A botanic garden is a collection of growing plants, the primary purpose of which is the advancement and diffusion of botanical knowledge. This purpose may be accomplished in a number of different ways with the particular placing of emphasis on different departments of biological science.

The scientific and educational work of a botanical garden center around the one important and essential problem of maintaining a collection of living plants, both native and exotic, with the end purpose of acquisition and dissemination of botanical knowledge.
THE GREEN THUMB
VOLUME TWENTY-FOUR, NUMBER TWO

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President's Annual Report For 1966

T he formal dedication on January 15th of the Edna C. and Claude K. Boettcher Memorial Conservatory was the highlight for the year 1966 in Denver Botanic Gardens. Although we had no turnstiles at the opening, when the largest crowds appeared, from April 20th through December 31st we counted 163,000 visitors. Between October 1st and December 31st our Conservatory Tour Guides conducted over one hundred guided tours which included scouts, churches, schools, handicapped, and many other groups. Guides were on duty from 10:00 a.m. to 4:00 p.m. daily. These Tour Guides are volunteers who have been trained to identify some 800 tropical and sub-tropical plants grown in the Conservatory. At the moment we have 35 trained guides. Mrs. P. H. Hayward is chairman of the Tour Guides.

Of inestimable value to our work in Denver Botanic Gardens have been the greenhouses and laboratory rooms connected with and used in the operation of the Conservatory. Having two laboratory rooms, cold storage space for bulbs, seeds and nursery supplies plus teaching space, has been of tremendous help. For all of this we are indebted to Mrs. James J. Waring.

The May-June 1966 issue of The Green Thumb magazine was devoted to the Boettcher Memorial Conservatory. This issue described the buildings, plants, maintenance and numerical identification of over 200 plants.

The Gift Shop, managed by The Associates of Denver Botanic Gardens, was moved from Botanic Gardens House at the time the Conservatory was opened to the public. Mrs. C. V. Petersen, Chairman of the Gift Shop Committee, coordinates the duties of volunteers who greet the public, answer the telephone, perform necessary secretarial detail, and sell merchandise. Through the efforts of Mrs. Hayes W. Neil the Shop has built up a regular listing of 160 book titles. The Shop has consistently shown increased sales and profits, all for the good of Denver Botanic Gardens.

One of the surprises for the use of the Conservatory building has been the South Room. Originally planned as a coffee shop or snack bar, it has been in constant use for every other purpose, including such things as displays, art exhibits, meetings, special events and Gift Shop special sales.

A fine bronze fountain sculptured by Edgar Britton was presented to us by the Assistance League of Denver. It was installed, on a temporary basis, in one of the pools in the Conservatory.

Maintenance of the various Denver Botanic Gardens units was hampered by lack of funds during the past year. The 1966 budget allotment was not sufficient for the needs of both Conservatory and grounds, and, since the Conservatory took priority over any other operation, many activities were postponed or eliminated in the Gardens. We believe that this problem has been overcome, and that in 1967 our letters from the public will be compliments on beauty and not complaints on weeds.

Fortunately the Gates family assisted in, if not virtually maintaining the beautiful Gates Garden. We were also assisted in the maintenance of the Lew Hammer Garden by Junior Girl Scout Troop No. 552. Two hundred and thirty other Girl Scouts helped with general garden maintenance throughout the summer months.

The Children's Garden program, as always, was a popular attraction and success. It ended with the usual Fair, graduation ceremonies and the awarding of special prizes.

In the main garden, plots of tulips, irises, gladioli, day lilies, petunias, marigolds, roses, dahlias, dianthus, verbena, annual phlox, ground covers and hardy chrysanthemums afforded a striking display of color from early spring to fall.

Guided tours of the grounds were coordinated by Mrs. T. B. Washburne, who was assisted by eight trained volunteer guides. Service groups, school units, and garden clubs were represented among the approximately 800 people who were conducted through the gardens.

The City Park Unit, consisting of about 100 acres, saw no major development during 1966. The labor force was insufficient, but the Rose Garden, Rainbow Iris Garden, DeBoer crab apple collection and lilac collection were maintained reasonably well.

The Mt. Goliath Alpine and Sub-alpine Unit plants have been partially labeled along the M. Walter Pesman Trail. Printed signs explaining the ecology and geology were installed along the trail. The signs were illustrated with line drawings prepared by Mrs. Walter B. Ash.

A 15-acre site on Bear Creek Canyon, ten miles west of Evergreen was willed to Denver Botanic Gardens by Mrs. Kuth Wallace Reed. We expect to have the title to the property early in 1967. This site will be an ideal place for ecological research, especially in conjunction with requested grants, study area, and additional testing site.

