This is a non-profit organization supported by municipal and private funds.

Denver Botanic Gardens maintains a collection of living plants, both native and exotic, for the purpose of acquiring, advancing and spreading botanical and horticultural knowledge.
Now that the Kathryn Kalmbach Herbarium is located in the Education Building and easily accessible to visitors, workers in the herbarium are becoming very much aware that many people do not understand the nature and functions of an herbarium. Visitors come to the herbarium fully expecting to see a collection of culinary herbs, complete with recipes for their use and directions for their culture. This misconception is by no means limited to the Kathryn Kalmbach Herbarium—Morton Arboretum reports that visitors there have the same mistaken idea, and this is undoubtedly true of other herbaria as well.

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

**What Is An Herbarium?**

An herbarium may be defined as a collection of dried, pressed plants systematically named and arranged for ready reference and study. The plants are carefully pressed and mounted, then labeled with scientific name, place of collection, habitat, name of collector, and other pertinent information.

We might also think of an herbarium as a reference library of pressed plants. Although botanists have always collected and classified plants, it was not until the sixteenth century that they began to preserve plants for future reference and study. The herbarium of one of these sixteenth century botanists, Andrea Cesalpino, was assembled in 1563 and is still in existence in the Museo di Storia Naturale at Florence, Italy. Other very old herbaria are also in existence, for carefully prepared specimens properly stored and handled last indefinitely.

The value of an 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. Today herbaria are to be found in all parts of the world. They are invaluable to taxonomists for reference, study, and comparison.

**The Beginning of This One**

The Kathryn Kalmbach Herbarium had its origin about 1943 as a project of the Colorado Forestry and Horticulture Association. George W. Kelly, horticulturist for the association, was the leader of a group of volunteers who were interested in learning the plants of Colorado, and it was his idea to start a collection of pressed plants of Colorado. George Kelly and Kathryn Kalmbach were the leaders and the inspiration to others in this work. This group of interested people made special collecting trips, as well as collecting as individuals on other mountain trips. The Colorado Mountain Club also helped in this project.

The purpose of this collection was 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.

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 an herbarium of Rocky Mountain plants and for a botanical laboratory. It was also announced that Mrs. E. R. Kalmbach had been put in charge of the herbarium. In the same issue, Mrs. Kalmbach reported that the herbarium had been promised some historical specimens as well as some more recent private collections.

Mrs. Kalmbach served as chairman of the herbarium committee from its inception until her death in 1962.

The hoped-for botanical facilities in the basement of Horticulture House were never fully developed, but the herbarium did have adequate storage space. The tables in the combined library and meeting room were also used by the herbarium, obviously not an ideal arrangement.

As the collection grew, it became necessary to recruit volunteers for help in mounting and labeling these pressed plants. Members of the 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 the specimens.

Money was always a problem, and
blotters, herbarium mounting paper, and other supplies were donated by interested persons.

To Botanic Gardens House

In March of 1959, the Colorado Forestry and Horticulture Association moved from Horticulture House to Botanic Gardens House at 909 York Street. Here the herbarium was housed in part in a small room off The Green Thumb office and in part in converted linen cupboards in the upstairs hall. Workers had to set up tables in The Green Thumb office or sometimes in the hall. Specimens were more readily accessible than they had been at Horticulture House, but it was still an inconvenient arrangement for those who wished to use the herbarium.

It was during this period that the herbarium acquired its first metal herbarium case. In April of 1963 it was announced that the herbarium had acquired three new metal herbarium cases, bringing to four the number of metal cases in the herbarium. A stereoscopic microscope for use in the herbarium and by Botanic Gardens staff has also been acquired. The number of cases was gradually increased until, at the present time, the herbarium has 16.

Later, the small room was needed for a duplicating machinery room and the herbarium was moved to the conference room which it shared with the Mycology group. This room, although crowded, had one large table which could be used as a work table, but it had the disadvantage that it was necessary to schedule meetings in this room. Thus the usefulness of the herbarium was still limited.

Its Present Home

In March of 1971, the herbarium was moved to its present quarters in the Education Building of the Boettcher Memorial Center. The herbarium is now housed in a large, well-equipped room with space for expansion as the herbarium grows. There is a sink, so necessary for working with plants. Adequate tables and chairs provide space for the workers and for those who come to see the specimens. There is a small but adequate attached storage room, as well as cupboard space in the herbarium proper. The facilities also include a display balcony where exhibits of interest to the general public are maintained. We can now assume that the Kathryn Kalmbach Herbarium is located in its permanent home.

The collection of plants that has become the Kathryn Kalmbach Herbarium grew first by purposeful collecting and from gifts of small private collections. From this small beginning, the herbarium had grown to a collection of 2000 sheets when Mrs. Kalmbach reported on the herbarium in the November-December 1960 issue of The Green Thumb. In 1961, she reported the gift of the Hartwell collection, the large private herbarium of a Colorado Springs surgeon. With this addition, the herbarium was expanded to approximately 4000 sheets. When the herbarium was moved to the Education Building, it had reached a size of about 5000 sheets. Late in the winter of 1971, the University of Denver herbarium was moved to Botanic Gardens and incorporated with the Kathryn Kalmbach Herbarium. This doubled the size of the Kathryn Kalmbach Herbarium and brought it to approximately 10,000 sheets.

