1982 that it was named — the F.R. Newman Arboretum. F.R.

Newman provided support for a fifty-one acre addition to the arboretum, which at that time consisted of gymnosperm, viburnum, nut tree, synoptic shrub, hedge, and vine collections on just under 150 acres of land. In the new area, New York natives and their cultivars will be emphasized. The existing vistas and topographically interesting terrain in this former pasture have been augmented by the construction of two large ponds.

Horticultural and botanical attractions at Cornell University are not limited to the holdings of Cornell Plantations. The L.H. Bailey Hortorium Conservatory houses an extensive collection of cacti, succulents, carnivorous plants, palms and a general collection of indoor plants used for teaching purposes. Near the Conservatory is the Miss Lua A. Minns Garden, the Department of Floriculture's Teaching Garden. Inside the pe-

rennial bed that borders the rectangularly shaped garden are display beds featuring annuals or bulbs, in season. The Horticulture Department also maintains the Willard Straight Rock Garden, a half-acre garden first planted in the spring of 1937, which at that time had a collection of 1500 plants. After a period of neglect, the garden was rejuvenated through the aid of Cornell students. In the Floriculture Test Garden, shade trees, shrubs, perennials, and ornamental grasses are evaluated.

In recent years the addition of the private Boyce Thompson Institute of Plant Research to Cornell's campus enabled the Dean of the College of Agriculture to claim that Cornell has the largest accumulation of plant scientists in the world. The superb library, herbarium, and botanical garden facilities, and the university's research all reflect this level of expertise. §

Calypso in a Swing

Edith Dusek
Graham, Washington

One of the plants that is often mentioned in passing is the delightful enchantress of the deep woods, *Calypso bulbosa*. A bit of a search through the literature will disclose that there are different forms of it on both the eastern and the western sides of the continent. The eastern one, it is said, differs in being less amenable to garden life than the western one. It also sports a white beard in place of the yellow one displayed by those out here. If photos are to be relied upon, at times it may

have much more blue in the pigment than I have ever seen in ours.

Albino forms are known in which all of the pigmentation responsible for the normal coloration is absent. Beyond that point, the literature is seemingly silent. However, if truth be known, our little western calypso has many color variants in addition to the normal rich orchid one with lip heavily marked with brown tones. Some of the plants dilute the orchid colors to a soft pink, in others petals will be mostly white with only a

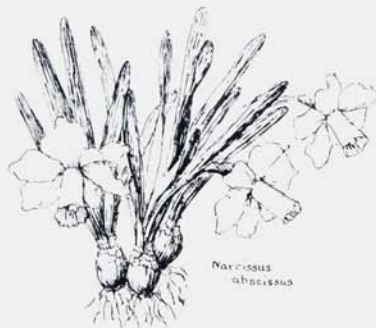
blush on their tips. Sometimes petals are all white. Yet another variant can be found in which the orchid tones have departed and the petals become a muted yellow shaded with creamy, buff, or warm tan. None of these forms can be considered as albinos for in each case the lip retains typical markings. In any given population, the variants may be common or only occasional.

Despite her reputation for being most demanding in her choice of home, *Calypso* can be found in a wide array of circumstances. Here in the west we most often look for her in the gloom of the deep woods making one suspect that it is deep shade which she covets. However, on the dry east side of the mountains, it is not at all uncommon to see her basking in considerable sun in the open pine woods. Her bed may be moss, rotted wood, or even the gravelly verge of a river where surely she must be inundated from time to time. To find a common denominator in such a wide array of situations seems impossible, yet there is one. In all cases she dislikes rubbing elbows with pushy neighbors. Like the queen that she is, she seems to need room from which to survey her subjects.

All paeans sung to the charms of a most delectable plant should be accom-

panied by grandiose claims of one's ability to grow them well. Alas! I cannot lay claim to such a feat. Sooner or later all attempts to hold the little lady have ended in failure. Despite the fact that she is a local native and our woods offer apparently ideal conditions, she was soon gone. For a time it seemed that the answer might lie in the open ended plastic house or in the self-water benches but after a season or two she departed from them too. The answer it seems was not that she had no taste for my offerings but that the all too prevalent slugs and mice had a sweet tooth for her.

Perhaps I have the answer now, not from the deep woods, but from a trailer court where a dear lady with a marvelously green thumb has kept *Calypso* happy for years in a fuchsia basket suspended in her patio. Needless to say, I am trying too, but in a slightly different fashion. My bassinet is suspended over the self-water bench in a sheltered nook between greenhouse and garage. A giant fir tree comforts *Calypso* with siftings of discarded needles, the rains bathe her regularly, and her box sways gently in the passing breezes. Thus far, after three years, all seems well in her miniature kingdom. Long may she reign on her bed of emerald green moss. §



Plant Hunting in Sichuan, China

Part I

Carla Teune
University Botanic Garden
Leiden, The Netherlands
Photographs by the author



In 1981 Raoul Moxley Travels (London, England) organised for the second time a plant hunting tour to China. The main purpose of this tour was to collect seeds and plants of Chinese perennials, shrubs and trees in the mountain area of Mount Minya Konkga (Gonggashan), at an altitude of approximately 3,000 to 4,000 m. above sea level. The botanical tour leader, our "guest-lecturer", was the well-known English botanist Mr. Roy Lancaster and our technical tour leader was Miss Theresa Atkins, a professional tour leader of great experience.

It was my intention to collect seeds from trees and shrubs for the Experimental Station at Boskoop, seeds and fern spores for our own Leiden University Botanic Garden, and seeds of various other interesting plants, trees, shrubs and alpine plants for the University Botanic Garden of the Free University in Amsterdam, the Arboretum at Kalmthout (Belgium), and for some befriended nurserymen, both in Holland and England. Last, but not least I hoped to collect and press

plants for the Dutch Rijksherbarium in Leiden, whose main interest is in plants from tropical Southeast Asia.

I had to join the group in London and I was the first to appear at the appointed place, but the other members of the group soon arrived so we could get acquainted with each other and follow the usual routine of checking in and passing safety control. This turned out to be quite hilarious in my case, as the X-ray machine detected "a weapon" in one of the pockets of my rucksack; it was my stapler.

We arrived on September 4th at 15.30 p.m. in Hong-Kong where we stayed at the splendid Peninsula Hotel. I shared a room with Dr. Alison Smith, a young biochemist from John Innes Institute, who turned out to be a very good roommate with whom it was very fine to share experiences, fun, and hardship during the 24 days of our tour. In the evening the whole group assembled in one of the rooms to meet some

American members of the group who had arrived the previous day, to have a drink together, to get to know each other a little bit better and to get a briefing from Roy and Theresa. She told us a lot that I already knew from my two previous Chinese tours, such as why it is unwise to eat melons and cucumbers as these plants have no natural filter system, so germs can enter these fruits easily and wait for a better host — us; a very wise lesson, but not always easy to follow.

After breakfast the next morning I did some quick shopping in one of the main streets of Kowloon, as I needed a new watch. I bought an interesting Japanese watch with seven functions, such as alarm, stop-watch, a little light, etc. The manual that explained the functions was much bigger than the watch: it was almost a newspaper!

We had reserved seats on the train to Canton on which we enjoyed a very good lunch. The “old hands” Roy, Theresa, Peter Addington and I had lots of fun seeing our poor, inexperienced friends handling their food with chopsticks for the first time in their lives, but realised that we had had the same difficulties, some years ago.

We had a very good view of the slowly passing landscape; although this was “the big train”, it goes very slowly and so it gave us a good opportunity to see plants and try to identify them. It was very comfortable to sit in the big seats of this train, moreover it was possible to turn them around in any direction you wished (with a foot pedal) and so you could sit face to face with friends, or face the landscape, as we all did. This invention should be installed in our modern trains.

As we had an unexpected three day delay in Canton as a result of a mistake in booking our flight from Canton to Chengdu we stayed at the excellent,

modern Tung Fang Hotel and with the guidance of our very nice, knowledgeable, English speaking, young tour guide, Mr. Chen Pin, visited some of the sights in Canton, among them the Lan-Po (Orchid Garden).

The (modern) entrance gate was moon-shaped and ornamented with two large banana leaves; through it you got a view of some beautiful shrubs. Instead of grass, the lawns in this garden were planted with the low-growing *Ophiopogon japonicus* (*Liliaceae*), in my country used as a pot-plant on window sills. It is much too tender to walk on, but magnificent to see. The main avenue was planted with *Araucaria* (a relative of the South American monkey’s puzzle tree) and leads to an artificial rock, a feature



The slender, silvery stems of *Bambusa lignaniana*



The roofs of Canton

that the Chinese have loved since ancient times.

Some of the trees we saw in this peaceful place were: *Michelia excelsa*, *Pittosporum tobira*, *Celtis chinensis*, *Podocarpus* sp., *Symplocos* sp. (with fruits on the trees), *Bauhinia* spp., *Nandina domestica*, *Dillenia turbinata* with beautiful big leaves, conspicuously veined, *Thevetia peruviana* with yellow flowers as well as salmon-flowered forms, and even with angular-shaped, unripe fruits on the shrubs, and many others. There was also a lily pond and a very dainty pagoda, hidden among the trees and bamboo-clumps. In the lily pond grew masses of tropical waterlilies with wine-red flowers and in another pond stood a little Chinese tea-house, where we were offered a cup of Chinese tea.