The Herb Garden, a gift from Denver Botanic Gardens Guild, was formally dedicated July 19, 1966. The "Boy and a Frog" statue, a cement casting of a bronze work by Elsie Ward Hering, sculptress, occupies a place in the center of the conventionally landscaped plot. It was dedicated along with the Herb Garden. The Guild has done an exceptionally fine job of creating and maintaining this garden.

Considerable unanticipated expenses have been incurred during the year, such as replacing the furnace at 909 York Street, etc., but they have all been absorbed, thanks principally to the financial assistance received from many sources.

Our Library Committee acquired a specially constructed case, donated by Mrs. Alexander L. Barbour, for the safe-keeping of rare and unusual books. She also contributed additional funds to the library.

During the year, nineteen botanical organizations held regular meetings in Denver Botanic Gardens. The average number of monthly meetings, including the organizations, was twenty-eight. Courses, for the adult gardening public, lessons in botany and other educational programs were conducted throughout the year with varying attendance. A more specific program is planned for 1967.

Administrative duties, office detail, bookkeeping, maintenance work and publicity were effectively and efficiently cared for, all by our small staff of employees.
Dr. A. C. Hildreth retired as Director of the Gardens August 31st, 1966, and the Board of Trustees conferred upon him the title of Director Emeritus. We appreciate the years of unselfish time and devotion that Dr. Hildreth gave to his work here. He plans to remain in Denver, and we feel certain that he will retain his interest in our work.

Dr. L. B. Martin, formerly of Los Angeles County Department of Arboretum and Botanic Gardens, accepted the position of Director, as of August 29th. Mrs. Beverly Pincoski was promoted to the position of Botanist-Horticulturist, and Mrs. Alice Willis was retained to handle publicity and public relations.

The Associates of Denver Botanic Gardens, formed in 1964, in cooperation with the Guild and the Around The Seasons Club, launched our most successful Plant Sale in 1966, realizing for Denver Botanic Gardens over $6,000.00. We are indebted to them all and especially to the chairman of the Plant Sale Committee, Mrs. Jess Gibson, and her 279 hard-working assistants.

An item of importance concerns the future of Horticulture Hall. You are aware that a part of the funds were raised in our drive. The matter was allowed to “rest” for a few months, then in December authorization was given for a feasibility study to be made to determine what efforts are required to accomplish the desired goal. A subsequent report will be made to the membership.

It has been an honor and pleasure to have served as your President, and I wish now to publicly thank our entire staff, the Board of Trustees, the Executive Committee, Committee Chairmen, and everyone else who has been of such fine assistance in making this another memorable year in the growth of Denver Botanic Gardens.

CHINESE HIBISCUS For Colorado Gardeners

A. C. HILDRETH

Tropical trees and shrubs for Colorado gardens are not as fantastic an idea as it may seem. In fact, our gardeners have been growing them for many years. As examples, fuchsias, which we treat as annual bedding plants for shady places, are actually small trees in tropical regions, and Pelargonium, the garden geranium, in the tropics is decidedly shrubby.

During recent years, some interest has been shown by Denver gardeners in another tropical tree or tall shrub, Hibiscus rosa-sinensis, the Chinese hibiscus. The Denver Parks Department experimented with it for a few years as a possible bedding plant. Cuttings were made in the fall and rooted in the greenhouse. The plants were grown in pots until time for setting them out in beds in late spring or early summer. They flourished and developed into attractive green shrubs. However, as they bloomed only near the end of the growing season and produced only a few flowers, the project eventually was abandoned. The shrubs did not survive the winters out-of-doors.

In the summer of 1965, Denver Botanic Gardens tried out several varieties of this hibiscus under simulated patio conditions. The shrubs were in containers in which they had been grown for nearly a year in a south Texas nursery. They bloomed satisfactorily and attracted considerable public attention. As a result, several container-grown hibiscus plants were offered at the Annual Plant Sale in 1966. Purchasers reported satisfaction with them as patio plants.

Nearly everyone who has visited the Denver Botanic Gardens Conservatory and its auxiliary greenhouses has observed that Chinese hibiscus plants grow and bloom very well under glass. (See Conservatory Plant of the Month article in this issue.) They should be good material for hobby greenhouses.

People who have tried them as houseplants are enthusiastic about them. They do well in the warm, dry air of our modern living rooms. If given a sunny location, they bloom almost continuously.

From these experiences it may be
concluded that the Chinese hibiscus is a desirable house plant and a good year-around flowering shrub for a hobby greenhouse. The plants can be grown out-of-doors in our climate only during the frost-free months when they make successful pot or tub plants for the lanai or patio. They are not suitable for transplanting to the garden as bedding plants although specimen plants in containers might be grown and flowered successfully in the garden by plunging the containers in the soil.*

Hibiscus rosa-sinensis is probably native to China but has been widely distributed and is now perhaps the most popular ornamental plant in the tropical and subtropical parts of the world. The plants are evergreen and the foliage is typically dark green and glossy. There are, however, variegated forms with red and white leaf markings. "Snow Queen" is a cultivar having foliage mottled and splashed with white.

