The Green Thumb
Denver Botanic Gardens, Inc.
909 York Street
Denver, Colorado 80206

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The Cover
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The Green Thumb
Fall 1986
Volume Forty-three, Number Three

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Published by Denver Botanic Gardens, Inc., 909 York Street, Denver, Colorado 80206

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"THE PATH AMIDST THE FLOWERS WAS NOT SWEEP FOR THE GUEST"
-The Poet DU FU (A.D. 712-770)

Reminiscences of A Horticulturist in China

by Merle M. Moore

It was a cold, windy January morning in 1967 as I caught my first glimpse of The People's Republic of China from a hilltop at Lokmaichau in the New Territories of Hong Kong. In the mist-enshrouded landscape before me I could barely discern the few farms and distant hills of Guang Dong Province lying tantalizingly out of reach of American tourists at that time. On a brief vacation from my assignment as a Peace Corps Volunteer in Thailand, I was enjoying the early stages of what was to become an enduring fascination with and interest in the people and cultures of Asia.

A subsequent position with the U.S. Agency for International Development in South Vietnam provided an opportunity for further travel in the region. It also heightened a growing desire to visit The People's Republic of China and encounter firsthand the venerable culture and people of that mysterious, forbidden land. Nearly 20 years would pass before this opportunity would finally evolve, not out of a once conceived career in the foreign service but as a result of returning to my initial career choice—horticulture.

In May 1985 Dr. Richard Harris, Professor of Horticulture at the University of California at Davis, invited me to join a delegation of landscape horticulturists from throughout the United States; at the request of the Botanical Society of China we were being invited to visit the People's Republic of China and exchange information with our Chinese counterparts on current landscape horticultural practices. Through organized meetings and professional discussion sessions as well as informal gatherings we would talk with our colleagues in five Chinese cities and observe firsthand their practice of landscape horticulture. Needless to say, this prospect of representing the Denver Botanic Gardens as a member of such a prestigious delegation was most exciting; it offered unequalled opportunities for scientific exchange between botanical gardens in China and our own.

Were it not for a supportive board of trustees, a number of whom contributed personally to the fund set up to make my participation in the delegation possible, the adventure would have ended there. However, through their generosity, I was able to represent the Gardens as a member of the delegation, make valuable contacts with my Chinese counterparts at botanical institutes in five different geographical regions of the country and lay the groundwork for a tour to China by Dr. Gambill on an earlier trip, I had ample evidence that he would be an intrepid traveling companion undaunted by the adventures we were bound to encounter in a journey to China.

Following a pre-tour briefing in Seattle, we boarded our flight on October 2 for Hong Kong and on to Beijing. Once in China we were under the auspices of the Chinese Academy of Science, a distinction that set our group apart from the usual crowd of tourists and on several occasions allowed us certain freedom of movement that contributed to the enjoyment and accomplishment of our overall experience.

As we drove from the airport to the Xiang Shan (Fragrant Hill) Hotel in the hills northwest of Beijing we were impressed by the extensive and colorful displays of potted annuals (salvia, dahlias, asters, asparagus fern, chrysanthemums and black-eyed susans) to be found on street corners, in front of government buildings and at the entrance to our hotel. They were a reminder of the austere and unimpressive, I was delightfully surprised by the beautiful, I.M. Pei-designed Xiang Shan Hotel. Not only were it for a supportive board of trustees, a number of whom contributed personally to the fund set up to make my participation in the delegation possible, the adventure would have ended there. However, through their generosity, I was able to represent the Gardens as a member of the delegation, make valuable contacts with my Chinese counterparts at botanical institutes in five different geographical regions of the country and lay the groundwork for a tour to China by our Botanic Gardens members in October 1988. It was a very productive, educational and fascinating three weeks. Arrangements for our visit were handled on this side of the Pacific by the Citizens Ambassador Program of People to People International, with its headquarters in Spokane, Washington. Founded by President Eisenhower in 1956, People to People International was established to encourage "increased visits by citizens of one country to another to give each the fullest opportunity to learn about the people of other nations . . ." Many of you may be more familiar with the Sister Cities Program in which the city of Denver is an active participant. In fact, the most recent addition to the roster of Denver Sister Cities is Kunming, China, a city visited on our tour.

William G. Gambill, Jr., Director Emeritus of Denver Botanic Gardens, was also a member of the visiting delegation. We agreed to be roommates for the trip, a development I enthusiastically endorsed as I looked forward to having ready access to an accomplished taxonomist as we immersed ourselves in the extensive and diverse flora of the Chinese continent. Having tramped through tropical rainforests in Sabah and the highlands of peninsular Malaysia with Dr. Gambill on an earlier trip, I had ample evidence that he would be an intrepid traveling companion undaunted by the adventures we were bound to encounter in a journey to China.

Expecting to find Chinese hotels to be austere and unimpressive, I was delightfully surprised by the beautiful, I.M. Pei-designed Xiang Shan Hotel. Not only was the architectural style of the building very striking but the surrounding garden and the general beauty of the setting in the hills above Beijing added to its dramatic effect. Magnificent specimens of Chinese lacebark pine, Pinus bungeana, Chinese pine, Pinus tabulaeformis, and Chinese fir, P. cembra, added to the splendor of its gardens.

Merle M. Moore, executive director of Denver Botanic Gardens, has long had a keen interest in both the peoples and the flora of the eastern Asian countries.
and maidenhair tree, *Ginkgo biloba*, were scattered over the grounds and through the gardens of the hotel.

Our first morning in Beijing was spent at the Science Hall where four presentations were given by members of our delegation. Subjects ranged from the latest advances in growing, training and transplanting trees to using plantings in and near cities for climate modification and pollution control. Following lunch at a nearby restaurant—the beginning of a gastronomic tour de force through five of the regional cuisines of China—we returned to the Beijing Science Hall for a more informal exchange of questions and answers on a wide range of horticultural subjects.