Special Collections

Specimens in the Kathryn Kalmbach Herbarium are filed alphabetically, first by family, then by genus within the family, then by species within each genus. Two special collections are filed separately for convenience in their use. One of these is the Dr. J. J. Waring allergy plant collection, and the other is the Mt. Goliath collection. Plants in the Mt. Goliath collection were collected and identified by Dr. E. H. Brunquist. This collection is especially useful when people ask to see alpines. Some of the interesting private collections that have been incorporated into the general collection include those of Katharine B. Crisp and M. Walter Pesman. Both Mrs. Crisp and Mr. Pesman were interested in the herbarium from its beginning.

Although the Kathryn Kalmbach Herbarium began as a collection of native Rocky Mountain plants, it now includes plants from foreign countries, most of which were in the University of Denver collection; plants from other parts of the United States as the eastern states, the southwest, California, Washington, and Hawaii; and cultivated plants. Because the Kathryn Kalmbach Herbarium is now
the herbarium for a qualified person who needs no instruction or help in its use. 

Users of the Herbarium

Since moving into the Education Building, the herbarium has been used by a number of individuals who needed help in identifying a certain plant. Out of state visitors have asked to see certain Colorado plants, and recently a nurseryman from Oregon spent several hours comparing some of our Colorado plants with related plants from Oregon which he is growing in his nursery. Research at the American Medical Center has been centered around some plants to be found in Colorado, and workers have come to us for help with identification.

Classes from high schools and local colleges have visited the herbarium and some have spent some time studying plants in our collection. Classes which make direct use of the herbarium are scheduled in the herbarium. For example, a University of Denver class in Local Flora, taught by Dr. William Gambill, made use of the herbarium last spring. The Botany Club of Denver also uses the herbarium.

Workers in the Herbarium

All work in the herbarium is still done by volunteers who have a good knowledge of plants. Because for years the herbarium had no room to expand, many specimens were stored away in boxes. These are now being sorted, mounted, labeled, and filed. The herbarium committee has not tried to verify identifications, except in cases of obvious error, but botanical names have been updated to conform to present use. Some specimens not suitable for inclusion in the herbarium (perhaps because of lack of data) have been prepared for use in educational displays.

As Denver Botanic Gardens grows, it will become necessary to have a trained taxonomist on the staff. Then research as well as teaching will become important functions of the Kathryn Kalmbach Herbarium.

Our herbarium is a small herbarium, but it is gradually increasing in both size and importance. It has come a long way from its very humble beginning. Let us remember that the Kathryn Kalmbach Herbarium would not exist if it had not been for loyal, dedicated volunteers. To date, there has never been a paid employee in the herbarium.

Pictures and Scrapbooks

We have, for example, a collection of pressed flowers carefully mounted and prepared as artistic pictures. A few which are dated show that this was done in 1918 or shortly thereafter. Because they are lovely, we have placed these pictures on the wall in the herbarium proper where they can be seen and enjoyed by those who use the herbarium. These pictures were stored with materials moved from Horticulture House, and no one working in the herbarium at the present time knows their origin. Is there a reader who could tell us where these flower pictures came from?

At the turn of the century, a popular hobby was collecting plants, pressing them, and mounting them in scrap books. Several such books have come to the herbarium and are on display from time to time in cases on the balcony. One interesting scrapbook was given by the Ladies’ Relief Society of Denver, a home for elderly ladies. This book was made by ladies at the home in 1901.

Perhaps our most valuable scrapbook is of special interest to the herbarium and to Denver Botanic Gardens because it was prepared by the father of Katherine B. (Bruderlin) Crisp. This book was prepared and bound by Emil Bruderlin in Central City between 1860 and 1863. It contains 50 species, all in very good condition in this more-than-a-hundred-year old book. The book was presented to the Kathryn Kalmbach Herbarium by the Emil Bruderlin family.

Displays

Visitors to Denver Botanic Gardens enjoy the display area on the balcony. Some displays, in glass-topped display tables or on the wall, are changed infrequently; some are changed two or three times a year or by seasons; some are changed monthly, particularly displays of plants to be found in bloom during a certain month. A popular feature has been a display of fresh plant material, both native and cultivated, which is changed weekly all during the growing season. This display has been useful to those wishing to learn the names of Colorado plants. All displays on the balcony are of interest to the general public. The balcony is open from 9 to 5 daily, or whenever the Education Building is open.

The Kathryn Kalmbach Herbarium is open every Tuesday from 9 until 3, with herbarium workers there to assist anyone who needs help in using the herbarium. It is also open by appointment to be arranged by calling Dr. Helen Zeiner, 722-3655. The librarian will also open the herbarium for a qualified person who needs no instruction or help in its use.

REFERENCES

ever the magazine has sorely needed an editor or contributor, her loyalty has surfaced quickly.

Professionally, she has written about House Plants for the Rocky Mountain News since 1963.

At Dr. A. C. Hildreth's request, Helen became chairman of the herbarium committee after Mrs. Kalmbach's death in 1962. Each Tuesday either she or a member of her committee assists visitors to the herbarium. Last spring the Board of Trustees designated Dr. Zeiner, "Honorary Curator of the Kathryn Kalmbach Herbarium."

Other volunteer activities have been many. With the advent of the Look and Learn Garden Tours in 1951, she served as "expert" each season. In those early days three tours were held each year, beginning at tulip time. This benefit gradually evolved into the Terrace and Garden Tours.

She contributed plants to the earliest plant auctions at Horticulture House; later dug, packaged and labeled plants for early plant sales here at the Gardens; and in recent years has served as consultant in the House Plant section of the Annual Plant Sale.