The flowers may be single or of different degrees of doubleness and six inches or more in diameter. Plant hybridizers have produced some gorgeous named varieties ranging from white through various shades of yellow, orange, pink and red and numerous striking color combinations.

Most of the cultivated varieties can be propagated readily by cuttings, much as geraniums are handled. In general, the plants have no special cultural requirements other than that ordinarily given to woody plants, such as watering, fertilizing and pest control.

Any plant so widely cultivated as the Chinese hibiscus must be adapted to many different kinds of soils. Like most tropical plants it needs a porous, well-drained soil that will insure a good oxygen supply to the roots. Given light and warmth and ordinary care, the Chinese hibiscus will reward the Colorado grower more generously than will most other tropical plants.

*Editor's Note. Chinese hibiscus plants in containers will be offered at the 1967 Annual Plant sale at Denver Botanic Gardens, May 12 and 13.

1967 ANNUAL PLANT SALE

Bigger — over three times the number of potted plants will be available to customers at the 1967 sale. Plus all types of outdoor plants.

Better — because of having had a full year to carefully prepare and select only choice species and varieties that are HARDY in the Denver area.

WALTER WILSON

HARDY CACTI

The sale of cacti at last year's plant sale gave us a better idea of what people wanted. It furnished us with a real challenge and a bigger "goal to accomplish."

Space will not permit listing all the plants available, but I'll mention the favorites requested based on the beauty of the flower, ease of care and how well they fit into those hard-to-grow spots, rock gardens, cactus beds or native theme. Here are a few:

Probably the most sought after cactus in Colorado, as elsewhere, is our Echinocereus caespitosus, purple candle, native to the southeastern part of Colorado and very hard to find in the field. This cactus deserves high praise for its exceptionally large, beautiful rose-purple (magenta) flower. Occasionally the color will vary from pink to deep purple. In their natural habitat, the flowers last for one day only but home-grown specimens will stay open for three days, probably due to tender, loving care (more water and less arid conditions). They will tolerate normal watering and will grow in any flower bed in part shade as well as full sun.

All Echinocereus are called "hedge-hogs." Others in this family are E. viridiflorus with pale green flowers which completely skirt many plants resulting in the common name of hen-and-chickens. These are recommended for those hot, dry spots which are well-drained and kept on the dry side. E. roemeri, beehive cactus, which grows into a huge clump that looks like a beehive, has orange-red flowers, 2" wide, funnel-form, some recurved petals with purple stamens. It will tolerate normal watering during summer months, likes full sun but will tolerate partial shade. It bears profuse bloom during mid-June into July. E. triglochidatus, strawberry cactus, king's crown or claret cup, has a scarlet flower and blooms freely from mid-June into July. Also has purple stamens, green stigma and lobes (similar to E. roemeri and closely related and hybridized). These plants will grow and flower equally well in full shade or sun and will grow into large clumps with normal watering.

Echinocereus coccineus, and varieties, which are known by several common names: bunch ball, Turk's head, heart twister and the variety Inermis.
(spineless) all have similar flowers to the preceding varieties of *E. roemeri* and *E. triglochidiatus*. As in all cacti there are variations in form and flower. They are all transitions or hybrids. Into this same group we can add *E. gono-canthurus*, robust claret cup hedgehog, listed in "Cacti of the Southwest" by Earle (available in our conservatory gift shop). It has scarlet flowers and central spines over 5" long. Will grow equally well in part shade or sun with normal watering during summer months.

Getting into another group of ball or barrel cacti, *Pediocactus simpsonii*, mountain cactus, has flowers in many shades of pink circling the crown of the plant. Sometimes they vary from white to yellow. We have some unusual forms of crests with multi-heads or off-sets which we call "flower pot pedios," for when they are in full bloom they look like a bouquet of flowers. Pedios are tolerant to lots of water, if in well-drained soil, and will grow well in part shade or full sun. They start flowering in late April if grown in full sun, later, if in the shade. Colors of spines vary according to terrain, some actually mimicking the soil in which they grow. For instance, there are white-spined ones, called snowball pedios, and others yellowish to golden, red to rusty brown and off-white to gray spines.

Last year's early sell-out was: *Coryphantha vivipara*, spiny stars, ball cactus. This is another plant outstanding for its pink to pale-purple (magenta) flowers coming out of the top of the plant. It grows best in full sun, is very tolerant of water and partial shade or dry spots if well-mulched.