Our next stop was at a nine-story pagoda in the heart of the town. On the terrace in front of the pagoda was a big

bronze incense vessel, with burning incense sticks. While we were there, a group of young children put some more burning sticks in the sand in this vessel, a rare sight these days, when religion is only mildly tolerated. We climbed the pagoda and from every balcony we got a better and better view of the city, the houses surrounding the pagoda and their inhabitants. Some men were doing exercises on the tops of the roofs — “shadow-fighting,” a grandmother was cooking dinner, some children were playing on the roof tops of some lower houses. It gave us a feeling of intruding on the family lives of these people.

In the afternoon we went by mini-bus to the South China Botanic Garden. This is a big park, 300 hectares, more than an hour's drive by coach from the city of Canton. A large part of this garden is still uncultivated woodland, as there are not enough workers to cultivate the whole area. There are some 3,000 taxa

in the garden and there is a botanical research institute, where people are experimenting on tinning rice (*Oryza sativa* ssp. *indica*). There is also an herbarium with 600,000 dried specimens.

The garden was founded in 1958 and at this moment there are about two hundred and sixty scientific workers at this South China Botanic Garden, working on the "Flora of Kwantung Province" (the province with Canton as its capital); fifty-eight staff members work daily in the garden. The garden has been open to the public since spring of 1980.

Even in this tropical garden the climate can be very cold, we were told, and (though this is an exception) two years ago the temperature went down to +2°C and some tropical trees were badly damaged.



Fishtail or Dragontail Bamboo

In Kwantung province there are more than two hundred different bamboo species. In this botanical garden there is a special "bamboo corner," where sixty-six species of bamboo and closely related genera are planted (a very beautiful area and very tempting for our bamboo specialist, Peter Addington). Sixteen species of bamboo are edible, some twenty species are ornamental and parts of many other species in China (and the rest of tropical Asia, so important and big is this genus) are used for a wide range of utensils, pipes and such. One of the staff members told us that after the drought of 1943 all the bamboo species flowered and died, but the seeds, spread by the birds, started new colonies of these plants. The lay-out of this garden looks very English and later during our tour we heard that the first (and now retired) Director, who created this garden, had worked for several years at Kew Botanic Garden, and had brought some of the ideas from Kew to China.

The following afternoon we went by coach to the Ding-Hu-Shan Arboretum. This Arboretum lies in a mountainous area, two hours by bus from Canton. The Ding-Hu-Shan Arboretum started its existence as an Arboretum in 1957. The climate is tropical to sub-tropical here and is very rich in plant genera. It has been for many years a holy place, on a holy mountain and that is the main reason why this area is so untouched and so rich in plants. Because land in China has been cultivated for over 6,000 years, native plant life is very impoverished and it is only in places where a big monastery has been, or in other holy places that plant life is still very diversified. The road to the arboretum is planted with *Casuarina* spp. and *Melia heterophylla*. *Manihot esculenta* plants can also be seen planted in the fields as crops, as well as *Agave sisalama* and

Citrus spp. There are small plots of peanuts (*Arachis hypogaea*), soy-beans, and jute, and big areas planted to sugar cane and *Ipomoea batatas*. We saw big lotus ponds, nurseries for the harvest of the edible seeds and rootstocks. Of course there were those big "elephant ears," the leaves of *Alocasia macrorrhiza*.

We were welcomed in the Ding-Hu-Shan Arboretum by its very kind director, who offered us a cup of pink tea. He had a lot of fun seeing our astonished faces when we tasted it. He explained that this tea is made from the leaves of a begonia: *Begonia fimbristipula*. On the way to the main entrance of the arboretum we met old ladies selling this begonia tea in plastic bags and we all bought some and were told how to prepare it: you pour boiling water over the leaves in a teapot, add some sugar and have a fresh tasting hot drink for a warm summer day.

Before our tour of the arboretum started, we enjoyed a "light lunch". It turned out not to be very light, but it was one of the best meals I ever had in China. We were treated with freshly cooked fish, chicken prepared in two different ways (one sweet and the other pepper-hot) and sea snails. These are about 3 cm. long. The trick for eating the snails was to suck them out of their shells (boiled, of course), but without ingesting the sand in the end of the shells, no simple thing. I dived into my purse and fished out some safety pins and that worked splendidly. At the end of the meal, of course I collected my pins, you never know.

On the streets around the arboretum not only begonia tea was sold, but the strangely-shaped Buddha-hand-lemon (*Citrus medica* var. *sarcodactylis*) was offered to us. Our walk in the arboretum, climbing a rather narrow and steep path, was very interesting. There were many



A little girl offered us a bunch of flowers

plants new to me (as I am not exactly an expert on tropical trees, shrubs and plants) and I was happy that the director was so very well informed and helpful. He had an inventory list of the arboretum, which proved to be very useful too. This arboretum, which is financed partly with money from Unesco, contains 1700 different plant species and we were told that there are some 170 different species of birds, of which we saw not a single one.

On our way to our first stop, a pavilion at 490 m. altitude, we saw the large, orange-red coloured fruits of *Sterculia lanceolata* and the cymbidium-like Liliaceae, *Dianella ensifolia*. We also saw the climbing *Psychotria serpens* we had seen the previous year. This little plant climbs on the trunks of big trees and

forms clusters of white berries. *Pinus massoniana* is famous for the resin, which is used for musical instruments like violins. *Schima superba* with splendid red-coloured young leaves occurred often, as well as the 75 cm. high herb *Oderlandia* (like a giant *Asperula odorata*, very astonishing). We also encountered *Jasminum mesnyi*, *Melastoma candida* (large pink flowers), a *Desmodium* sp. with purplish-pink racemes, *Ficus fulva* with large, brown-haired leaves, *Begonia laciniata*, *Selaginella wildenowii* (with plasticky-green leaves), *Maesa salicifolia*, *Braedia fordii*, *Craibodendron kwantungense*, *Clerodendron fortunei*, and *Ardisia quinquegona* (with berries). Half-way to the top of this mountain we had a rest and a drink at a pavilion (modern style, Chinese concrete), where we saw plants of *Buxus harlandii* (leaves longer and more elliptical than the *Buxus sempervi-*

rens we know), and on a slope we found three splendid red-flowering plants of a *Costus* sp. (*Zingiberaceae*), juicy and sugary-sticky and very sweet-smelling members of the Ginger family. There were rhododendrons in seed and the tiny herb with blue flowers, *Tourenia foumieri*. I collected fern spores to germinate in the phytotron of "my own" botanic garden and I met "my old friend" the climbing *Dischidia benghalensis* (*Asclepiadaceae*) and *Lemnaphyllum microphyllum*, a small fern that lives in trees. This area is very rough and "the boss" told us that there are many big, old trees of *Castanopsis* (a tropical relative of the oak).

On our way home we followed the same roads as earlier that day to the arboretum. At the ferry over the Pearl River we had to wait for some time (rush hour), and some of the fishermen had returned "home." Their real homes are



Fishing Boats on the Pearl River, Canton

very often their small fishing boats: beautifully built wooden boats, which have a fish-well in the middle of the boat; a very good way to keep the fish fresh in this tropical climate. Some of the boats were clearly too small to live on. I did not like the habit of threading a bamboo-stick or a piece of iron through the back-fin of the fish, but it was very useful when the fishermen wanted to show us their fish as these could be pulled easily out of the fish-well.

On September 8 after a delicious Chinese breakfast of rice gruel, vegetable and meat dishes, and steamed bread with and without bean curd filling, we were transported by coach to the airport, where we enjoyed an early lunch on the first floor of the always overcrowded airport-restaurant. The food was again very tasty and consisted this time of a combination of several kinds of meat and several species of mushrooms: the kind I call "devils' ears" (mice-ears in Indonesia), a sponge-like thing; and a brown-coloured, kidney-shaped mushroom, undeveloped and still in its "purse" (the Latin name of this one is a translation of "mushroom-still-in-its-purse") — delicious of taste.

The flight to Chengdu (capital of Sichuan Province) was very amusing: we were sitting at the tail-end of the airplane in second-class. In the first class, occupied by short Chinese officials, there is a great deal of room between the rows of seats — space enough for long legs. In our part of the plane the space between the chairs is much narrower, so very tall Paul Meyer (± 1.94 m.), our tallest man, did not fit in this restricted space and had to sit half on his chair arms with his feet in the aisle and he could not use his seat-belt. This didn't bother the Chinese, they did not notice this strange way of sitting in a chair, or, perhaps, they just ignored it to "save

face."

The airport in Chengdu is about an hour from the city, and the drive in gave us a good opportunity to see life on the land in harvest time. Sichuan, the province of which the city of Chengdu is the capital, is the biggest province in China with more than 100,000,000 inhabitants. It is the biggest rice-growing province in China and rice harvest was at its height. We saw a lot of people working in the fields. Mowing in China is still honest hand-work with a reaping hook and threshing is done by hand or a foot-powered machine, very much like our old-fashioned treadle sewing machines, usually operated by two girls. Or the threshing is done by men who beat their sheaves against wooden boxes, but then the loss of precious grain is relatively high. The empty sheaves are dried on the field, the dry straw being used for many purposes, such as making rice-paper. To dry the grains of rice they spread these on the roads, leaving only a small space for traffic (mostly bicycles and military lorries). It looks rather dangerous, but the drivers take good care and hoot a lot. Young girls sit at the edge of the roads, chatting or knitting and every now and then rake the drying rice with big wooden rakes. At dinner time they sweep the rice into one big heap (including small stones), put it in bags, go home and return the next day. Trees are planted on the side of the roads, as China is working on an enormous re-afforestation program, but these are frequently not native Chinese trees. We saw *Melia azedrach* with unripe, globular fruits, *Toonia chinensis*, *Platanus x acerifolia*, and huge clumps of the very useful bamboo: *Sinocalamus vulgaris*.