While waiting for the afternoon session to begin, I enjoyed a delightful exchange with a group of Chinese students who were eager to help me identify some trees and shrubs growing adjacent to the building as well as practice their English. That evening our delegation, along with several smaller visiting delegations from England (beeckeepers), Sweden (medical technicians) and the U.S. (dental hygienists), was treated to a reception held at the Beijing Hotel. In addition to the dramatically presented feast which had been prepared for us there were various singers, dancers and instrumentalists who performed for our enjoyment.

Visits to important historical sites and to the Beijing Botanical Garden filled our next three days in Beijing. In each instance we were accompanied by our technical guide from the Chinese Academy of Science who also acted as our principal interpretor. Upon arrival we were usually met by those Chinese officials responsible for the planning and management of the horticultural/botanical collections at each site.

At the Ming Tombs, where 13 of the 16 Ming emperors chose to be buried, ripening persimmons, *Diospyros 'Kaki'*, gave the appearance of orange ornaments hanging from the trees in adjacent orchards. Just outside the entrance to the Ming Tomb complex local farmers had set up a fruit market along both sides of the road to sell the persimmons as well as several other fruits which appeared to be crab apples and green plums. In Imperial times none but the deceased Emperor and his funeral cortege were permitted to traverse this road; any other person would be killed. Seeing the fruit vendors and tourists by the hundreds now visiting the tombs helped to focus in my mind the tremendous changes China has gone through in the past and is experiencing even more rapidly at the present. It will be most interesting to follow over the next few years the evolution wrought by this momentum for change which we experienced during our visit to China.

Our visit to the Beijing Botanical Garden (Northern Garden), situated at the foot of Mount Shouan and incorporating the plantings within the Shi Fan Pu Jue Temple (Temple of the Sleeping Buddha) became, in retrospect, more interesting as our tour of China progressed. This is principally because we saw few botanical gardens that had such a park-like feeling and used large displays of bedding plants and perennials simply for their colorful effect.

While the introduction and acclimatization of plants in China can be traced back 7,000 years, these early introductions most often were related to plants of agricultural or medical interest. It was not until 1929 that the Sun Yat-sen Botanical Garden was established in Nanjing to apply modern scientific methods to the study of plants. In 1934 the two professors responsible for establishing the Nanjing garden set up a new botanical garden in Lushan. Located to the south and west of Nanjing, the Lushan Botanical Garden with its higher elevation and much greater rainfall concentrated on collections of conifers, rhododendrons and rare and endangered plants of cooler, sub-tropical regions. During World War II both gardens were damaged extensively and further development of a national system of botanical gardens was halted.

Following the founding of the People's Republic of China, the Academy of Science was established making possible re-
construction, in the mid-1950s, of the botanical gardens in Nanjing and Lushan. By the end of that decade a national system of botanical institutes, each with a botanical garden, had been developed. Today there are 21 botanical gardens extending from the Russian to the Burmese borders, and from the center of the continent to the east coast. National conferences held by the Academy of Science in 1963 and in 1978 determined the three priorities for botanical gardens in China today. These priorities, as published in The Botanical Gardens of China by Yu Te-tsun, are:

1. Exploit wild-plant resources, introduce important plants from abroad, and collect plants which are rare, precious or on the verge of being extinct, so as to enrich the variety of flora in China and cater to the needs of China's national construction.

2. Study the pattern of the growth of plants, do research on the adaptability of the plants introduced, find out the economic characteristics of these plants and look into the laws of genetic variation, sum up the experience gained in the introduction and acclimatization of plants, perfect the relevant theories and improve the methods.

3. Set up exhibition centers which integrate beautiful landscape with scientific research and activities to spread the knowledge of botany.

As we visited other botanical institutes during the course of our tour, a routine emerged which included a briefing usually given in that part of the institute where the exhibits and displays were located, a tour of the botanical garden and the presentation of papers by members of our delegation and, less frequently, by our Chinese counterparts.

One cannot go to Beijing without visiting the Forbidden City, now referred to by the Chinese as the Imperial Palace. For me the Forbidden City held a special interest. I had visited Taipei (Taiwan) on several occasions and each time, toured the National Palace Museum which houses a remarkable collection of art treasures and jewelry that was smuggled out of the Forbidden City, and subsequently out of China, by the Guomindang forces led by General Chiang Kai-shek. More than 200,000 pieces of art are contained in that collection, most of them stored in caves deep in the mountain behind the museum buildings. In spite of this staggering loss there remains much to be seen of the Imperial treasures and life style in the Forbidden City today. Of particular interest was the increasing use of plants as one approached the heart of the Forbidden City where the Emperors and their families actually lived.

Adjacent: to the Forbidden City, just outside the Gate of Heavenly Peace, lies Tian'anmen Square. This immense public square can accommodate gatherings of more than a million people. It is also the site of Mao Zedong Memorial Hall where the body of Chairman Mao lies in state in a crystal sarcophagus. The exaggerated scale of other buildings surrounding the square is exemplified by the Great Hall of The People which seats 10,000 people in its main assembly hall. During Richard Nixon's visit to China dinner was served for 5,000 guests in one of its dining halls. The beds of brightly flowering annuals and roses scattered sparingly around the square contribute little to bringing the scale into a comfortable human perspective.
Visits to the Temple of Heaven and to the Summer Palace with its wonderfully landscaped grounds and serene Kunming Lake (complete with the Machiavellian Empress Dowager's extravagant marble bost built with funds embezzled from the Imperial Navy) concluded our introduction to the use of landscape plant materials in historical and public "parks" in and around Beijing.

In all this stimulating Beijing adventure, two highlights stand out above the others. The first was a visit to the Great Wall at Badaling, northwest of Beijing. Seeing this incredible architectural marvel at any time of the year must be an awe-inspiring event. However, to be atop the Great Wall on a clear October morning, amidst the autumnal glory of the smoke tree, Cotinus coggygria, painting the hillsides with a brilliant burgundy hue, was a sight to be forever remembered. The exhilaration of seeing the Great Wall, juxtaposed with that dramatic fall coloration, was tempered by the realization that many human lives were sacrificed in the building of this monument to the absolute power wielded by the Chinese emperors.