She was an active member of the Education Committee. Although she was on the staff at the University of Denver when Around the Seasons Club was formed in January 1961, she was a founder of this volunteer organization and has continued to teach its members plant propagation and elements of botany and plant identification. As an Associate she teaches in the classroom for the guide training program. She has spoken at the Botanic Gardens Lecture Series and has given countless talks to garden clubs and plant groups.

A true doctor, Helen exercises extreme patience with her amateur botany students and on Botanic Gardens field trips as her associates readily attest.

Accomplished seamstress and tailor (even quilts), baker of bread, cookies and pies from scratch, skilled artisan in leathercraft, lover of camping, hiking and fishing, and good friend of her fellow workers, Dr. Helen is much more than an eminent botanist, author, columnist, teacher, and curator of an herbarium. She is, most of all, a really successful human being.

Born near Big Timber, Montana, Helen was taken east to Ohio by her parents when she was 10 years old. Her strong interest in nature and wild flowers led her to major in botany when she worked her way, at the proper age, through Western Reserve University. She couldn't major in journalism there but she became extremely proficient in it anyway.

Helen taught English, journalism and botany at junior and senior high school levels before earning her doctorate in archeology at the University of Indiana. For her thesis she studied living plants in the Angel Mound archeological diggings nearby. She taught at the University of Denver shortly after arriving in Denver with her husband, Dr. Fred Zeiner, professor of zoology and native Denverite. (He sometimes jokingly accuses her of marrying him just to return to the West.)

Probably Dr. Moras Shubert, a fellow professor at the University who was active at Colorado Forestry and Horticulture Association, acquainted Helen with The Green Thumb magazine. Her first contribution, "Consider the Ornamental Grasses," was published in June 1950. During the past 24 years she has continued as one of the magazine's valued stalwarts. With formation of the Green Thumb Editorial Board in January 1955 and at George Kelly's request she wrote a series of articles on "Our Marvelous World of Plants." Her first article on "Exotics of Colorado" appeared in April 1961, at the suggestion of Dr. James Feucht, editor at that time. She has written from two to six "Exotics" each year and has continued the column without interruption since 1968. She was interim editor of the magazine in 1963 and more recently served as volunteer co-editor for almost two years. Her articles, "Hail the lowly Rhubarb," "Chinese Elm" and "Red Bud" under "Exotics," her numerous articles on house plants, their selections and care, as well as a comprehensive study on "Begonias"—all have added to the stature of The Green Thumb. On the human side, when...
The Arnold Arboretum at Jamaica Plain, Mass., had been established fifty years when the Morton Arboretum at Lisle, Illinois, made its debut in 1922. Since both areas support similar plant communities, Joy Morton wisely arranged for John van Gemert, Propagator, and Henry Teuscher, Botanist, to spend their first year at the Arnold Arboretum. There they collected propagating materials and herbarium specimens for the brand new Morton Arboretum.

Teuscher had been trained at the botanic garden of the Royal Botanical Museum, Berlin-Dahlem, Germany. When he arrived at the Morton Arboretum in January of 1923, he began at once on a comprehensive collection of the woody and herbaceous plants growing naturally on the grounds. A vouchedered list of these plants was sent to arboreta and botanical gardens throughout the world. This served to introduce the new Arboretum and made it eligible to receive exchange propagating materials, an invaluable asset in developing an extensive plant collection.

Teuscher also began publication of the monthly *Bulletin of Popular Information* which continued till 1965 when it gave way to the *Quarterly*.

The herbarium grew rapidly. Teuscher added nearly 3500 specimens and other American collectors donated more. The Arnold Arboretum shared many of its duplicates from European collectors. Some ranged back as far as 1832 and bore names like V. Komarov and Hermann Zabel. It also presented the young Arboretum with its largest single collection — nearly 4000 specimens of spontaneous woody plants of North America collected by Ernest J. Palmer from 1915 to 1928.

In The Old Milk House

By 1929, nearly 10,000 herbarium specimens were stored in the wooden cabinets of the “old milk house” on what is still known as the South Farm of the Arboretum. Teuscher resigned to become Director of the Boyce Thompson Arboretum, and his duties were assigned to the Arboriculturist, E. Lowell Kammerer. Herbarium work ground to a halt. It remained status quo till after the death of Joy Morton in 1934.

The following year, the present Administration Building was built and given in memory of Joy Morton by his daughter, Mrs. Joseph M. Cudahy. Included was a wing especially designed to house the herbarium. It was a spacious, pleasant room, handsome in decor and lined with metal custom cabinets from floor to ceiling. There were adjacent offices for the Arboriculturist.

Inspired, Mr. Kammerer began an extensive collection of the Arboretum’s woody plants. He kept at it five years. In 1940-41 he hired a summer student to pursue the work. In all, nearly 3000 specimens were added to the herbarium. World War II took its toll. Collecting dwindled once more, this time for nearly twenty years.

Other problems developed. The beautiful herbarium room proved less than satisfactory. Its location was such that a constant stream of casual visitors roamed freely through it. Serious studies were difficult. There were no facilities for the often less-than-tidy preparation of specimens. The floor-to-ceiling cabinets meant in reality that one-third of all storage space could be reached only with a stepladder.
The herbarium stirred to life once more in 1963 when the Arboretum's first Taxonomist, Floyd Swink, was appointed. He began collecting vouchered specimens of positively identified, cultivated, living plants growing on the grounds. This procedure has since become standard practice at the Arboretum.

Full Time Curator

Also in 1963, the Sterling Morton Library was built adjacent to — and entered by way of — the herbarium. Traffic problems became intolerable. By 1968 it was evident the library needed this area for expansion. The herbarium would have to move. The only available space was in a basement classroom beneath the present Administration Building Auditorium.