Our hotel rooms were still occupied when we arrived at 2 p.m. in Chengdu, so Roy and Theresa had a talk with the guides and finally we were driven to a



The rice harvest was starting around Chengdu

famous bamboo garden in which we could while away the next three hours. There was also an old temple with a bonsai exhibition, some of which looked really splendid; others were sadly neglected. We passed a half-opened door in a big wall and were very curious, so that a peep around the door became "a must." Behind the door was a very interesting nursery and we received permission to enter and look around. It was a very good nursery with rare plants that we had never seen before and we would have liked very much to be able to bring some of these interesting plants home.

The gardeners were very kind to us, and became even more so when our guide told them that we were "colleagues" from different Western countries and very interested in their nursery and plants. The nursery actually consisted of two different parts: the shrub-nursery and a part with orchids hanging under some sort of shelter. The work in this nursery was — to our standards —

primitive, but the plants looked healthy and that is the most important thing.

Finally we went to our hotel, and it turned out to be the same hotel where we had stayed in 1980 before going to Mt. Omei. This time we were more honoured than last year. We were welcomed at the main entrance instead of the back entrance as we had been in 1980 and we lived in a "richer" wing of the hotel. After taking a bath and changing clothes we were offered a banquet in a restaurant consisting of 22(!) courses. The tables were beautifully decorated with coloured rice and begonia flowers. There were several officials from the Chinese Mountaineering Association and one of "the big bosses" was a very kind, strong-looking elderly lady, especially flown in from Peking for this occasion to meet us. The Chinese offered us a strange mixture of drinks: Peking beer, red wine and the very strong Mao-Tai. My neighbours were both Chinese (I had the honour to be invited to sit at the head

table) and tried to drink me under the table, with no success I am happy to say. The Chinese lady, who was sitting on the opposite side of the table was very interested in the proceedings on my side.

After this elegant repast we returned to our hotel where we were confronted with the problem of packing and repack-

ing, what to leave behind in the good care of CMA, and what to take with us in the mountains. I managed to pack all the necessary things in a nylon bag, leaving my other bag behind, but bringing my herbarium bag. The next day we were off to the unknown. §

(To be continued)

Farrer, Cox and Kelley

Dr. Nickolas Nickou
Branford, Connecticut

What prompted me to get involved with the above triad is my recent completion of *Farrer's Last Journey* by E. H. M. Cox, which is now available as a reprint from Gus Kelley's Theophrastus Publishers.

Over the years I have pursued many a book about plant exploration, particularly those about that magical, mysterious and frequently inaccessible area which encompasses South Western China, adjacent Burma and Tibet. It contains an enormous number of attractive species of plants, but, sorry to say most of them are not hardy in our north-eastern United States. Certainly it is known to have the greatest concentration of rhododendrons and primulas, as well as the regal meconopsis and the daintily beautiful nomocharis. In my part of shoreline Connecticut if the winter does not kill them, the summer will!

But, back to the book. The reason this particular tome triggered my writing reflex is that it is different. I've been through the sagas of Kingdon-Ward, Forrest, Rock and Farrer himself in his *On the Eaves of the World* and *The*

Rainbow Bridge, but this book by Cox differs sufficiently so that it deserves special comment.

First, Cox writes very well about what the profession of plant exploration is all about. He gives some insight into the character of Farrer, but still one feels he never quite gets into this brilliant and rather aloof person. His admiration for the man is evident and it's obvious that they were on very good terms as they corresponded frequently and in depth.

In 1919 Cox accompanied Farrer for a season of collecting in Northern Burma. They explored the slopes and passes of the mountain ridges which separate the Irrawaddy and Salween River drainages. Nowhere else on earth do four major rivers run parallel, each in its own spectacular trench and all within a distance of less than one hundred miles. From west to east they are the Irrawaddy, Salween, Mecong and Yangtze. The ridges between the rivers run north south and attain a height of fourteen to sixteen thousand or more feet. They offer no obstruction to the monsoon, which penetrates deep into

the continental mass, watering as it goes. To the west, the Himalayas run east-west and are only well watered where the monsoon can penetrate. Kashmir, for instance, is protected by several enormous ridges, which makes it appreciably drier than Yunnan; Kashmir has about three species of rhododendrons and just a few primulas while Yunnan has hundreds.

I have developed this prelude to explain why Mr. Cox's book is different. Just visualize what it must be like — exposed to torrents of rain, mists which obscure the spectacular views and keep foliage drenched; washouts, slippery trails and flooded streams making every crossing extremely dangerous; the ever present leeches, the biting flies, the inadequate food and the loneliness.

Some of us have experienced small samples of these conditions for a week or two or three but what about these conditions for month after month after month? Wet bedding, no one to talk to, endless and repeated struggles up to high areas to find desirable plants, checking on their progress as far as seed development is concerned and, finally, the last trip late in the season to collect the seed, which may already have been scattered, been eaten by birds, mammals or insects, or indeed, may be under a few feet of snow. Think of the unerring sense of location needed to find and dig down to collect the elusive capsules.

The different collectors had varying techniques for collecting seed and of course there were herbarium specimens to collect and preserve. Kingdon-Ward covered tremendous areas and if it was convenient would collect seed, but all too often when a prize plant was located he would be hundreds of miles away when the seed was ripe and would have to return to collect the seed another year on another trip. Farrer's method was to remain in one area for a season and

study it exhaustively, remaining long enough for the seed harvest. George Forrest delegated a good bit of the seed collecting to his loyal and well trained Chinese helpers and was probably the most efficient collector of all.

Again why is the book different? It is because Cox makes it clear what these great plant explorers experienced in their quest. He notes that Farrer would never complain, at least not in his writings, about the difficulties encountered, though in private correspondence he did advance some questions about whether his efforts were appreciated. Generally these men took the difficulties in stride. In short they were the intrepid, energetic, knowledgeable people we have gotten to know in our reading about the era. They were not complainers and what Cox conveys to us is that they had plenty to complain about and he is going to do it for them.

Of the group I believe Kingdon-Ward is my favorite. He wrote in an easygoing style and seemed to cover enormous distances effortlessly. He was a great observer of all he encountered. He particularly noted the characteristics of the various tribes inhabiting the area, many of whom were of origins different from those of either the Chinese or Tibetans. I still remember his description of the Moso tribe, which occupied the area in the great loop of the Yangtze river. In particular I remember his description of the women whom he described as well dressed, charming and fair skinned — "The little minxes know they are good looking . . . with laughing eyes they sedulously avoided me when I went into the city with my camera." I still wonder about those Moso women. Were they that beautiful? Or, had he just been away from "civilization" too long?

Mr. Cox has several other books to his credit, mostly about rhododendrons and a good one on shrubs. Some of

these he wrote with his son P. A. Cox. I particularly recommend his *Plant Hunting in China*, which will serve to guide the reader to more detailed works by and about the collectors in China. It contains maps of the regions described earlier and some excellent photographs. But alas, none of the Moso women.

I'll finish with a complimentary and appreciative reference to Augustus (Gus) Kelley. In publishing reprints of the

better known, constantly sought after, and now very expensive classics about plant hunting and rock gardening he has performed a great service to our avocation. He has an excellent product at a remarkably reasonable price. His list of reprints is extensive and also covers other horticultural subjects. I suggest you start first by ordering *Farrer's Last Journey*. §

Abronia Latifolia

GEORGE H. NATION
Victoria, B.C., Canada
Photograph by the author

When you first come across *Abronia latifolia* on a West Coast beach you know right away that you must find out its name and family and everything there is to know about it. You also quickly come to the conclusion that it deserves a place in your own garden.

Shortly after first arriving in Victoria I was walking along the beach with my son-in-law when we spotted this interesting plant. As I was on my way to work, I asked him to dig up a piece and plant it in our beach and also try to root some in the alpine house. When I got home both cuttings looked sad and I was ashamed to learn that I had dug up a protected plant, which, I learned from our local authority Ed Lohbrunner, is impossible to transplant. I did learn the name from my son-in-law, who found it on a poster of protected plants.

Thus armed I turned to the index of the ARGs Bulletins and found not a mention. Then I turned to the three

indices of the AGS Bulletin and there was one listing for Volume 11, page 67, but despite my collection of 156 back copies of the AGS Bulletin, this one is lacking. Fortunately the local flora describe the species, however cultural and more general descriptions are not readily available.

It is a member of the Nyctaginaceae Family, mostly tropical, of which the most familiar is *Bougainvillea*. The genus *Abronia* is confined to western North America and many of the twenty-five species come from deserts. The name *Abronia* comes from 'abros' meaning delicate though this does not seem very apt for this sturdy plant. As you can see from the picture, *Abronia latifolia* should not be overlooked. The large umbels of about twenty-five individual, shiny yellow flowers are held on stems about 6 cm. high above round or oval leaves. The individual flowers are about 10 mm. long with a yellowish green tube that

opens up to a strong yellow, five-lobed mouth. The late Dr. Lewis Clark in *Wild Flowers of British Columbia* says of the scent, "The fragrance is entrancing, perhaps as sweet as any wild flower in our area." The leaves are thick and fleshy and both leaves and stems are covered with sticky hairs that help to hold the plant in place in its home among the shifting sands. It lives in the area between the high tide line to about ten feet back into the sand dunes and is most common in areas where it is exposed to ferocious weather. It can be found from the Queen Charlotte Islands of British Columbia just south of the tip of Alaska's panhandle to the wonderful beaches of Oregon and Washington.