The second was the opportunity to see Dr. K. H. Shing again and meet his family. Dr. Shing, a taxonomist specializing in ferns and fern allies, came to Denver as a visiting professor in 1981-1982 under the auspices of the University of Colorado in Denver. While here, he spent many hours at the Botanic Gardens and assisted us in reviewing our modest collections of both living and preserved ferns. In Beijing Dr. Shing is responsible, as Curator of the Fern Herbarium of The Institute of Botany, for more than 150,000 preserved specimens of ferns and fern allies maintained in the National Herbarium of the Academy of Science. He is one of 30 staff taxonomists at the herbarium which comprises a total collection in excess of 1.3 million preserved specimens. With minor herbaria located at each of the 21 botanical institutes throughout the country it became increasingly evident during our tour that taxonomic research is currently of considerable importance to the Chinese. In fact, Chinese taxonomists are expected to spend 3-4 months of every year in the field conducting their studies.

Meeting Dr. Shing's family at their residence was both a rare privilege and a very enjoyable respite from our otherwise tightly scheduled daily routine. After a refreshing glass of wine produced from grapes grown at the botanical institute where Dr. Shing works, we settled back to enjoy a most delicious lunch his wife had prepared. His daughter, Hao Wen Shing, a cute and perky 16 year old, had received special permission to come home from school and join us for lunch and it was delightful having her tell us, in very good English, about her school and the subjects she was taking.

Dr. Shing's apartment, located near the Beijing Zoo, consists of a small "sitting room" where we enjoyed our lunch, two bedrooms, a small kitchen area and a bathroom. While it would seem quite cramped and spartan by our western standards, Dr. Shing and his family enjoy a degree of "luxury" not known to a great majority of Chinese people. Dr. Gambill shared my sense of relief to find Dr. Shing in good health and obviously having made a relatively uneventful transition from living two years in the United States and then returning to his home and family in The People's Republic of China. The time we were able to spend with Dr. Shing, to reminisce about his two years in the U.S. and to get a sense of the impact that experience had on him was woefully inadequate. Nor was there sufficient time for us to share with him our interest and excitement about the experiences we were having in his country. I look forward to the possibility that we will meet again in October 1988, when a group of Botanic Gardens members will join me for a tour of China. It will be a pleasant opportunity to once again share our experiences of the intervening years.

In the next issue of The Green Thumb I will conclude my article on China by sharing with you reminiscences of our visits to Chengdu, the capital of Sichuan Province which is noted for its variety of bamboo products and its spicy cuisine; Kunming, capital of Yunnan Province, Denver's newest Sister City and the World War II home of the Flying Tigers; Guilin, with its incredible landscape so reminiscent of classical Chinese landscape paintings; and Guangzhou, a city of beautiful gardens bustling with the energy of China's new freedom of trade with the outside world.
The Kathryn Kalmbach Herbarium

by Helen Marsh Zeiner

In the winter 1973 issue of *The Green Thumb*, a comprehensive report on the Kathryn Kalmbach Herbarium was presented. Although brief reports had appeared from time to time in *The Green Thumb*, this was the first complete and detailed account of the herbarium from its beginnings, a period of about 30 years. It is once again time to report on the Kathryn Kalmbach Herbarium, an important department of Denver Botanic Gardens.

Casual visitors to a herbarium often expect to see a collection of culinary or medicinal herbs. The misunderstanding arises because of the similarity of the two words, herb and herbarium, both derived from the Latin *herba*. "Herb" to the botanist means any non-woody flowering plant. A herbarium, therefore, is not a collection of culinary, medicinal, or aromatic plants as the common use of the word herb might imply. It may include all plants, both woody and non-woody.

The plants are carefully pressed and mounted, then labeled with scientific name, place of collection, habitat, name of collector, and other pertinent information, and arranged systematically for ready reference and study. A herbarium is a reference library of pressed plants—a place to learn and not merely a "morgue for dead plants" as some irreverent person once said. Properly prepared specimens in a herbarium are permanently preserved and available indefinitely for study.

The value of a herbarium becomes apparent when one compares learning from an actual specimen, even though pressed and dry, with learning from a written description which may be lengthy and hard to understand or, on the other hand, incomplete. Herbarium specimens are invaluable to taxonomists for reference, study, and comparison. A herbarium is an important source of information about the vegetation of an area, telling us much about distribution, both local and widespread. In identifying new plant materials, herbariums are valuable for comparison, often making it easy to identify the plant in question.

The Kathryn Kalmbach Herbarium originated about 1943 as a project of the Colorado Forestry and Horticulture Association. Kathryn Kalmbach and George Kelly were leaders of a group of volunteers who wanted to start a collection of pressed plants of Colorado, to provide a means for members of the association to see and identify native plants and to provide general information on the flora of the state. This group of interested people made many special collecting trips as well as collecting as individuals. The Colorado Mountain Club also helped with this project.

Helen Marsh Zeiner, Ph.D., is curator of the Kathryn Kalmbach Herbarium serving as an invaluable volunteer at Denver Botanic Gardens.

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When the Colorado Forestry and Horticulture Association acquired Horticulture House at 1355 Bannock Street, the herbarium officially came into existence. It was announced in the January-February 1947 issue of The Green Thumb that there would be facilities in the basement for a herbarium of Rocky Mountain plants, and that Mrs. E. R. (Kathryn) Kalmbach would be in charge. The hoped-for botanical facilities were never fully developed but the herbarium did have adequate storage space. The tables in the combined library and meeting room were used for preparing and studying specimens, obviously not an ideal arrangement.

Mrs. Kalmbach was designated as chairman of the Herbarium Committee which was comprised of the volunteers working in the herbarium. It was always a working committee, and has remained so, with all committee members serving as volunteers in the herbarium.

As the collection grew, both by purposeful collecting and by gifts of personal collections, it became necessary to recruit additional volunteers for help in preparing the specimens for inclusion in the herbarium. Members of Home Garden Club of Denver as well as other interested persons responded to the appeal and an active group met weekly at Horticulture House to prepare specimens.