The herbarium was now down but not out! The Arboretum chose that very crucial time to appoint its first full time Curator of the Herbarium, Mr. Ray Schulenberg. The physical act of moving the herbarium provided an opportunity to reevaluate the arrangement of the collection and to implement changes that would facilitate its use.

Pre-1929 collections were now intermingled with those of later years. Woody and herbaceous plants were no longer separated. Filing was simplified to a single continuous sequence: plant families were alphabetized as were the genera within each family and the species within each genus. All infraspecific taxa were interfiled with the species.

Acquisition policies were revamped from vague “anything goes” to specific goals. Within the Arboretum, the herbarium now vouchers living specimens of all validly described kinds of cultivated woody plants including all significant stages of development. In the geographic region, the herbarium welcomes specimens of all vascular plants (and some cryptogams) occurring spontaneously, also new distribution records for such plants. Outside the region the herbarium gathers woody specimens, both wild and cultivated, relevant to the Arboretum's collections, especially if presumed hardy in this area. If beyond the hardiness zone, they are usually collected on field trips, etc. sponsored by the Arboretum's Education Department.

A vigorous collecting program is again underway. An Assistant Curator has been added to the staff. As with our Denver Botanic Gardens, much credit is given the faithful volunteers who make collecting trips, spot new distribution records, and patiently help with manual tasks such as mounting and accessioning specimens.

Two Goals

True to its primary goals of education and practical research, the herbarium presently serves both needs. Unknown plant material brought in by staff or public is quickly and accurately determined by the staff Taxonomist who uses an authenticated specimen from the herbarium as his standard of comparison. Since 1968, classwork has become extremely popular. Courses such as “Knowing Common Weeds,” “Spring Flora,” and “Cultivated Woody Plants of the Morton Arboretum” require hundreds of specimens. The most recent course teaches the amateur collector how to make his own herbarium.

Highlights of 1972 included the acquisition of three valuable Illinois collections. The first, gift of the University of Wisconsin, consisted of Chicago area plants gathered by L. M. Umbach from 1896 to 1916 while he was Curator of the Herbarium of Northwestern College (now North Central College). The second was a collection of wildflowers gathered around Naperville in 1896 by W. C. Wallachs, then a student of Umbach. The third was a DeKalb County collection made by George H. Greeley around 1886. These gifts help to more accurately complete the picture of Illinois plant communities as they existed before man disturbed their distribution.

Doesn't Compete With The Giant

A few miles east of the Morton Arboretum, the Field Museum of Chicago has a herbarium consisting of over 2,350,000 specimens. The Morton Arboretum herbarium has never attempted to compete with this “giant” in numbers. Rather it has sought to fill a vital gap in the knowledge of the spontaneous and cultivated woody plants of this hardiness zone. Its nearly 25,000 sheets represent 950 genera from 170 plant families. More than half are of wild herbaceous and woody plants. Cultivated trees, shrubs and woody vines comprise most of the rest. A total of 11,000 come from Illinois, over 8000 from the Arboretum itself. Massachusetts, through the generous donations from the Arnold Arboretum, has contributed nearly 2800 specimens.

Ray Schulenberg, Curator, voices hope for the continued progress of the herbarium: “Through gifts such as these (referring to the three in 1972) and through a sound program of continuous collecting, the Morton Arboretum should be of increasing value to scientists and laymen in the Chicago region.”

BIBLIOGRAPHY

We have all heard about the gold stored in the vaults of Fort Knox, but relatively few know of the plant treasure guarded at Fort Collins. There, resting in thousands of shiny pint cans are the seeds of important food stocks from all over the world, plus a growing number of ornamentals. Particularly valuable is the germ plasm of primitive crop plants from which modern hybrids are developed. If these fall prey to blights, disease and insect attack, today's breeders can go back to the original strains and work toward different characteristics.

The Laboratory, a handsome building on the campus of Colorado State University, built in 1958 by the U.S. Department of Agriculture, was the first of its kind in the world. The Director is Dr. Louis N. Bass, a native of Iowa, who holds a doctorate in botany from Iowa State University, where he served on the faculty before coming to Fort Collins when the Laboratory was opened.

Preserve Germ Plasm

"Japan now has a seed storage facility," Dr. Bass explained, "and there are various specialized collections in this country, such as woody plants and tropical fruits, but the concept of preserving germ plasm is so important in a hungry world that the Food and Agriculture Organization (FAO) of the United Nations is looking forward to a global chain of storage facilities to preserve strains which experience has shown are all too easily lost. For example, of the many clovers introduced into the country since the turn of the century, only 2% are available today; 66% of introduced oats and about 90% of soybeans are lost, and this is the case with many other crops."

"We think of this country as being fertile and rich in production of food stock, but Dr. Bass points out that it is surprisingly low in native crop germ plasm and primitive cultivars. The early colonists brought in their cereal grains, vegetables, forages and deciduous fruits. The Spanish and Portugese introduced figs, dates, olives, lemons and oranges. As far back as 1819 the Secretary of the Treasury issued a circular asking American consuls abroad to send back useful plants. From 1836 to 1862 the office of the Patent Commissioner promoted plant introduction and, after the creation of the Department of Agriculture, collectors were sent out to Europe, the Orient and the southern hemisphere. In 1898 the USDA set up a special section of Seed and Plant Introduction, with a budget of $2,000. Since then more than 150 expeditions have gone out and brought back 350,000 plant introductions to U.S. scientists. Some outside help has supplemented the always limited federal budgets, including a program to augment exploration for ornamentals, initiated in 1956 by Longwood Gardens of Kennett Square, Pa.