Where it is totally exposed to the weather, *Abronia latifolia* grows about one foot in diameter, but where it has a corner of a sand dune or a big old log to hide behind patches up to six feet

across will develop. Its ability to cope with moving sand dunes was nicely demonstrated last winter when the local municipal officials dumped about two feet of sand on a plant growing beside a retaining wall. I was furious and complained to the superintendent. I might as well have saved my temper and my breath as the plant came up more vigorously than ever thanks to the deep sand mulch.

Although cuttings and divisions are well nigh impossible, *Abronia latifolia* comes readily enough from seed. After about six weeks all growth came to a halt in pots, but as soon as they were put out in deep sandy soil in full sun the young plants spurted ahead.

The seeds are solitary in achenes only about half of which bear seed. These achenes, which are the size of a pea, are shaped like the tail of a missile or a jet aircraft with, usually, three big wings and



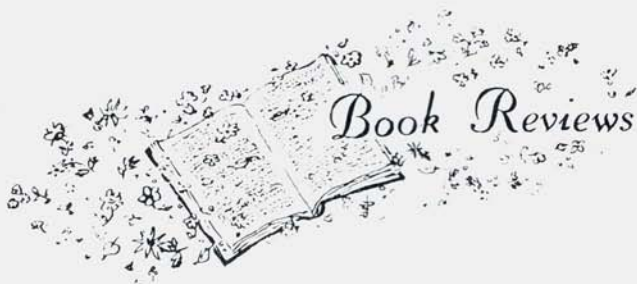
Abronia latifolia

two little ones. These wings are probably useful for movement down wind and then, when the achene finds a spot to rest, to help gather drifting sand around itself. One year in order to save postage for the seed exchange I spent hours digging seeds out of their firmly embedded position in the achene only to find that germination is far superior when achene and seed are planted together. This is rather like *Cornus canadensis* where, when the red berries are planted, more seedlings are produced than I know what to do with, while cleaned seeds have never germinated for me. It is interesting that *Hortus Third* advises the reader to remove the husk before planting.

Abronia latifolia seems happy in a dry

scree and appears to thrive with lots of sunshine. Very little water is needed except in the plant's first year when weekly buckets-full ensure survival. In mature plants the leaves turn vertical as they lose moisture; they remind you of children raising their hands in school when they get really thirsty. Last summer, however, these plants took four weeks without a drop of rain before they demanded attention. Our temperatures drop to around 20°F for a month or so and during this winter season the plants die back to the roots leaving no sign of their presence on the wind blown shore.

Abronia latifolia is a well behaved plant, which will add interest, texture and scent to a dry corner. §



Gardening with Native Plants of the Pacific Northwest — An Illustrated Guide

by Arthur R. Kruckeberg. 264 pages.
University of Washington Press, Seattle,
WA. \$24.95

When a professional taxonomist uses his botanical expertise to popularize the propagation of garden worthy native plants of the Pacific Northwest, serious gardeners everywhere will jump on the bandwagon with him, for conservation is "in" these days. Professor Arthur Kruckeberg of the University of Washington in Seattle and his wife Mau-

reen have long been active in the affairs of the Northwest Chapter of the American Rock Garden Society and she runs a small specialists' nursery. This well produced book is the result of their joint interests.

The natural environment of over 250 Northwest trees, shrubs, vines, and herbaceous perennials considered suitable for garden use is discussed and various methods of propagating these plants vegetatively and by seed are presented for each species. Unfortunately keeping

these wild plants healthy ever afterwards in gardens is only touched upon. The possible need of summer irrigation and the addition of such organic fertilizers as manures and cottonseed meal are not mentioned. Consideration of competition and natural succession, especially in wooded areas, is ignored. — Gardening does take place in space and time.

And there are also aesthetic as well as scientific considerations involved since gardening is also an art. The myriads of leaf patterns displayed by communities of groundcovers in the varied Northwest forests; the red, white and blue, grey and gold-fretted herbs that make autumnal hikes so exciting; the disposition of the jewel-like alpines over mountain moraines are models for gardeners to imitate. For a wild garden is, above all, a community of plants; their propagation is merely one aspect of gardening with them.

Obviously the good doctor has not acquired permanent stains under his fingernails excavating overly aggressive *Corydalis scouleri*, *Smilacina stellata*, *Vancouveria hexandra*, *Dicentra formosa* and their ilk from mixed plantings of shade-loving natives and exotics. "Hitchy" did warn him about *Maianthemum dilatatum* and *Oxalis oregana*, but apparently forgot to warn him of the enthusiastic seeding propensities of *Allium cernuum* and the various taxa of *Camassia* and *Brodiaea*.

Requests come in regularly from Europe for seeds of such improbable items as Devil's Club, Cow Parsnip and tall corydalis. Fortunately our worst weeds usually behave themselves when grown under different conditions of climate and soil just as many exotics do for us. However, there are exceptions. Nevertheless aficionados of plants of the Pacific Northwest living overseas should welcome this book, especially its section on small herbs.

The appendices are a veritable storehouse of information about our indigenous plants. There are rules for collecting in the wild; lists of plants for particular settings; sources of information on natives; lists of West Coast botanic gardens featuring Northwest natives; sources of seeds and plants; a glossary of horticultural terms; derivations of genus and species names used in the text. There is also an extensive bibliography, though it's too bad that Professor K. didn't happen upon Beebe Miles's *Wildflower Perennials for Your Garden* (1976) in paper. There is also a good index to help find one's way around in all this wealth of material. (Incidentally, the late John and Lila Leach's Botanical Park, now owned by the Oakland Park Bureau, in spite of years of neglect, is also an excellent place to see Northwest natives in a garden setting.)

The text is illustrated with some 200 line drawings, and color and black and white photographs. Being greedy we would have liked to see more. With dozens of other garden-worthy wildlings waiting in the wings a sequel is called for.

Northwestern gardeners will proudly display this compendium on their coffee tables and in their bookcases, but will think twice before lugging it into the field and to their mountain or seaside retreats.

Gardening with Native Plants of the Pacific Northwest is a milestone in the literature on the preservation of our rapidly disappearing native flora. Enshrining rare and endangered plants in official publications merely calls attention to them and hastens their extinction; propagating them for garden use is a positive way to save them for future enjoyment. Dr. Kruckeberg shows how to go about this task, and for this alone all lovers of wild plants and their endangered habitats owe him a debt of gratitude. — Faith Mackaness

Alpines '81 — Report of the Fifth International Rock Garden Plant Conference and Show.

Edited by Alfred Evans. From Mrs. Jill Sleigh, Royal Botanic Garden, Edinburgh EH3 5LR, Scotland or Your ARGS Bookstore, \$19.00 p.p.d.

This report is obviously akin to those of '61 and '71. All three have pieces on genera, on the flora of particular areas (Alaska by our own Dick Redfield in the present volume), accounts of the flower shows, reports of recent introductions, and papers on how to grow plants in the garden. *Alpines '81*, however, is a much more luxurious production than its predecessors. It is longer by about fifty percent. Instead of plain wrappers its cover display is a spectacular photograph of *Meconopsis horridula* and inside there are 105 plates, over 70 in color (monochrome is used for white-flowered and foliage plants only). Usually there are two plates to a page, of about 19 square inches each, but besides the meconopsis there is a remarkable full-page plate of *Cypripedium acaule*.

The photographs will stir longings in any gardener, and are of the highest quality, but much more important is a marked qualitative improvement in the text. Gone for the most part is the amiable superstition that traditionally permeated most horticultural literature, though I did see one occurrence of the absurd statement that a clone had been weakened by division over the years. There is a new scientific spirit, not at the expense of our passion, but rather reinforcing our passion by making it intellectually respectable. Only in one case did this new spirit go too far for me. The piece on modern methods of vegetative propagation was cool, deft, but sterile — no mention of a particular plant, no suggestions about technique, nothing in error, but I learned nothing.

The most substantial paper, and for me the most exciting, is Jim Archibald's entitled "The Introduction and Maintenance of New Plants." Archibald has himself explored for and introduced plants from many areas of the world, from the Atlas Mountains to the tropical alpine areas of the Andes, but perhaps most concentratedly from Turkey and eastward. He also knows in detail the achievements of others. The burden of his song is a lament for splendid plants that have not become established, or that survive precariously in the collections of a handful of devoted gardeners. True to the spirit of this volume, he never says that a plant is not amenable to cultivation. Rather, he castigates our lack of skill. The alpine house, he says, is a "clumsy and outdated makeshift attempt to adapt our climate" and he dreams of converting a spare room into a growing room, with temperature, humidity, light and air-circulation controlled by a computer. A sensible gardener will, of course, grow only those plants that will do well in his climate, though he may be willing to modify his soil and give a bit of winter protection. But who of us is really sensible, or wants to be? Certainly not Jim Archibald. Like Alexander he yearns to conquer the world — of plants, that is. May he live long in full vigor so that we may all ultimately share the spoils of his conquests.