Money was a real problem, and necessary supplies such as mounting paper were donated.

In March 1959 the Colorado Forestry and Horticulture Association moved to Botanic Gardens House at 909 York Street. Here the herbarium was housed in part in a small room adjoining what was at that time The Green Thumb office, now the administrative office of the outdoor gardens, and in part in converted linen cupboards in the upstairs hall. Workers had to set up tables either in The Green Thumb office or in the hall. Specimens were more readily accessible than they had been at Horticulture House, but it was a very inconvenient arrangement both for workers and those who wished to use the herbarium. It was during this period that the first standard metal herbarium case was acquired.

When the Botanical Gardens Foundation of Denver merged with Colorado Forestry and Horticulture Association in 1960, this facility became the official herbarium of Denver Botanic Gardens. Kathryn Kalmbach remained chairman of the committee and in charge of the herbarium until her death in 1962. It was named the Kathryn Kalmbach Herbarium in her honor. Following Mrs. Kalmbach’s death, Helen Zeiner, Ph.D., was appointed chairman of the committee to direct work in the herbarium.

By April 1963 the herbarium had acquired three new metal cases. A stereoscopic microscope for use in the herbarium and by Botanic Gardens staff was also acquired during this period.

The small room designated for the herbarium was soon needed for duplicating machinery, and the herbarium was moved to the conference room (now converted into office space) which it shared with the mycology group. This room, although crowded, had one large table which could be used as a work table. Unfortunately it was necessary to schedule meetings here, limiting the availability and usefulness of the herbarium.

In March 1971, the herbarium was moved to its present quarters in the Education Building of Boettcher Memorial Center. This large room provided space for expansion. By 1973, the herbarium had 16 storage cases and for the first time a sink with running water, so necessary for working with plants. It also provided tables for workers and others who used the facility. There was also a small store room. At last, the Kathryn Kalmbach Herbarium had adequate working space, and boxes of plants which had been stored could now be processed.

The collection had grown to 5,000 sheets, prepared under very inconvenient working conditions. Late in the winter of 1971 the University of Denver Herbarium was moved to Denver Botanic Gardens and incorporated into the Kathryn Kalmbach Herbarium. This doubled the size of the facility and...
brought it to approximately 10,000 sheets. The herbarium continues to grow, and now there are storage cases with more than 23,000 specimens accessioned. Included in the herbarium are native Colorado plants; special collections from Mt. Goliath, Chatfield Arboretum, the montane Walter S. Reed Botanic Garden, and South Table Mountain; the J. J. Waring allergy plant collection; cultivated plants; voucher specimens of plants grown at Denver Botanic Gardens; and plants from other states and foreign countries.

To simplify use, plants are filed first as lower vascular plants, gymnosperms, monocots, or dicots, then alphabetically by family, genus, and species. To date we have been able to maintain a card file index by genus. From the very beginning Kathryn Kalmbach Herbarium has been staffed by volunteers selected for their knowledge of plants. At the present time 10 volunteers work in the herbarium—some professional botanists and others amateur botanists with "professional" ability. Dr. William G. Gambill, Jr., Director Emeritus of Denver Botanic Gardens, is the official taxonomist for Denver Botanic Gardens. Dr. Janet Wingate, as well as serving as a volunteer, is a part-time staff member employed to collect and prepare voucher specimens of the plants cultivated at Denver Botanic Gardens. Dr. Helen Zeiner has served as chairman of the committee since Mrs. Kalmbach's death in 1962, and in 1973 was named honorary curator of the Kathryn Kalmbach Herbarium "in recognition of outstanding volunteer service."

The Kathryn Kalmbach Herbarium is unique in that it provides a number of services to the public. Many times plants have been identified for individuals; other persons have used our specimens to make their own identifications. Classes from high schools and local colleges have visited the herbarium and some have spent time studying plants in our collection. Classes which make direct use of the herbarium, such as taxonomy classes, have been scheduled.

The Committee maintains exhibits of interest to the general public on the display balcony, an important part of the Kathryn Kalmbach Herbarium. Some of these displays are of a "museum type" and changed infrequently. Such a display is a lichen exhibit, so popular with some teachers that it is included in work sheets for classes visiting the Gardens. Other displays are changed at more frequent intervals. Some are seasonal. A popular feature has been a display of fresh plant material, particularly Colorado wildflowers, as an educational tool for the public who want to know "what flower is this?"

In the fall of 1984 a glass enclosed case in the lobby court was provided so that the herbarium staff could display fresh wildflowers in season in a location where they would be easily seen. During the winter months, a display of Colorado evergreens aroused a great deal of interest. This was followed by exhibits of winter twigs and forced twigs. During the spring and summer, Colorado wildflowers are featured.

The Kathryn Kalmbach Herbarium is still a small herbarium whose very existence is due to the hard work of loyal volunteers. As Denver Botanic Gardens grows, the Kathryn Kalmbach Herbarium will continue to grow and increase in importance. It is an asset to Denver Botanic Gardens and to the city of Denver.

Reference

The Kathryn Kalmbach Herbarium is open to the public Tuesdays 9 a.m. to 3 p.m. and Thursdays 10 a.m. to 2 p.m.

A Mountain Meadow—Mt. Falcon Park

by Peter Root

Perhaps the most difficult part of a discussion of mountain meadows is defining them. The term can be applied to a wide variety of habitats ranging from large permanent mountain grasslands known as parks to sites of former forests or even spaces between trees in an open ponderosa pine forest. Meadows can be wet or dry; at higher altitudes they resemble tundras; as we near the foothills they take on many characteristics of the plains. They cannot be described as having a single vegetation type and are influenced by adjoining habitats. The wide variety of plants living in meadows makes them a spectacular feature of the scenery during the flowering season.

A very accessible example of a mountain meadow near Denver is Mt. Falcon Park, part of the Jefferson County Open Space System and located near Indian Hills. The upper part of the park contains a large successional meadow which was probably cleared about a hundred years ago. When forests are removed, vegetation recovers through an orderly series of stages called succession. In some cases grazing, fire or climatic factors delay reestablishment of forest and a successional meadow results.