"Our laboratory," said Dr. Bass, "must be regarded as part of the USDA's Regional New Crops Research Program, which has experiment stations at Pullman, Washington, Ames, Iowa, Geneva, New York, and Experiment, Georgia. While we act as a bank for germ plasm, we also carry on research in techniques of long term seed storage."

"An example of the value of primitive germ plasm may be found in the article, "Retrieving Genes for Space Age Corn" (Agricultural Research, November, 1971). "Genes hidden in corn cultivated since the stone age were salvaged for space-age hybrids when ARS scientists discovered that the primitive kernels have an extra thick aleurone layer. Aleurone, the site of B vitamins and high quality protein just under the kernel hull, is two to five cells thicker in primitive Corioco corn than in U.S. commercial hybrids. Thus, Corioco, which grows on the eastern slopes of the Andes Mountains, might serve as parent stock to improve the nutritional value of U.S. hybrids."

Operations at the Laboratory

Research workers may submit obsolete varieties, current varieties, breeding lines and genetic stocks for storage. In the laboratory, seeds become the property
of the federal government and are available, as needed, for further research. All seeds coming in are tested for viability, their characteristics cataloged on punch cards for easy retrieval and then stored in cans on shelves in rooms kept at 40 degrees and 32 percent relative humidity. Every five years tests are made and, if germination is poor, contracts are arranged to replenish the stock. For testing, a certain number of seeds are placed on blue-gray germination paper or special towelling, and then set in moist chambers providing favorable germination conditions, similar to their native climates. There are more than 80,000 cans on the shelves today, with space for a half million lots.

Thanks to the Storage Laboratory, now, if wheat rust appears, sturdier tomatoes are needed for mechanical harvesting, or corn blight attacks, scientists can go back in time to a choice of strains to develop hybrids suited to today's needs and conditions.

Some foreign governments have placed seeds in storage. There are corns from Africa and sorghum from India, but, when samples are requested by their research workers, the procedure can be complicated, what with quarantines, permits and all the involvements of "going through channels."

Plant patents are protective up to seventeen years, and, according to Dr. Bass, this is usually long enough since the commercial life of a variety can be brief due to constant change — as any seed catalogue indicates. Among the items in storage is seed for all the phased out vegetable varieties from the Cheyenne Experimental Station, notably a large collection of tomatoes.

**Inventories and the Budget**

Inventories are published at intervals and it is evident that the value of the stock will increase steadily. There are fewer isolated areas in the world now where collectors may find the primitive strains. Varieties become obsolete and are almost forgotten or discarded. Other seeds are lost under poor storage conditions. The Laboratory, for example, takes pride in its part of saving the classical Blakeslee Datura collections.

Asked if cuts in federal spending had affected the work of the Laboratory, Dr. Bass reported ruefully that its budget has never been increased since the opening in 1958! With today's inflation this means a smaller staff, less frequent testing and many other corners that must be cut. Such stringency seems hard to understand in view of the Laboratory's present and potential value to researchers working to improve the world's food supply, to establish pollution and sound barriers along highways, airports and urban areas, to restore lands stripped of natural vegetation, and to enrich the forage of our western rangelands.

The storage room of this quiet Laboratory may resemble a supermarket with the colorful labels shorn from the cans, but, with a little imagination, it becomes a fantastic place. Here, waiting like the jinni in the magician's bottle, are macadamia nuts from Hawaii, papaya from Puerto Rico, sorghum from Ethiopia, wheatgrass from Russia, melon from India, sweet basil from Turkey and chrysanthemums from Japan. Here, indeed, is living treasure!

---

DENVER BOTANIC GARDENS
909 York Street, Denver, Colorado 80206

I hereby apply for membership in the Denver Botanic Gardens □
I wish my membership in the Denver Botanic Gardens extended □

Enclosed is $ __________________ for my annual dues.

Class of Membership desired: (check one)

□ Junior . . . . . . . . . . . . . . . . . . . . $ 2.50
□ Regular . . . . . . . . . . . . . . . . . . . . . $ 7.50
□ Supporting . . . . . . . . . . . . . . . . . . . . . . $ 25.00
□ Contributing . . . . . . . . . . . . . . . . . . . . . . $ 50.00
□ Participating . . . . . . . . . . . . . . . . . . . . . $15.00
□ Business & Education Institutional — $100.00

Name ____________________________
Address __________________________
City __________ State __________ Zip Code ________
NEW BOOKS in

The Helen Fowler Library

Solang Huggins


A new readable book, well illustrated in black and white and in color, on a currently very popular subject, is always welcomed. The vogue towards terrarium gardening may be due to space — lots or limited, to the variety of expression possible, and perhaps to the small amount of care needed after the initial effort. These possibilities are explored in this book and the authors show you how with words and pictures. Sources of plants, glass and plastic terrariums, equipment and supplies, form a valuable appendix.


In the second edition of a basic work, the authors have set as their aim "to give practical and necessary information on selecting, building, equipping and managing a greenhouse, and modern methods for growing familiar as well as unusual and exotic plants."

The authors live up to their commitment and meet the needs of the novice as well as the experienced greenhouse gardener. The book is well illustrated, lucid as well as enjoyable reading.