Archibald warns us at the beginning of his piece that there is something insular about the terms "expedition" and "establishment." Americans should heed the warnings. Not every plant "established" in England can endure the continental extremes of temperature that prevail over most of our land. Conversely, and more importantly, plants that have resisted establishment in Britain may very well thrive with us. Turkish plants are a case in point. Archibald

regrets that little has remained from two decades of John Watson's introductions. But it is my belief that from the MacPhail and Watson collections alone we are by way of acquiring permanently a dozen or two of new plants that include some very bright stars indeed. I do not mean to imply that we are better gardeners than the British, far from it. We do not begin to exploit the horticultural possibilities of our climate as well as the British do theirs. Rather, it is a question of latitude. Turkey lies between the 36th and 42nd parallels, a band that includes much of the U.S.A., roughly from Cape Cod to Cape Hatteras on the East Coast and from the southern border of Oregon to midway between San Francisco and Los Angeles on the West Coast. The sun is violent, the summers dry and baking, the winters cold. Some of the best Turks are intensely hairy and retain their dead leaves, both, I believe, as protection against desiccation. But these same characteristics may be their undoing in the gentle sun and deliciously moist air of Britain, (latitude 50° to 59°). Here in Connecticut the Turkish plants grow well, but some require protection from dew and rain. They performed distinctly less well this past summer, which was wet and cool, bad for tomatoes and for bud-set on rhododendrons, fine for roses and apples. But their real future as general garden subjects will, I suspect, be in the dry ride of the Rockies (P. Callas take note).

What is true of Turkish alpiners in general is, I imagine, even truer of the fritillaries and other choice Near Eastern bulbs, which are grown as a tour-de-force by dedicated British specialists, but for which congenial areas could surely be found in our West.

The bulk of the Conference Report consists of articles on the choicest alpiners

from particular areas of every continent (except Africa) in the wild and in the garden. There are relatively few of the traditional studies of genera and those few tend to be more technical than in the past. In particular James Cullin's piece entitled "Ericaceae (Rhododendron classification)" is a careful and original taxonomic study of the lepidote (scaly) rhododendrons. Frankly I found this rather difficult to listen to in the heady atmosphere at Nottingham, but reading it at ease I found it one of the most valuable pieces in the volume. It is not only a useful study of its subject, but also serves the layman as an introduction to the mysteries of what hitherto had seemed to me to be an impenetrable science.

Barry Starling's account of the Show was marred only by inadequate praise of his own stunning exhibit of Ericaceae. This Show Report, together with Jim Archibald's account of new introductions, brings us up to the moment on what is happening in our world.

Among odds and ends, there are two papers on conservation, in the wild and in the garden — but see also Jim Archibald's refreshing, if rather naughty, remarks on the subject. And Brinsley Burbage writes on the history of plant collecting, learned and witty as ever.

Alfred Evans was chairman of the Conference Committee and editor of the Report, as well as the author of a good part of it. Surely to him must go much of the credit for the success of the Conference and the distinction of its report. The Conference was intoxicating. The Report permits us in sobriety to understand the important advances that have been made in our branch of horticulture, and is more important than the Conference itself. Serious gardeners will want it. §

— H.N.P.

Rock Gardening in Newfoundland

Bernard S. Jackson
St. John's, Newfoundland
Photographs by the author

Rock gardening, as readers of this journal understand it, is not at all common in Newfoundland. Indeed, to the best of my knowledge there are probably fewer than two dozen serious growers of alpinists in the whole province, though there are, of course, a fair number of gardeners who have set aside a small patch of earth where some of the commoner, more versatile rock garden plants flourish. But on the whole, I think it fair to say that rock gardening in Newfoundland still presents a wide-open field for exploration. It was for this reason, coupled with my own personal love for alpine plants, that I initiated the small rock garden and scree at the Oxen Pond Botanic Park, back in 1971.

Unfortunately we were unable to create our garden on a natural rock outcrop and had to make do with siting it on a fairly steeply sloping bankside along the edge of my driveway. Though not what I would have preferred, at least it is the sort of site available to many a local homeowner. The garden is approximately 130 feet long, from 10 to 34 feet wide and faces southwest.

Our soil is naturally clayey, so our first effort was to improve drainage by incor-

Mr. Jackson is the manager and naturalist at Oxen Pond Botanic Park, Memorial University of Newfoundland in St. Johns.

porating large quantities of coarse, sharp sand and shredded sphagnum peat moss. With an annual precipitation of approximately 59 inches and a moisture surplus of 40 inches we have found that even more drainage is needed and so this will be incorporated during future improvements. We do not have a reliable snow cover and suffer badly from the effects of repeated freezing and thawing from November to May. Since it is the clay that responds so adversely to this phenomenon I would like to reduce its percentage in the growing medium as much as possible.

The stone we used is not ideal, but since one cannot be too choosy on a slim budget we took what was locally available. Years ago the local pioneer farmers piled their rocks in the corners of newly cleared land and there they have remained, weathering ever since. This was the rock we used; local granite, weathered a pleasant lichen-encrusted grey, it fits in well with the surrounding environment and gives a definite sense of maturity.

Newfoundland sits in one of the backwaters of North America and although this does have its advantages it nevertheless can present problems when trying to buy goods and services. Locating and acquiring plants has been and still is an aggravation to us. So many times when visiting elsewhere we see or hear of a

plant that we “must try” or “should have”. We have found few nurseries of value to us in Canada. Alpenglow Gardens in British Columbia has been most helpful and has always sent us good-sized plants in excellent condition. When browsing through the back of this journal, I envy you your many accessible nurseries. Most of our plants have been grown from seed, but we do have some rather nice material from cuttings made available to us through the courtesy of the Royal Botanic Garden, Edinburgh and that fine, friendly plantsman, Alfred Evans.

Growing plants from seed necessitates a large investment of time. This, coupled

with the fact that so little has previously been grown in Newfoundland, causes a certain amount of uncertainty of what material to try. Whenever I consider trying a new plant I first reach for my copy of H. Lincoln Foster's *Rock Gardening*, then Will Ingwersen's *Manual of Alpine Plants*. There are other books of course but these two are my favorites. How sad it is that Lincoln Foster's book is now out of print for certainly no rock gardener in Newfoundland should be without it. (*It has been reprinted and is now available in paper back from your ARGS Bookstore. – Ed.*)

There is of course another source of some rather beautiful alpine plants —



Rock Garden at Oxen Pond Botanic Park



Native *Saxifraga caespitosa* in Rock Garden

the wild. Newfoundland is fortunate in that it has not yet suffered the ravages of excess habitat destruction and over-zealous plant collectors. Though I do not encourage the collecting of unusual and difficult wild plantlife, we do judiciously collect a few specimens for our own garden.

I always look forward to the first sight of *Saxifraga oppositifolia* blooming in spring, often surrounded by wet snow. We have a very nice dark purple form, but unfortunately the local ants are inclined to play havoc with its petals. The compact, emerald green buns of *Saxifraga caespitosa* are very pleasing, while its flowers provide an interesting comparison with those of its cultivar S.c. 'Grandiflora', acquired from Edinburgh. Our native *Saxifraga aizoides*, though not spectacular, is interesting in itself. I had a bit of trouble with this one until I gave it a moister site. Last summer I

found *Saxifraga aizoon* clinging to some cliff edges a few yards inland from our east coast. This was the first time I've seen this species in the wild and now have a small piece or two under cultivation in our cold house. We already have the cultivar S.a. 'Lutea' but since we are particularly interested in growing native flora, from our own gene pool, I look forward to moving our wildling out of the nursery into the garden. We do not have a great variety of saxifrages in our garden but do find that *Saxifraga cotyledon* 'Caterhamensis' does very well with us, as does one of my own particular favourites *Saxifraga umbrosa* (*x urbium*) *primuloides* 'Clarence Elliot', the miniature London Pride. It requires light shade and a more humusy soil.

The miniature pinks do well in Newfoundland. *Dianthus deltoides* is very common and will self-seed almost anywhere. The white variety is less common

and came to us as seed from the Scottish Rock Garden Society. Also doing well are *D. arvensis*, *D. haematocalyx* and *D. 'La Bourbrille'*. The white, fringed, intensely fragrant blooms of *D. squarrosus* show up well in our scree but this plant doesn't seem happy elsewhere. We have trouble growing *D. alpinus* and the pretty *D. neglectus*. The former is terribly pest prone, while the latter does well for a while but then just gives up. Since the Park is also a nature reserve, especially for butterflies, we do not use any pesticides except the occasional few slug pellets tucked beneath such vulnerable plants as the phloxes.

Dwarf phloxes are such satisfying plants and though some growers scorn them, I personally cannot imagine a rock garden without the gay splashes of colour provided by this genus. We have a number of named varieties of *Phlox subulata* of course; my own particular favourite being *P.s. brittonii rosea*. More compact and possibly more hardy are selections of *Phlox "douglasii"*.^{*} We have 'Rosea' and that perfect little beauty 'Boothman's Variety'. *Phlox borealis* does well in the scree but not elsewhere, while *Phlox nivalis* is a little too tender to do well. All these phloxes hate our slushy winters and springs and just cannot stand being covered over with wet, compressed snow for very long. *Phlox borealis* appears particularly susceptible to molds and rots.

^{*}Though there is a species *P. douglasii* in a few sites in western U.S.A. it is rare and probably not in cultivation. As Dr. Edgar T. Wherry points out in his monograph, *The Genus Phlox, the epithet "douglasii" has become a "catch-all" trade-name, particularly among British growers, for western mossy phloxes. Most so-called Phlox douglasii available in horticulture are probably of hybrid origin.* — Ed.