Peter Root, a volunteer at Denver Botanic Gardens, leads wild flower field trips and works in the Kathryn Kalmbach Herbarium, specializing in ferns and fern allies. He is also a volunteer naturalist at Roxborough State Park.

The meadow, which can be entered through a ponderosa pine forest, is a gently sloping bowl draining eastward. In early summer it is visually dominated by green grasses, but among them are many plants with more conspicuous flowers. The composites range in size from the very small white pussy toes, Antennaria species, to the large yellow and red flower heads of Gaillardia. They are joined by several species of legumes in the genera Astragalus and Oxytropis which have flowers ranging from white to blue and purple.

Along the south side of the meadow the edge of a forest of ponderosa pine and Douglas-fir is advancing. Among scattered trees kinnikinnick, Arctostaphylos uva-ursi, a forest floor species, is mixing with meadow plants. The western tanager can be seen and heard here. A very noticable plant is the green gentian, Frasera speciosa, looking in its young stage much like a plastic houseplant with its large cluster of light gray-green leaves. Its 2-foot tall stalk of green flower heads of golden banner, Thermopsis varicarpa, bloom here in spring and early summer.

Some large ponderosa pines have remained at the east edge of the meadow along with patches of aspen where Colorado blue columbine, Aquilegia caerulea, may be found. Its blossoms, appearing like blue and white balloons lightly tethered by their slender stems, are im-
pressive even to those who usually ignore wildflowers.

The soil here is richer and, after early summer rains, yellow mushrooms of the genus *Suillus* come through the litter like thick, sticky pancakes. The clustered purple and yellow flower stalks of the spotted coral-root, *Corallorhiza maculata*, a saprophytic orchid, bloom in the humusy soil under the pines.

In the central part of the meadow the dark blue flowers of blue-mist penstemon, *Penstemon virens*, make a collective display which truly lives up to its name. Occasional plants of the one-sided penstemon, *P. secundiflorus*, are conspicuous with their lavender-pink blossoms. Contrasting with these against the green background of grasses are flower heads of orange arnica, *Arnica fulgens*.

A curious feature in the meadow is the presence of several clumps of scrub oak, *Quercus gambelii*, which in this location approaches both the northern and the upper altitude limits of its range. Although the oaks appear to have died back to the ground recently, they are still sprouting at their bases.

It is commendable that open space land has been set aside near Denver; however, complacency must be avoided. Although this land may be safe from development, the pressure for diverse recreational uses will continue to present problems for land managers. Without constant vigilance by managers and citizens open space land could eventually degenerate into well manicured suburban parks.
FOCUS ON Mango, Mangifera indica, IN THE BOETTCHER MEMORIAL CONSERVATORY

by Peg Hayward

The mango is one of the oldest cultivated tropical fruits. Its original home is believed to have been somewhere in eastern Asia and the Malayan archipelago and it seems to have been cultivated in India for more than 4,000 years. Akbar, who ruled northern India in the 16th century, is said to have planted 100,000 mango trees at a time when large orchards were unheard of. The Portuguese probably carried the mango to East Africa where it is common. Now mangoes are widespread in the tropics where they are valued for shade trees as well as for their fruits.

*Mangifera indica* L. is the best known and most important of the some 40 trees that comprise the genus. Mangoes are handsome broad-spreading evergreen trees with rounded tops. They may attain a height of nearly 100 feet with a spread of 125 feet. These trees often live to be 100 years old. Leathery dark green leaves of the mango have long drawn-out tips which point downwards. New leaves attract attention with their coppery-red color. Filmy fragrant flowers grow in panicles. They have yellowish-green sepals and creamy petals with darker yellow ridges on the surface, but the petals turn pink as the flowers age. Smooth-skinned fruits, which dangle from the twigs, vary enormously in size and shape from almost round to narrowly oblong or oval and are slightly beaked on one side. When ripe the skin may be yellow or orange with a red flush or they may be greenish yellow depending on the variety. Each fruit contains a large flattened seed covered with coarse fibers and surrounded by yellow or orange pulp. A superior variety, properly ripened, is one of the world's finest fruits. An inferior or unripe mango is fibrous, tough and has a flavor resembling turpentine.

Fruit of the mango is a better source of vitamin A than the orange and a fair source of vitamins B and C. Mangoes may be eaten raw, stewed, frozen, or made into preserves and chutney. The mango is a staple article of food during the hot months in the tropics where it is called the "king of fruits".

Mangoes are in the poison ivy and poison oak family, Anacardiaceae. Some people are sensitive to the raw fruits and may suffer from a poison-ivy-like rash about the lips and face as a result of eating them. Other related plants are sumac and cashew nut.

Hindus regard mango leaves as symbols of happiness and prosperity and use them on festive and religious occasions.

Besides being double-duty trees, ornamental as well as food producing, mango wood is used for doors, window frames, packing cases, boat building and plywood.

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Peg Hayward, long associated with the guide training program for Boettcher Memorial Conservatory, writes "Focus On" as a regular feature of The Green Thumb.

References


A Benefit for the "Greening of Denver"

The Garden Club of Denver, founded in 1916, has been involved in many ways with public gardens and civic plantings in the Denver area. Currently, it is planning a fund-raiser to benefit both Denver Botanic Gardens and the "greening of Denver," a project for improving the ambiance of Lower Downtown with street plantings.

The Garden Club, in cooperation with Historic Denver and Denver Botanic Gardens, will host a holiday table settings show on December 5 and 6 in the Ice House at 1801 Wynkoop Street in Denver. Half of the funds raised will be used to implement the first phase of the "greening of Denver" project—street plantings in the historic warehouse district of Lower Downtown; the other half will benefit Denver Botanic Gardens.

The new streetscape design for downtown Denver is an integral part of the recently adopted Downtown Area Plan unveiled in May by the city and Denver Partnership and approved by the city council in July. City appropriations will be used to fund the streetscape research design through Denver Partnership, but implementation of the landscaping designs must be funded separately.