Andrew Knauer


Dwarf rhododendrons are not about to become the "new petunia" of Western gardens. Although there is some special potential among a few super hardy dwarfs like "P. J. Mezzit" and "Ramapo," rhododendrons are likely to remain a very specialized and limited garden subject in High Plains and Rocky Mountain gardens.

This British publication treats the subject comprehensively. Its nomenclature is up to date and certainly most, if not all members of the Rhododendron genus which are usually 5 to 6 feet in height or less are discussed.

Read chapters 1 through 4 with great care and discrimination before plunging into the world of the elegant rhododendron.

MARGARET McLISTER

A TRIBUTE

Margaret Boehner McLister was born in Leadville. Her father was a mining engineer of German background and education, her mother a New Englander of long tradition in Massachusetts.

In her early adolescence the family moved to Denver. Educated in Leadville and Denver public schools, Margaret soon took her place in this community.

As a young woman a long sojourn in Europe awakened her interest in other cultures, an interest which increased during her many journeys to the Orient and to South America.

Her marriage to Frank McLister, a life-long contract happily fulfilled, saw the beginning of her many volunteer services to this community. The excellence of these remains a tribute to her citizenship. She was an early member of the Junior League. Membership on the Boards of Byers School, the Denver Orphans Home, the Children's Hospital, and war work with the Red Cross followed.

As a member of the Garden Club of Denver and of Ikebana International she took part in various horticultural activities.

Her first priority among these many interests was her dedication to Denver Botanic Gardens of which she was an early member of the Board of Trustees. Her commitment to The Gardens was shared by her husband. Evidence of their generous financial support and of her unremitting hours of service is visible in the entrance gate to The Gardens — the gift of Margaret and Frank McLister.

To her many friends, Margaret McLister has left a priceless, though intangible, legacy — the poignant remembrance of her loyalty, her solicitude and her affection.

Anna R. Garrey
FOCUS on
Cyphomandra Betacea

in the
Boettcher Memorial
Conservatory

Peg Hayward

Cyphomandra betacea (Cav.) Sendt., the tree tomato, is a small, softwood, evergreen tree or bush, growing from 8 to 12 feet high. Cyphomandra from the Greek refers to the way in which the anthers form a hump. The genus Cyphomandra belongs to the family Solanaceae and is, therefore, related to the potato and the common tomato. Only one species, betacea, is cultivated.

The tree tomato is a native of South America. It was cultivated by the Indians of ancient Peru for its fruit. The plant is not cultivated to any great extent in the United States or Europe, although, it is fairly easy to grow in a greenhouse or conservatory as a pot plant.

Cyphomandra betacea has spreading branches and large, soft-pubescent and drooping leaves. The leaves are simple, spirally arranged but appearing to be alternate, and are commonly about 6 inches by 4½ inches. They are medium green, but dark pink when very new and small. The margins are entire but are wavy, and the apex is pointed with a sharp and slightly curved tip; the base is heart-shaped. Leaf-stalks are up to 6 inches long. Leaves and new wood have an unpleasant smell when crushed.

Small pinkish, fragrant flowers droop from short, slender stalks in loose axillary clusters. There are 5 sepals, 5 pale pink or cream, waxy petals which are joined at their bases, and 5 very short stamens with yellow anthers forming a short, tight column concealing the one style. The flowers usually appear in spring, although under ideal conditions the plant flowers continuously.

Fruits are heavy, hanging from long green stalks, 1 or more in a bunch. They are egg-shaped, and pointed at one end, about 2 to 3 inches long by 1½ to 2 inches wide. The smooth skinned fruits are a greenish purple colour at first, ripening to an orange-red, faintly striped with dark streaks. Inside is a firm rind about ¼ inch thick, which has two stony and uneven-shaped lumps embedded in it. The orange pulp in the center is divided in half by a thin wall of firm flesh. In the pulp are many small seeds coated with an orange-coloured mucilage. Fruits are eaten raw when fully ripe. The flavor, which is distinctive, is acid and slightly sour. The rind is bitter and should be avoided. Their chief use is for jams and preserves or for stewing. The tree tomato is an unusual fruit which ought not to be unusual.

Propagation is usually from seed which germinates readily, but it can also be started from cuttings. The compost in which it is grown should be a rich loam to which leaf mold and well-rotted manure have been added. During the winter it should be watered moderately, but during the summer it needs abundant watering. The plants need pruning in April to restrict growth and prevent straggling. The tree tomato is a quick grower and can be expected to produce fruit in its second year and continue bearing throughout the year.
In 1894. Immediately after his arrival here he began experimenting with plants, developing new varieties of iris, a spurtless columbine (now lost), and cacti. He became a pioneer and an authority in the raising of grapes in Colorado.

During World War I Dr. Cutler did expert work with Indian corn for the United States government and established the largest botanical and pharmaceutical garden in the west. His large herb garden lay just off University Boulevard, north of the Warren Avenue entrance to the campus. Monkshood, raised there, was supplied to the producers of digitalis. His corn experimental plot was at the corner of South Josephine and Evans.

Many of the large trees, particularly the evergreens on the university campus, were planted by Dr. Cutler.

In 1900 the Cutlers purchased the comfortable home on South Clayton Street in University Park and Dr. Cutler landscaped the property, planting the trees and an extensive garden. Four of the trees there are listed as unusual in E. Alan Rollinger’s "Pioneer Trees of Metropolitan Denver" (1969): Horse-chestnut, Aesculus hippocastanum; English Oak, Quercus robur; Eastern Hickory, Carya ovata. The pine is perhaps the largest specimen of that tree in Denver, and the hickory, magnificent in fall coloring, has been called by the City Forester one of two such hickories in the city.