Sedums are of course the backbone of a beginner's garden. We have a few nice species but often have to politely refuse one of the countless ugly ones when some well-wisher tries to unload a bit from their garden that they don't see in ours. *Sedum ewersii*, *S. caucicola* and *S. sieboldii* do well for us providing they are well drained. I cannot keep *S. spathulifolium* for long outside no matter how I try. The very common *S. acre* gives us some glorious splashes of gold especially when sheared back hard after flowering and I am now trying *S. anglicum* gathered as tiny cuttings from a cliff face in the Scottish Highlands. If it eventually looks half as good as it did in its homeland I'll be well satisfied. *Sedum roseum*, though not one of the better sedums, is grown since it is our only native species. It is often extremely abundant on the cliffs of seabird colonies.

Our scree is gradually acquiring a more mature look. Though small it is here that some of our more choice alpine grow. *Potentilla nitida* and *Globularia nana* from Edinburgh cuttings, *Acantholimon venustum* and *Armeria caespitosa* from Alpenglow, and *Ptilotrichum spinosum roseum* from seed. Here also are two more of my favourites, *Iberis saxatilis* and *Alyssum wulfenianum*. Were I in the position of the average local home owner, with only a small back garden in which to grow alpine, I would dispense with a rock garden as such and concentrate on either a scree or a raised bed. Our weather produces so much rain and slush (with no indication of an improving trend) that a scree-type environment is almost always the safest place to try a special plant.

We do not give our plants any winter protection. We did at first use evergreen boughs and although we still recommend this covering to owners of a small

rock garden, we ourselves have now dispensed with them. In our climate they are inclined to go moldy before removal time comes around; they then have to be taken off, shaken out, aired and replaced — far too much work for us. Also, they often become stuck to the ground, embedded in a sheet of ice, and then cannot be removed until so late that damage to the plants occurs. In addition they hook out labels, which means more unnecessary work replacing these. A stone mulch, however, is of value in our climate. Amongst other benefits it shoots the water off the crowns and stops soil splatter.

Since our garden is small we haven't many exotic shrubs and will be relying on native woody material to add a sense of permanency. We have many dwarf willows with which to experiment; this group of plants offers great potential both in the garden and for pot culture. Newfoundland also has five dwarf birches, three of which are found in alpine situations. The two native junipers, *Juniperus communis* and *J. horizontalis* add to any rock garden; in Newfoundland the former has three varieties, *J.c. var depressa*, *J.c. var saxatilis*, a depressed and trailing form and *J.c. var megistocarpa*, which is similar but has larger fruits.

We have two shrubby *Hebe* (often listed under *Veronica*) in our rock garden, which are, surprisingly, quite hardy. *H. lycopodioides* makes a nice small clumpy bush and doesn't seem to mind our winters, even without a snow cover whereas *H. epacridea* is more tender. The latter is inclined to get cut back by spring winds but nevertheless seems to bounce back after the removal of dead growth.

Genista pilosa is beautiful in flower and is slowly spreading; however, it does suffer quite badly without a reliable snow cover and may not be able to survive a

row of snowless winters. *G. delphinensis* has flowered but is even less hardy and more dependent on the protection of a deep blanket of snow. *G. pulchella* (syn. *G. villarsii*) is also under trial but it's too early to voice an opinion on its hardiness.

It would be hard to imagine a rock garden without sempervivums. There are of course enough types to keep one quite active growing nothing else. Personally I find it very difficult to see any difference between many of them and so keep to a few of the more obvious ones. We have fifteen, mostly as offsets from Edinburgh.

We are only now trying a few *Lewisia*, since I'm not at all sure that we have a suitable site for them. We do have a very small piece of rock wall but it's facing south-west and very exposed. *Lewisia cotyledon howellii*, *L. nevadensis* and *L. rediviva* have done well in our cold frames and have recently been put on trial outside.

What would a rock garden be without a few campanulas? The tiny bells of *Campanula cochlearifolia* and *C.c. var. alba* are much admired by our visitors. *C. carpatica* is very hardy of course and self-seeds all over the place. Adding interest to this group we have *C. warleyensis* with pleasant china-blue, double flowers and *C. garganica* with its bright star-shaped blooms. We have difficulty keeping the latter; I'm sure the slugs travel miles to get at it.

As with any new garden venture in an almost untried area, we have our share of failures, due mainly I think to our enthusiasm for trying plants that catch our eye somewhere else, but really shouldn't be tried anywhere near Newfoundland. We do of course have some nice plants other than the few I've been able to mention here. Some of my own particular favorites being *Antenaria dioica minima rubra*, *Androsace sar-*

mentosa "Watkinsii", *Aquilegia flabelata* var. *pumila*, *Bolax glebaria*, *Geranium subcaulescens*, *G. dal-maticum* and *G. renardii*, *Hypericum olympicum*, *Kniphofia galpinii*, *Papaver alpinum*, *Pulsatilla vulgaris*, *Scabiosa lucida*, *Silene acaulis* and *S. alpestris* and *Succisa pratensis* 'Dwarf Form' from Jack Drake seed, Aviemore, Scotland.

Since native plants are our main concern we do, of course, have such treasures as *Diapensia lapponica*, *Loiseleuria procumbens* and *Empetrum eamesii*. Actually many natives seem to do far better for us in a peat bed (which I plan to cover in another article) but *Diapensia* has been kept to the rock garden and not yet tried elsewhere. This plant is quite common in Newfoundland, being found on many of our windswept, nutrient poor, fog-bound hilltops. I have seen a lot of this plant, both in Newfoundland and Labrador, but have rarely seen a really compact, unspoiled, uniform bun that was well covered with bloom. Personally I feel that *Diapensia*'s main attraction lies in the difficulty of

growing it rather than in its beauty; there are certainly countless species that are far more beautiful. We have transplanted a piece about six inches across; it bloomed for three years, then died. Small plants about the size of a twenty-five cents piece are easier to transplant but slow growing and liable to be forgotten and smothered by more robust plants. Seed germinates easily providing you get it from the less common, later flowering strain. *Diapensia* normally flowers quite early but there is a rust (or some such thing) that seems to destroy the viability of the seeds in early summer. We are presently investigating how best to treat the seedlings once they're up.

As I mentioned earlier, our rock garden is quite small and certainly couldn't be compared to Kew, Wisely, Edinburgh or, I'm sure, many private American gardens. Nevertheless, we would always be pleased to see you, our fellow enthusiasts, should you ever find yourselves visiting Newfoundland the "Outpost of a continent". §



Silene acaulis in scree

China — A Sentimental Journey

T. Paul Maslin
Boulder, Colorado

Photographs by the author

One autumn day in 1979 my wife brought me a magazine and said, "Look at this." It was an advertisement by a travel agency of a tour of China. What was so exciting about the tour was that it included a visit to Lushan where my wife and I had taught in the Kuling American School and where I had spent a greater part of my childhood and adolescence. It also included Wuhan where I was born and where my wife and I had met while we were teaching at Boone Middle School and the Central China University. Best of all, a cruise through the Yangtse River Gorges was included, a trip we had made together in December 1935. We couldn't have planned a nicer itinerary, so with no more ado we made reservations for the sentimental journey.

The tour started in Hong Kong on August 12, 1980. From there we went by train to Guangzhou (Canton), then after a sumptuous dinner flew to Shanghai. The following day touring began in earnest. I had hoped to have an opportunity now and then to do a little seed collecting between prescribed tour events, but it turned out that diversions of that sort were too difficult in schedules involving groups that had to move and stay together. It was also very frustrating to find a desirable plant in flower but without mature fruit.

In Shanghai we visited a large and extremely popular garden built in 1557

by a city official named Yu. The Yu Yuan (Yuan means garden) was our first experience with genuine Chinese gardens. We had read extensively about them and knew what to expect, but seeing and reading are two different things. Chinese gardens consist of four basic elements: buildings, water, trees and shrubs, and most important of all, eroded limestone rocks. To western eyes the rock work seems overdone and occasionally too contrived. But in some gardens, where more restraint was employed, the rock arrangements are aesthetically pleasing and fascinating. Flowering plants are used, but not to create masses of color or compositions involving rocks, interesting foliage, and contrasting colors as we do. Other features are frequently used in Chinese gardens too, such as bridges of many sorts, interestingly paved walks, potted and trained shrubs, lattice-work, and shaped windows and entrance ways. A Chinese garden is certainly no place for a westerner to collect seeds of unusual alpine plants.

From Shanghai we went to Suzhou, the garden city of China, also referred to as the Venice of China because of its fascinating network of canals. Here we visited outstanding gardens, all different and yet all remarkably similar. These gardens, too, were extremely popular. It was here we first saw some of the finest examples of vertically placed columns of

grotesquely eroded rocks from Tai Lake. One of the most famous of these is the twenty foot high "Cloud-capped Peak", a magnificent and beautifully shaped mass of limestone.

One of the principal evergreens used extensively in all the gardens we saw is the Lace Barked Pine. *Pinus bungeana* Zucc. This pine tends to be bush-like and to develop multiple leaders when young. This is taken advantage of by the Chinese who encourage the trees to produce laterals and inhibit excessive vertical growth. The result is an irregularly shaped tree somewhat contorted to assume weathered forms found on precipitous cliffs and in the mountains so loved by Chinese painters. Many of the more spreading trees were braced by beams or ropes reminding us of the carefully supported pines in Japanese gardens. It was only later that we learned that most of these supports and ropes

were hastily placed to protect the trees from high winds; indeed, there was a typhoon warning for the area. Fortunately for us the typhoon never developed into more than a light rain storm.