Because of the large number of improvements called for in the plan for just Lower Downtown, city officials and downtown business interests have welcomed support from citizen groups such as the Garden Club of Denver to help bring the landscaping portion of the plan to fruition, noted Mary Roberts, historic preservation consultant for the Denver Planning Office.

Sara Jane Seward, project manager for Denver Partnership's involvement in the streetscaping, says research is proceeding using photographs dating from 1860 to the present to determine what has occurred historically along the streets of lower downtown. "We're looking at the streets in the 24-block area as they have appeared over time—studying materials used, changes that have occurred, and what design remnants exist or have completely disappeared. We would like to determine what historical threads, in fact, have been genuine to the street design of the area.

"We will work with Lower Downtown property owners and Historic Denver to gain input, and then obtain approval from the city for the overall streetscape plan."

Seward and Roberts say that the actual project implemented with assistance from the Garden Club of Denver will be a section in lower downtown where the need is greatest.

"Several sidewalk areas have not been improved in recent memory," Seward said, "because the area was primarily a warehouse district until the 1960s. While the loading dock atmosphere provides interesting character, sidewalks need to be improved to create a safe and attractive pedestrian environment."

As research and planning progress in coming months, representatives from the Garden Club will meet with Historic Denver and Denver Partnership to select the specific site for this "greening of Denver" project.

The December benefit will be one of the few opportunities for the general public to visit the Ice House Design Center, usually open "to the trade only."

This event offers a unique opportunity to see the remodeled former Beatrice Foods cold storage warehouse, which was built in three stages beginning in 1903. Various construction techniques employed through the years, including the heavy timber work in the oldest section of the building are apparent. The Ice House is remarkable for its exceptional polychrome brickwork, high ceilings, and other vintage details.

In addition to its active involvement in the development of Denver Botanic Gardens through the years, the Garden Club of Denver, founded in 1916, has aided numerous other civic projects besides the present "greening of Denver," some on city property and some for other nonprofit organizations in the area.
Natural Gardening in Colorado — II

by Panayoti Kelaidis

A modular garden

Allan and Mary Taylor purchased their house in 1965. It was situated on a corner lot dominated by many trim lawns and a giant, spreading Douglas-fir, *Pseudotsuga menziesii*, that grew atop a long retaining wall largely hidden beneath English ivy. Douglas-fir, ivy and lawns are things of the past now. They have been replaced by a series of gardens—discrete units, separated by fences, walls and walks, each with radically different cultural and aesthetic treatments.

Dr. Taylor has written a detailed account of his experiments with various dryland plants in recent issues of *The Green Thumb* but did not elaborate on the garden in which he experimented with most of these plants. In the northwest corner of the lot, bordering the sidewalk and the alley was a stretch of lawn that was a nuisance to maintain. Nostalgia for the dramatic, rocky landscape of his growing-up years on the western slope and a serious interest in tropical cacti inspired the thought of building a natural garden in which to grow their hardy counterparts. What better place than the far reach of his property that was so hard to keep watered?

The dryland garden was built slowly and deliberately, over a period of almost 15 years. Shapely, interestingly mottled sandstone of the Fountain Formation was placed with meticulous care to imitate the sort of sandstone boulder fields one occasionally encounters in canyon country. Each sandstone boulder—deep purple-red, banded with streaks of white and tan—is almost gaudy in coloration. Somehow, by combining them artistically, interplanting them with silver and green leaved plants, the garden really does look like a piece of sagebrush-west transplanted into the city.

Much of the success of this garden lies in its integrity: some 50 by 25 feet in extent, it is composed of just one kind of rock, and is restricted to native, dryland plants of the American West.

In contrast is a sunken patio nearby, along the north side of the house. Almost 5 feet of earth were removed to create the open space bordered by timbered retaining walls filled with a variety of rhododendrons and azaleas. Perhaps the most dramatic plant here is *Rhododendron metternichii* var. *yakusimanum*, the Yaku Island rhododendron noted for its tight habit and leathery leaves. The specimen is over 10 years old, a furry mound of indumentum much of the early year.

Native herbaceous perennials are combined with succulents in the dryland garden.

Mottled red and white sandstone boulders contrast with the silver and green of the succulents growing among them.
Wooden steps lead to yet another patio to the west, to the back yard lawn and vegetable garden, and to the oldest garden in the yard, an alpine garden that crowns the retaining wall and stretches around the front steps. Aspens and unusual maples help provide a bit of shade in this garden built of lichen-covered granite boulders and interplanted with dwarf conifers and a variety of alpine plants. One portion is reserved for Mediterranean bulbs, tulips, narcissi, crocuses and even the difficult Mediterranean iris, Gynandriris sisyriochium, that has bloomed repeatedly here.

Across the steps from the alpine garden, a small patch of woodland garden grows under a flowering dogwood tree, Cornus florida. Masses of holly grape and manzanita carpet the ground beneath the dogwood, and hardy cyclamens bloom prodigiously every fall. Cyclamen hederiolum appears to be the only reliably hardy species of cyclamen in Colorado, and one plant here is surely over 10 years old.

Descending from these natural gardens on the top of the retaining wall, a large perennial border stretches on the east and much of the north part of the garden facing the street. The neatly mortared wall provides a fine backdrop for Siberian and bearded irises, peonies, roses and many other showy flowers. Perhaps the most dramatic and unusual elements of this border—at least for Colorado—are the large, spectacular azaleas underplanted with a dwarf manzanita, Arctostaphylos nevadensis var. coloradensis, that blooms very early in spring, this year opening its first flowers in January. It resembles a robust kinnikinnick, but grows much more thickly, thus suppressing weeds. In summer white bell-like flowers give way to showy berries against lustrous evergreen leaves.

The azaleas are Rhododendron japonicum, perhaps the most heat tolerant and reliable species for our climate. They bloom luxuriantly every year in full sun with little extra attention or care. Soil in Boulder is acid, and this spot is protected from the full blast of winter winds. Also much humus was incorporated in the early years of this garden. With care and study one can often find a spot in local gardens where such exotic plants can be accommodated.