A man of wide-ranging interests and great accomplishments, Dr. Cutler was not limited to his botanical field. He was an artist at arranging cut flowers and through all his 38 years of service was in charge of the decorations used...
Dr. Cutler made his mark in music, organizing in 1900 the University's first glee club, of which he had charge for a score of years. He supervised the publication of the first edition of "Denver University College Songs," containing some of his own compositions. Later he wrote the words and music of "Hail to Denver U.," still popular.

Dr. Cutler taught geology, as well as botany, doing extensive work in the fossil fields at Florissant, Colorado. Some specimens he excavated in the Southwest are in the museum at Washington, D.C.

This exceptionally broad man had an intense interest in youth. He formed a boy's club which later became the first troop of Boy Scouts organized west of the Mississippi River. Dr. Cutler served them in many capacities until 1933.

"Who's Who in America" reveals that he was at one time commander of the R.O.T.C. at Denver University, and that he had been national president of Phi Sigma.

In later years he was eminent in ornithology, starting a collection of Colorado birds, expanding it to birds of the whole country, forming the nucleus of the university's collection.

These many interests he never gave up; he continued his activities in them and added, at last, china and pastel painting, knitting, crocheting, tatting, needle point, metal and wood work.

Dr. Cutler retired from the university in 1935 and died May 25, 1936.
A Colorado Orchid

THE
SPOTTED CORAL ROOT
Corallorhiza maculata

The Veins of other Flowers
The Scarlet Flowers are
Till Nature leisure has for Terms
As "Branch" and "Jugular."

We pass, and she abides,
We conjugate Her Skill
White She creates and federates
Without a syllable.

Emily Dickinson
c.1864

Carol L. Radetsky

The family name Orchidacea comes to us from the Greek philosopher Theophrastus, student of Plato and Aristotle between 370 and 285 B.C. It is derived from the word Orchis. In Greek, the word Orchis means 'testicle' and was used because of the resemblance of the paired roots or bulbs to the testicles of animals.

During medieval times when medical thought was supported by the Doctrine of Signatures, preparations from these roots or bulbs of specific orchids were used for the stimulation of sexual activities. Many people thought that a child of the required sex could be produced with the help of these roots; a preparation from the younger one of a pair of these roots was believed to assist in the bringing about of a male child and from the older a female child.

Orchids represent the largest family of flowering plants. There are some twenty thousand species already identified with this number steadily increasing. About twenty-two of these species are found in Colorado. Orchids are generally accepted as outdoing other flowers in beauty. They have acclimated themselves to the extreme habitats of the arctic circles, mountains, and the arid regions of Africa and Asia.

Construction of the Orchid

All orchid flowers are constructed in such a way that they can almost always be distinguished from any other flowers. The orchid family belongs to the Monocotyledons; they possess a single seed-leaf or cotyledon. The leaves have almost always a parallel venation and the flowers are tri-merous – that is, each successive whorl consists of three elements termed sepals which protect the bud. The three members of the next whorl are the petals. They are usually colored and often larger than the sepals. The whorl formed by the sepals is the calyx, and the one formed by the petals, the corolla. Both the calyx and corolla form the perianth which encloses the sex organs. Monocotyledons usually consist of six stamens and an anther being pollinated by insects. The phenomena of pollinating is fascinating indeed. The unknowing insect must brush over the stigma on the column before reaching his particular goal of the nectar. With this mechanical brushing he deposits any pollen he might be carrying. Receiving his fill of nectar, the insect unwittingly comes in contact with the anther, picking up more pollen to be carried on to the next flower and thus, pollinating occurs.

The Spotted Orchid

The specific orchid of interest is the Spotted Coral Root. It was placed in the genus Corallorhiza in 1760 by J. J. Chatelain of France. The word Corallorhiza comes from the Greek words meaning coral and root. The species name is maculata. Coral roots are leafless, the leaves being reduced to sheaths and scaly bracts devoid of green color. The stems are naked forming the racemata from which the flower hangs in a subdued manner, cloaking the somber colors of a reddish-brown stem. The petals are white with purple spots near the base of the lip, hence maculata meaning spotted. C. maculata stands about six to eight inches tall with flowers about ½ inch in length alternating on the stem. The Spotted Coral Root nests on the forest floor near pine and spruce trees. The plants have no chlorophyll which precedes photosynthesis for nutrients. Therefore, nourishment for C. maculata is saprophytic, absorbing food from decayed wood soil under forest trees or from moist leaf-mold in symbiotic style.

The Spotted Coral Root in North America is found from southeastern Alaska to Nova Scotia, ranging southward on the west coast from British Columbia to California, and in the middle states of Colorado, Michigan, New Mexico, Ohio, Nebraska and Missouri. On the east coast, the coral root is found from New York and the New England states southward to Georgia and Florida. Being relatively prolific and perhaps the most common of the wild orchids, the coral root also pollinates in the north temperate regions in parts of Europe and Asia. The particular orchid photographed was found growing on the south side of a mountain at an altitude of 8300 feet in the montane zone. It was located in an area above Evergreen in Clear Creek County, flowering in the later part of June and in the month of July.

Coral roots are difficult if not impossible to propagate. Seeds are produced in abundance, but are so small that each seed has only minute amounts of food to give it a start until it can establish its own root system. Attempts at transplanting the orchids have also failed. Thus "the Royal Family" of wild orchids eludes the hand of man.
Picea glauca is an important component of the northern coniferous forest or boreal forest formation which extends across the North American continent in a wide band stretching from Labrador to Alaska, bounded on the north by arctic tundra and extending southward to the New England states, the lake states, across Canada and to the Pacific coast at Cook's inlet. A southward extension along the Rocky Mountains reaches into Montana. The variety *denstata* occurs in South Dakota — hence the name Black Hills spruce.