Pinus bungeana is not a popular tree in the United States. It is extremely slow in getting started, and in its middle years it tends to be vertically compressed. But the exfoliating bark, like that of sycamores, is interesting and beautiful. Only mature trees develop a splendor found in few pines. The crown ultimately spreads out and the lower laced-bark effect is replaced by rough, chalk white bark. The tree is a native of north China and Mongolia and should do well in Colorado. A specimen in our garden is growing vigorously, but after fifteen years is still poplar-like and little more than twenty feet tall.

From Suzhou we went on to Nanjing



Singing Wave Pavilion in Suzhou, "The Venice of China"

and here visited all the main tourist attractions such as the impressive Yangtse River Bridge, the Jiangsu Provincial Museum, the Sun Yatsen Mausoleum, the Lingyu Temple Park, the Zijin (Purple Mountain) Observatory, the Yuanwu Lake in People's Park, and other points of interest. The fir trees bordering the approaches to the Sun Yatsen Memorial are very beautiful. We were told that they are the Tibetan Fir, probably *Abies spectabilis* (D. Don) G. Don. Our guides also referred to them as the "Christmas Trees", presumably because of their pyramidal shape. In the beautiful forests at the Lingyu Park two bulbs were in full bloom, the very showy Spider Lily, *Lycoris radiata* (L. Her.) Herb. and the dull lilac flowered *Scilla chinensis* Benth. The latter is much taller than the ones I have and I'm beginning to believe mine are nothing more than *S. autumnalis* L. I collected a handful of bulbs of *L. radiata* at the Provincial Museum where they had been uncovered and abandoned when the local gardeners had reformed some beds.

Our drive up through the deciduous forests on the way up to the Purple Mountain Observatory had me fidgeting in my seat; so many interesting shrubs and trees rushed by with glimpses of unknown plants beneath; The only seeds I could get were from a small locust-like tree, probably an acacia, and, from what we were told, was a "Carnelian Tree" because of its red carnelian berries. Identification must wait until the Denver Botanic Gardens can raise plants to recognizable size.

Lushan, where I had been raised, is a mountain mass lying west of Poyang Lake and south of the Yangtse. It is a 5,000 foot, isolated outspur of the south China Hills. Due to its height it traps a tremendous amount of water, over 200 inches a year, and for this reason is lush with an immense variety of plants. It has

been popular for thousands of years and is studded with temples, pagodas, waterfalls, and magnificent views. A botanical garden established here in 1934 was well worth the visit. It specializes in gymnosperms and has a large collection. They also have a well tended and labelled general garden of shrubs and perennials and a good rock garden.

The director was extremely cordial and provided me, for the Denver Botanic Gardens, with a very well prepared seed list. An exchange relationship is now established.

Not much was in flower when we were there, but the more open spaces were spangled with *Platycodon grandiflorum* (Jacq.) A.D.C., what I took to be *Lilium speciosum* Thunb., a very showy and gracefully arching *Lepedeza*, probably *sieboldii* Miq. I particularly wanted seeds of this, but none had formed at that time (Sept. 2). I was able to collect some shoots of a small vertical sedum, hoping that it was the one a friend had asked me to look out for. These were wrapped in plastic until we reached our ship, the Kun Lun. From then on the poor plants suffered repeated alternations of plastic entombment in the dark of my pockets to brief moments of light in some hotel drinking glass. Their worst experience was in the New World Hotel in Hong Kong. Here I placed the shoots, braced with wet paper, in an ashtray. They enjoyed the pale light of our window for two days, but the third day, when we returned from a shopping tour, they were gone! After a frantic search for maids, I located a chief floor steward who spoke excellent English. He discovered that our maid had emptied and cleaned the ashtrays. Fortunately the waste bin from that floor had not yet been carried off. So its contents were dumped onto a sheet and a small gang of stewards, maids and I pawed through the refuse of a hundred



“Cloud-capped Peak” in Humble Administrator’s Garden, Suzhou

rooms. And sure enough, at the very bottom we found the bedraggled shoots and rescued them. They had just better be the white-flowered sedum my friend wants. (They weren’t.)

At Wuhan, my birthplace, we visited the splendid Wuhan University. On its grounds we found a planting of the Wu T’ung tree, *Firmiana simplex* (L.) W.F. Wight, shading one of the walks. This tree is in Sterculiaceae, which also includes the genus *Cola*, members of which provide flavor to some well-known soft drinks. The Wu T’ung tree is mentioned frequently in Chinese literature, credited with magical qualities of one sort or another. Its large seeds are used in the production of moon cakes eaten at the autumn festival of the eighth month, and it is said that it is the only tree upon which the celestial bird, the phoenix, will alight. The tree is also of horticultural interest. It grows rapidly,

has a smooth, green bark and huge maple-like leaves supported on one foot petioles. One of the unique features of the tree is its fruit. The flowers are not showy, but the carpels grow precociously before the fruit matures. These become Chinese spoon-like structures about three and a half inches long on the edges of which the pea-like seeds ultimately form. Its habitat is south China, but a friend of mine reports that he has seen groves of it in Beijing (Peking). That city is on the 40th parallel, so we can assume that if the tree is happy there, it should thrive here in Denver. I recovered a nice lot of seed from the “spoons” beneath these trees and time will tell whether they can accommodate themselves to our climate.

Another tree was in fruit at this time, a tree previously used extensively as a shade tree for city plantings. So far I have not been able to identify it; the

foreign community of China when I was there called it the "Mountain Ash." It definitely is not a *Sorbus*, but it might be some variety of *Fraxinus*, the true ashes. The flowers and ultimately the one-winged seeds are closely attached to a pendant five inch stem and are produced in vast quantities. The compound leaves are pinnate, like those of our own ashes, but the tree as a whole spreads more and makes a very good shade tree. This species is now replaced in China by millions of *Platanus* (Sycamores) planted along every major street, a conspicuous sylvan cultural feature of the People's Republic of China.

The next part of our tour took us up the Yangtse River Gorges to Chongqing (Chungking). Even this far from the coast, palm trees with fan-shaped leaves were common and on the open slopes of the less gorge-like areas citrus orchards were abundant. We stopped at three small towns on our way up and I was able to collect a few spore bearing fern fronds. Whether these will produce

hardy ferns remains to be seen. From here the tour was condensed and we had little time to do more than follow the leader.

A final visit in Guangzhou (Canton) to the Orchid Gardens was a great pleasure. Here in this subtropical area bamboos are used extensively in gardening where they make wonderful stands in glades and along walks. Their beautiful stalks of various colors bend gracefully, providing living lattices to peer through at distant vistas. Little use was made here of grotesque limestone, and buildings, while present, were not important elements. Water, walks for strolling, pergolas, and small gazebos were featured. This garden, while still basically Chinese, shared enough with our western ideas of gardens to make it more acceptable and aesthetically pleasing to us and provided an easy transition back to our own garden at home. §

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• • • of Cabbages and Kings • • •

Many, if not most, taxonomists would prefer to ignore variations.

Living organisms are not an undifferentiated continuum. They come as elephants, cats, ferns and pine trees, goldenrods and gentians. In order to classify them, taxonomists have therefore separated them into more and more refined categories according to their affinities. Thus the Plant Kingdom is differentiated from the Animal Kingdom by certain characteristics that apply only to organisms in one Kingdom but not to those in the other.

The Plant Kingdom is in turn divided into thirteen categories called Divisions,

starting with the most primitive. The first twelve Divisions encompass such things as bacteria, algae, liverworts, fungi, mosses, and ferns and their allies, the latter being composed of plants that reproduce by spores and have vascular systems. The thirteenth Division is comprised of flowering-seed-bearing plants. These Divisions are further divided into Sub-divisions of which there are two in Division XIII: the Gymnosperms with ovules that are not enclosed in an embryo (conifers, yews and the Ginkgo tree being examples), and the Angiosperms whose ovules are enclosed.

These Sub-divisions are once again

divided into Classes, the Angiosperms containing two: the Monocotyledons whose embryos have but a single cotyledon or seed-leaf, i.e. grasses, lilies and orchids; the Dicotyledons whose embryos bear two seed-leaves.

Classes are also separated into categories, called Sub-classes, of which there are two in the Dicotyledons. Sub-classes are further divided into Orders, which are sometimes split into Sub-orders if they are very large ones. When trying to key out an unknown plant, one next arrives, thankfully, to the next classification, the Family.

Though very few botanists and probably no amateurs can remember the names of all the Families of flowering plants, some are old friends: the Compositae, the Ericaceae, the Primulaceae and the Cruciferae. Knowing at least the most common Families and their significant characteristics can be most helpful if one is trying to identify a plant; having a clue as to which Family a plant belongs can cut out a great deal of aimless leafing through the pages. Very large Families are sometimes split up into Sub-families and Tribes.

Unfortunately, in very intricately constructed or very minute flowers it is not always easy to see what is what. It is quite possible for the amateur to assign a plant to the wrong Family if its flowers and/or seed capsules (the portions of the plant usually used to differentiate Families) are so small that their characteristics can only be discerned through strong magnification.