The most recent garden to be developed lies between the perennial border and the dryland garden to the west. It once was a grove of lilacs, and before that a bedded planting of tall bearded irises. Taylor mound soil (excavated from the patio area beyond) against the retaining wall, planted one of the northernmost piñon pines (rescued from mining operations at Owl Creek) and has slowly been adding a variety of shrubs and dwarf trees emanating from the Southwest and southern Europe. Many are dwarf oaks and broadleaf evergreens which are at such a premium in our steppe climate. It resembles a sort of chaparral, and that indeed was his goal.

For almost 10 years Dr. Taylor has collaborated with the grounds department at the University of Colorado at Boulder to introduce there unusual and interesting trees. He helps purchase unusual trees, finds sources for others, and has donated many rare specimens that he has often grown himself. Among these are true cedars, hemlocks and true cypresses. Many trees on the campus are unique in the entire Rocky Mountain region. One of his greatest contributions locally has been in sharing seeds, plants and knowledge with Denver Botanic Gardens.

Taylor's garden consists of six or seven discrete entities that range from formal vegetable garden and hybrid tea roses to rhododendron beds and natural rock gardens. His special interests range from penstemons and succulents to sequoias and magnolias. Gardening may be his avocation; yet he has attained extensive knowledge and experience, and achieved an excellence that equals the professional.

Thriving on only the natural rainfall of the area, a dryland garden provides year-round interest in foliage texture as well as summer blooms.
Perched on the highest ridge in Littleton, Bill and Sandy Snyder’s new home presented an unobstructed view of most of the Front Range, and Pikes Peak seemed only a short distance away. But the yard—an acre of short, wispy bluegrass and not much else—was discouraging. The few trees on the property showed damage from the disastrous winter of 1999. From the beginning, both Snyders collaborated on planning the garden; but Sandy took the initiative in developing the flower beds which now make this one of the showiest gardens in the region.

Like every plantsman’s garden, the Snyder garden contains a multiplicity of beds and garden styles. Some of the first beds developed were along the periphery to mask unsightly fences and screen neighboring yards. A long and undulating perennial border stretches along the western edge of the property, becoming a combined shrub, bulb and groundcover garden bordering the street on the north. In the perennial border are mass plantings of many standard perennials: vigorous crown imperials, Fritillaria imperialis, and hundreds of bulbs to celebrate spring, a constant progression of composites and conventional perennials in summer months, and giant grasses such as Miscanthus to add interest in the late fall and winter.

The shrub border is carpeted with sweeps of ground covers, such as variegated ajuga, and mulched areas thickly interplanted with daffodils and tulips. Four upright star magnolias, Magnolia x loebneri, form street tree plantings along the north. Other aristocratic shrubs that have gradually spread to cover large areas are colorful brooms including Kew broom, Cytisus x kewensis, and winged broom, Chamaespartium sagittale, vigorous manzanitas and a number of Somerset daphnes, Daphne x burkwoodii ‘Somerset.’ At the northeast corner the shrub border becomes more formal;

Burkwood viburnums, Viburnum burkwoodii, screen neighboring yards and add backdrop to a large planting of hardy hollies of the ‘Blue Prince’ and ‘Blue Princess’ series, Ilex x meserveae.

The only other bed to the north lies directly in the shadow of the house, a classic site for woodland plants. The native soil was excavated to a depth of 5 inches and replaced with a porous, acid, peaty soil. Several dozen dwarf azaleas and rhododendrons are interplanted with unusual trilliums, hepaticas, evergreen wild gingers and double flowered bloodroots. This garden forms a fine counterpoint to the sunnier gardens to the south of the house.

Every serious gardener must have a work area, and in the Snyder garden this is located east of the house. A prefabricated utility building tucked here stores tools and equipment. A series of sand beds used for propagation extend southward and are delimited by railroad ties. This “railroad tie” garden is versatile. Some small square beds are used for transplants, others are filled with strawberries or other vegetables, some contain plants “in transit” or seedlings. The entire work area is always clean and trim, and interesting to linger over. This garden has been profitable as well, for admiring neighbors and even passers-by have been delighted to purchase starts of the showy plants that fill the garden.

Next to the house facing the railroad tie garden is a bed of succulents. Here are several hardy agaves pupping vigorously and gradually growing larger, promising one day to produce their giant flower stalks. The succulent Greek spurge, Euphorbia myrsinites, has one bed largely to itself, since it spreads readily surrounded by paths and patio. In spring, it is a sea of lovely gray, green and yellow. Growing along this hot, south-facing slope are several vigorous cacti including vicious, but interesting, rat-tail cactus, Opuntia whipplei.
The bulbs are grown in thick colonies—often 100 to 200 of a kind together. These were planted in drifts, naturallyistically, and appear to have grown there for decades rather than only two years. The bulbs bloom in waves: earliest crocuses and snowdrops in February and early March, reticulate irises from late February throughout March. April is the month when tulips take over: the glowing purple-magenta of *Tulipa humilis* ‘Pulchella Violacea’ and the white-tipped yellow of *Tulipa tarda* which in turn are succeeded by the small-flowered, but vivid, *Tulipa linifolia*.

It will be interesting to see how seedlings will distribute themselves through this garden, and if hybrids might appear between some of the more closely related plants. Lawn is no longer a somewhat inanimate and passive surface but here it has become a true garden, an aesthetically complicated entity.

For years a patio extended from the west of the Snyder house, shored up from the garden far below by a tall, steep rock wall. So tall, so steep that after one spring of especially torrential rains the entire wall collapsed. The original patio was never really large enough to entertain all the plants. Lawn is no longer a somewhat consuming for their needs. Intrigued with the use of buffalo grass, *Buchloe dactyloides*, at Denver Botanic Gardens, the Snyders decided it would be a good alternative in this suburb with its exorbitant water rates. The greatest drawback to such lawns is the month or so in spring when buffalo grass remains dormant after bluegrass turns bright emerald.