Because of the climatic changes which occur as altitudes increase, the subalpine forests of Colorado grow in a climate similar to that of the northern coniferous forest. Our Engelmann spruce forests can be considered as an ecological equivalent of the northern coniferous forest. The climate and the life form of the trees is the same — only the species are different.

**Gifts and Bequests**

Lifetime and testamentary gifts to the Denver Botanic Gardens are deductible in computing both income and death taxes. The Trustees ask anyone who wishes to add to the Gardens limited resources to consider making a gift of either real or personal property during life, or a bequest or devise by will. Such disposition can be made specifically either for the Development Fund or the Endowment Fund or both. The proper designation of the recipient is The Denver Botanic Gardens, Inc., a Colorado Corporation.

**FORM for GIFT or BEQUEST**

I hereby give [ ] bequeath [ ] to The Denver Botanic Gardens, Inc., a Colorado Corporation, a non-profit, educational institution, the following:

Endowment Fund, Amount: ____________________________ Development Fund, Amount: ____________________________

to be applied for the purposes of The Denver Botanic Gardens.

Name ___________________________________________

Address _________________________________________

City ___________________________ State ___________ Zip _________

Signature _________________________________________

Phone ________________________________
THE GREEN THUMB

BOOKS in the HELEN FOWLER LIBRARY
Books on Herbs, Solange Huggins, Summer P. 69
Books on Trees, Solange Huggins, Summer P. 61

CHATFIELD ARBORETUM
An Arboretum for Denver, Green Thumb Report, Summer P. 34
The Story of the Land, Green Thumb Report, Summer P. 37
State Recreation at Chatfield, Gene Knight, Summer P. 41
State Forest Service Plans, Green Thumb Report, Summer P. 43

COMPOSTING
Simple Composting for the City Garden, Wes Woodward, Autumn P. 92

DENVER BOTANIC GARDENS
Arboretum – See Chatfield Arboretum
Boettcher Memorial Conservatory – See Focus on . . .

GUILD, Mid-Summer Annual Garden Tour, Summer P. 47
Helen Fowler Library, See Books in Helen Fowler Library
Kathryn Kalmbach Herbarium, Helen Marsh Zeiner, Winter P. 98
Plant Sale, Plant Auction to Plant Sale, Bernice Petersen, Spring P. 28
EXOTICS OF COLORADO, Dr. Helen Marsh Zeiner
Daffodil, Spring P. 26
Tomato, Summer P. 56
Honey Locust, Autumn P. 71
White Spruce, Winter P. 124

FOCUS ON . . ., Plants in the Boettcher Memorial Conservatory, Peg Hayward Callistemon, Summer P. 54
Magnifera Indica, Autumn P. 82
Cyphomandra Betacea, Winter P. 116

GARDENING
Fall Clean-up, Putting Your Garden to Bed, Raymond A. Blue, Autumn P. 84
The Homestead, Circa 1973, Glen Mentgen, Autumn P. 88

HERBARIUMS
The Kathryn Kalmbach Herbarium, Helen Marsh Zeiner, Winter P. 98
The Latchstring is Out at the Morton Arboretum Herbarium, Avalon Kosanke, Winter P. 106

INSECTS
Women's Lib in the Insect World, J.W. Brewer, Autumn P. 73

LATCHSTRING IS OUT, Avalon Kosanke
At the Holden Arboretum, Summer P. 44
At Longwood Gardens, Autumn P. 76
At the Morton Arboretum Herbarium, Winter P. 106

LETTERS to The Green Thumb
Barron, Mrs. Arch (Gloria), Autumn P. 96
Congdon, Edwin A., Summer P. 57
Mitchell, Irene, Summer P. 48
Wallace, Edmund W., Summer P. 48

MARINE ALGAE
The Fascinating World of Marine Algae, L. W. Hagener, Summer P. 49

MUSHROOMS
Mushroom Hunters, Four Do's and One Don't, D.H. Mitchel, Summer P. 49

PEOPLE
Dr. Cutler and the Denver University Rose, Green Thumb Report, Winter P. 118
Margaret McLister, A Tribute, Anna R. Garrey, Winter P. 115

SEEDS
Our National Seed Treasure, Josephine Robertson, Winter P. 110

SUBJECT INDEX
Subject Index, 1973, Winter P. 126

TREES

Physiology of Freezing Injury and Cold Hardiness, Bert T. Swanson, Spring P. 12
Observations Following the Freezes of 1969 and 1971, James R. Feucht and Bert T. Swanson, Spring P. 17
Selection of Shade Trees for Denver-High Plains Conditions, Andrew R. Knauer, Spring P. 20

Books on Trees in the Helen Fowler Library, Solange Huggins, Summer P. 61

White Spruce, Exotics of Colorado, Helen Marsh Zeiner, Winter P. 71

Honey Locust, Exotics of Colorado, Helen Marsh Zeiner, Winter P. 124

WILDFLOWERS
Spotted Coral Root (orchid), Carol L. Radetsky, Winter P. 122

Dr. Helen Marsh Zeiner, Green Thumb Report, Winter P. 104
Denver Botanic Gardens maintains a collection of living plants, both native and exotic, for the purpose of acquiring, advancing and spreading botanical and horticultural knowledge.