Such was the problem of the misidentification of *Aruncus aethusifolius* (Rose Family) as an astilbe (Saxifrage Family), discussed in Volume 40 of the Bulletin on pages 110 and 111. Because the two genera so closely resemble each other in leaf pattern and in the general texture and stance of the inflorescence, the average horticulturist, untrained in botany,

might very readily assume that the newly introduced aruncus was a small astilbe and fail to examine its individual flowers through a hand lens to make absolutely certain. There is also always the problem of having on hand the portion of the plant used in the keys for identification.

When one reaches the next level of classification, the Genus, things become even more complicated as the differences between the genera within the same Family, Sub-family or Tribe become ever more subtle. Telling an *Aster* from an *Erigeron*, a Cow Parsnip (*Heracleum*) from an *Angelica*, or a Hemlock Parsley (*Conioselinum*) from Poison Hemlock (*Conium*) is not all that easy, though not impossible, for the amateur. I, myself, am sometimes less than certain whether the plant I am admiring is a *Silene* or a *Saponaria* or even a *Lychnis*.

The next step is trying to identify the Species of the plant in question. Separating the goldenrods — to pick a particularly confounding genus to classify — is a job for an expert and trying to key out one of the species of Micro-phlox from another can add a number of white hairs to even the most knowledgeable head. Hybrids among species, and variations within species don't help simplify matters.

Humankind seems to have a passionate need to name that which it sees, as though putting a name to something gave it an existence it did not otherwise have. Names are certainly essential if one is to speak of something to someone else: "That little white flower about two inches tall that you see in the woods in the spring", simply will not suffice. And it helps, if one wishes to communicate with a person of another language to have a name common to all languages. Try talking to a French, Italian or Japanese gardener about "columbine" and see how far you get. In order to

name something one must be able to describe it in unmistakable terms.

One can readily see from the above preamble on classification, why taxonomists seek to classify living organisms by tucking them into a series of increasingly small containers that fit inside each other like pigeon-holes within cabinets within rooms, each container having within it a group of plants or animals with definite fundamental qualities or "essences" that separate one group from another. Variation plays hob with such a system. How can one correctly assign organisms into specific pigeon holes — or into generic cabinets or family rooms, for that matter — if variations, as they frequently do, refuse to fit neatly into a clearly defined container, but, rather, tend to slop over into adjacent containers? Should one give them another pigeon hole of their own and, if so, into which cabinet should it be put?

A so-called species with a wide geographic distribution is likely to have somewhat different characteristics at the limits of its range, these characteristics frequently intergrading between the extremes as the species adjusts itself to somewhat different external circumstances. Should such a "species" be separated into two or more species? If so, at what point or points should the dividing lines be drawn? In addition, a widespread "species" may have within it disjunct colonies that live in a variety of habitats and have developed certain characteristics not shared with the rest of the population in order to cope with their special ecological niches. How much variation from the "essential" norm must a colony have in order to be considered a new species?

In their efforts to answer such questions taxonomists have developed different methods of classification. The so-called "splitters" are more than likely to assign separate pigeon-holes to each

local, somewhat variant population, thus establishing a plethora of species, each rather narrowly defined. This multiplicity of species, based on what are frequently rather minute differences, is considered nit-picking by many critics.

The other school, called "lumpers", broaden the criteria for each "species" and stuff into a single pigeon-hole all variations that fall within these criteria. This frequently enrages those of us who enjoy finding obscure species — the more the better — as is true of those bird-watchers whose life-lists were shortened by a number of species in the recent ornithological lumping. We plantmen can sympathize. We have lost species in the taxonomic revision of our own ARGS emblem *Dodecatheon* and not too long ago lost a whole genus when our American *Douglasia* was swallowed up by *Androsace*.

But we must remember, even as we gnash our teeth over the lumping or splitting of our old familiar species and genera, that classification of living organisms is a matter of opinion rather than a set of absolute laws. At the present time, lumping is perhaps more fashionable in taxonomic circles than is splitting. This may change. The inclusion of the genus *Douglasia* in the genus *Androsace* is, after all, the work of a single author, Dr. P. Wendelbo of Bergen in 1961, and although this classification has been followed by Dr. A. Kress of the Munich Botanic Garden among others, it has not, by any means, gained wide acceptance among informed experts. Taxonomy is, indeed, a question vexed.

As any really careful student of wildflowers knows, even within a field of daisies — all, probably, very closely related — one can find innumerable variation in individual plants of such visually obvious characteristics as size of the disk, and width, length, shape and number of the rays on the flowers. Con-

sider, therefore, the unseen variation among these daisies: differences in season of bloom, cold hardiness, ability to withstand drought and heat, susceptibility to disease. Horticulturists are well aware that *Cornus florida* varies not only in the color and size of the bloom, but in winter hardiness as well. A Flowering Dogwood from Florida or Georgia will frequently lose its flower buds and even winter kill when brought north and planted in Connecticut though individuals of this species planted in the same site, but native to the northern portion of its range, come through the same winter unscathed.

Some species such as *Trillium ovatum* and *Trillium grandiflorum* are notorious for variation, as is Christmas Fern (*Polystichum acrosticoides*). *Lewisia cotyledon* varies enough in growth habit, flower color and leaf shape to have once been divided into a number of separate species: *howellii*, *finchii*, *heckneri*, et al., and some taxonomists still consider this classification valid. Some species seem to have greater genetic flexibility than others and almost, it would appear, make a game of experimenting with variations of all kinds.

Though such variations may be a headache to taxonomists, they can be a joy to horticulturists and hybridists who are always seeking a sweeter pea, a hardier, more prolific wheat, a wilt resistant squash, or — unfortunately — a less squashable tomato. Rock gardeners, not satisfied with those plants which are naturally short, creeping or bun-shaped, are forever searching for more compact, dwarfed variations of plants that are normally tall in stature, wide spreading in growth habit, or simply too vigorous to suit the somewhat precious limits of the ideal rock garden plant.

Some variations that are beneficial to a plant may maintain themselves by permitting such plants to outbreed their

cohorts. Other variations may be detrimental and usually vanish, as individuals bearing genes for such a variation are likely to lose the battle for existence before they can produce progeny. In a few cases such a gene, a tendency for dwarfness for example, which would prevent a plant from getting enough light to exist among its taller companions, would prove beneficial to a plant whose seed landed on a mountaintop where high, desiccating winds would cut down its normal, tall siblings. Such a plant could in time be the progenitor of a whole race (? new species) suited to that particular habitat. But under normal conditions a deleterious gene is swamped out either by the death of its bearer before it can reach breeding age or as a result of interbreeding with its healthier, better adjusted kind. Just as human beings have developed social taboos to prevent intermarriage of close relatives — thus preventing the pooling of deleterious genes, which might prove fatal or at least debilitating to the group — so plants have developed barriers to prevent or at least make difficult a plant's ability to fertilize itself.

Species within a genus can also usually interbreed. Although frequently prevented from doing so in the wild because of geographic separation or a difference in blooming period, such species frequently miscegenate quite happily if brought together in a garden situation or, even in the wild, when a late flower of one species is still sexually active at the same time as an early flower of another related species. Could such a cross give rise to a new species?

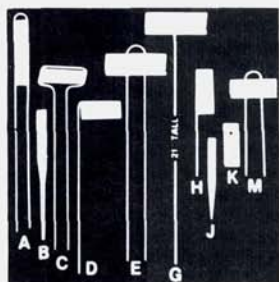
In theory at least, genera are not inter-fertile and this is considered one of the characteristics that differentiate genera from species. Yet bigeneric crosses are possible, as witness the X *Phylliopsis*, the X *Heucherella* and the X *Solidaster* mentioned by Roy Davidson in Volume

41 of the Bulletin on page 28. And some species within a genus will not hybridize, even when encouraged to do so by dint of human interference. Lepidote (scaly) rhododendrons and elepidote (scaleless) rhododendrons will not cross with each other nor with azaleas (usually), nor with the species in the Camtschaticum Series. Yet all are now considered by taxonomists to belong to the genus *Rhododendron*. Should this genus therefore be split into four separate genera?

It becomes increasingly evident as one discusses the problems faced by taxonomists that the classification of plants or animals is an artifact, a rigid structure that human beings attempt to impose on endlessly flexible organisms, which by their very nature cannot be categorized. An inflexible organism is

almost inevitably headed for extinction. Variation enables living organisms to immunize themselves against disease. It is variation that enables plants to adjust to changes in their environment (and environments, as we know, change rather rapidly). Variation permits plants to colonize new ecosystems. Variation is the raw material of evolution. It is what has given us the rich flora that clothes nearly every ecological niche on earth, from the deserts to the lush rain forests, from sea level to mountain tundras, from the tropics to the poles. Variation may be a nuisance to those who wish to classify living matter into immutable, namable groups, but it is also a fundamental reality of nature. It is primary. Variation is life itself.

Indeed, without variation, where would we be? §



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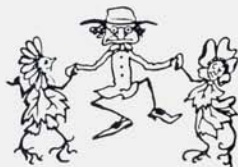
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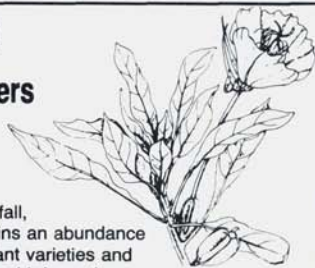
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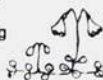
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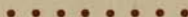


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