Why not plant bulbs in the buffalo grass? These are most active when the grass is not, and the grass in turn will help take excess water from the dormant bulbs in summer. Two thousand bulbs of various species, crocus, iris, tulips—even snowdrops and tiny daffodils—were planted in the fall of 1984. The following spring these all bloomed vigorously, and many produced seed. Thus far in 1986, most of the bulbs appear to have increased significantly—a sign that this may be a fine way of growing the minor bulbs in other sunny gardens in this region. The bulbs and small herbaceous plants and shrubs now occupy the broad curve of this rock garden. On the hottest, south-facing slope a small area of cactus and succulents includes some of the smallest and choicest natives.

*Penstemon teucrioides*, the brilliant blue mat-former from the southern mountain parks of Colorado, forms wide mats and cushions on this bank. Tiny little buns of rupture-wort, *Herniaria gutta*, pieced with bulbs in spring grow alongside many other tiny cushion plants: Spanish sandwort, * Arenaria tetraphylla*, and New Zealand scab plants, *Raoulia australis*, are some of the choicest. The steep scree slopes are a perfect background upon which to grow these mounds and cushions, which can spread their skirts widely on the surface of the gravel unencumbered by other plants.

At its northern edge, in the shadow of a large Austrian pine, the rock garden takes on a woodland flavor with many cool-soil plants thriving in a peaty bed thriving in the shade north of the house. The garden, an aesthetically complicated entity.

Many truckloads of soil had to be brought in to create a proper slope, a path was designed and several large boulders of different sizes were selected for the site. Each of these was photographed, and their placement in the new garden practiced with the photographs on a design done to scale.

Finally, the rocks were brought on a large truck and placed with a crane in their specified locations. Large rockless areas extending between the boulders are intended to mimic the scree slopes one finds frequently in the Rockies. The entire garden has been mulched with pea gravel to enhance the feeling of scree. Several hundred kinds of tiny bulbs and small herbaceous plants and shrubs now occupy the broad curve of this rock garden. On the hottest, south-facing slope a small area of cactus and succulents includes some of the smallest and choicest natives.

Rhododendrons and woodland wild flowers thrive in the shade north of the house.
A country garden

One motivation for Coloradans who move to the country is to avoid the drudgery of gardening. When the meadows and forests around are filled with flowers that natural gardeners struggle to grow in the city, why bother? Robert and Anette Heapes moved to a hilly, sparsely populated area near Parker in 1972. Not only were there children to raise, but weekends were filled with skiing in winter and hiking in summer.

So rich in flowers were the meadows surrounding Heapes' home that he began photographing them and learning their names. He has identified 185 different kinds of native plants on his property—all persisting with no effort on his part. Six species of penstemons alone occur naturally here: Penstemon angustifolius and P. albidos, both typical of the Great Plains; P. vires and P. secundiflorus usually restricted to the foothills; P. gracilli local in occurrence from New Mexico throughout the Central States and upper Midwest; and P. virgatus var. asa-grayi, the last to bloom, found from the plains to the montane zone in Colorado. The 10 acres of Heapes' land is mixed ponderosa pine and shortgrass prairie. The one thing missing was a rocky outcrop. An area along the driveway near the house had been disturbed during construction and had always invited cultivation. What better place for creating the missing feature?

In the summer of 1984 tons of rock were placed along the patio stretching the entire length of the north side of the house, and outcrops were placed to the southeast as well. A lichen-covered sandstone similar to that in outcrops nearby was used. The philosopy was to create a natural garden using native and natural-appearing wildflowers that would have year around appeal of foliage as well as showy flowers for much of the spring before native meadows came into full bloom.

To obtain the large number of plants needed for such an ambitious venture, Heapes constructed cold frames to grow seedlings and scoured local nurseries for the best plants. He read widely in rock garden literature to find out what to avoid, and volunteered in the propagation and rock garden areas at Denver Botanic Gardens to benefit from their experience.

In barely a year and a half he put together a tremendous collection of choice alpines that have already spread to cover most of the thousand or more square feet of garden he created. So natural is his rock garden construction that most recent visitors assume the outcrops were always there and the house simply built to take advantage of them.

The naturalistic style of this garden blends harmoniously with the surrounding fields and forests. There is an effortless transition between the untended meadows and the carefully planted gardens. The native plants show little urge to expand into the rock gardens proper, nor do the rock garden cushions show any tendency to become weeds. Heapes has been careful to grow mostly choice, slow growing plants in the rock gardens proper. A wide spectrum of creeping phloxes and numerous kinds of penstemons are especially noteworthy, but literally hundreds of unusual alpines are growing rapidly in the virgin soil, some forming large cushions in a surprisingly short period of time.

The various mats and mounds of alpines bloom for a long season. In the mild winter of 1985-1986 blossoms could be found on one or another plant any time the snow melted. What has delighted the Heapes most about their new garden, however, has been the way it enhances the patio areas. Certainly, the woods and meadows around their home were always lovely and interesting. But somehow, the new plantings are so colorful, dramatic and appealing that they find themselves having breakfast outside, and sometimes even lunch and dinner, when the weather is pleasant.
Garden visitors from as far away as Britain and both coasts have come to visit and see this remarkable young garden. This summer, the Heapes hosted the annual meeting of the American Penstemon Society in their garden, and the local chapter of the American Rock Garden Society will hold its fall plant sale there. A lovely garden attracts guests as surely as its flowers attract a host of interesting pollinators.

In many ways this country garden represents the classic ideal of natural gardens. Hardly any neighbors are visible from the garden, only wild meadows and woodlands in all directions. Just as rock outcrops in nature seem to harbor an especially rich assemblage of flowers, so too do the seemingly effortless rock gardens around the Heapes’ home seem to be an intensification of the surrounding landscape. When the annuals in the planter boxes are devastated by hailstorms or untimely frosts, the hard cushions in the rock gardens seem unfazed. These are the plants nature selected to live in variable climates. They look especially vigorous and healthy in their new home, in a country garden.