Another much-requested cactus was *Opuntia arborescens*, tree cactus, cane cactus, bush cactus, etc. Flowers vary from rose-pink to purple. This is a fast grower from cuttings and grows into a large bush (tree) in a few years under cultivation. So allowances must be made for growth. It is more tolerant to dry areas and likes to dry out between waterings, will do well in part shade and, like all hardy cacti, must be kept dry in winter, depending entirely upon normal rain and snow.

There will also be a good selection of *Platyopuntias* (flat pads) called prickly pear, dwarf, hunger, starvation, grizzly bear, porcupine, wide, brittle and triangle cactus. All have variable flowers that range in color from golden yellow, orange, salmon, pink, red and scarlet. All will do best in full sun. Some will do well in part shade, but they will flower poorly in full shade. All are ideal for those hot dry spots that get only occasional water. Over-watering and soggy conditions are the nemesis of any cactus.

In the interest of preservation, some of these cacti have been literally "rescued" from areas all over the state where destruction was imminent in the immediate future because of bull-dozing many thousands of acres for industrial and housing developments, for new roads and widening of highways. The Colorado Cactophiles have made a continuous effort to preserve these fine cactus specimens wherever it is feasible.

**Tender Cacti**

*Zygocactus truncatus*, Christmas cactus. Highly esteemed as a houseplant for its large, beautiful flowers. Colors range from tinted white through pinkish-salmon, red and magenta (hybrids). They are zygomorphic or "a flower within a flower." In nature, these are epiphytic plants which grow in the crotches of trees. Home care: they thrive on a fine mist spray daily, rich humus and porous potting mix well when night temperatures do not drop below 45 degrees, although they do require the cooler nights to build up sugars and energy. Epiphyllum, orchid cactus, commonly referred to as leaf cactus (misnomer for stem). Do not confuse these cacti with orchids or plants of the Orchidaceae. In nature these, too, are epiphytic and some grow in the crotches of trees as pendant plants.
Epiphyllum oxyptetalum. A scarce variety among a few private collections and growers in the Denver area. (Often mistaken and mis-named Nopalochia phylyanthoides, which it resembles in form but has a small red flower.) These have large white flowers over eight inches in diameter, flower and corolla tube often over a foot long, pendant, straining every branch to support the weight when two huge buds or flowers are on the same stem. Here in Denver they flower in late August or September as the nights begin to get cooler. They are nocturnal and generally start opening the huge bud at dark (about 8:00 p.m.). Some claim that there is a slow, audible "pop" when the bud bursts, slowly unfolding each perianth segment or outer petal and then each inner petal, one by one, recurving to take its correct place and position to show its beauty best. Finally, each snowwhite stamen takes its allotted place to form a tongue or lip, giving it the illusion of an orchid, hence its name. They have a sweet, spicy fragrance when close and from another room tend to refresh memories of magnolia or orange blossoms. They are generally fully open about 10:00 p.m., remaining so until dawn when they methodically close each part in the same intriguing manner as they opened. Care: about the same for all epiphytes — daily mist sprays to keep foliage fresh; outside in deep shade during frost-free months; bring inside when nighttime temperatures drop to 45 degrees. Keep in cool, airy spot until flowering, then gradually cut down on watering with no fertilizing during rest period. Water about twice a month or only just enough to prevent shrivelling. Signs of new growth appear in the spring when normal watering and feeding can be resumed. Plants thrive on food high in nitrogen such as 12-6-6.

Epiphyllum ackermannii (sometimes mistaken for other named varieties). This is a beautiful hybrid which originated in England. It is the most free-flowing of all species of Epiphyllum and deserves high praise for its dazzling red flowers that measure 2½" in diameter on well-established plants, and they will remain open for several days. Care: The same as most epiphytes, E. oxyptetalum, and others called orchid cactus.

Echinopsis cactus, commonly called Easter lily cactus because of the similarity of flower and form. Many of these plants vary because of origin and flowers which range in color from pure white to pink and shades of red. They are easy to grow and are very tolerant of water if allowed to dry out between waterings. The parents of these hybrids originated high in the Andes Mountains in South America. Until they have been cultivated outdoors in Denver in order to adapt them to the climate, the only way to grow them successfully is to bring them inside for the winter. Give them a light, cool spot with all possible sun. Keep on dry side, watering only about once a month, during winter. In spring, when they show signs of growing, spines start showing new color and normal watering can be resumed. Since these house-plants are not completely hardened off to full sunshine, place them under some protective shade, gradually exposing them to more sunlight. In a few weeks they can be placed in ANY flower bed for the summer.

We want to thank Raymond Carlson, Editor of The Arizona Highways, for the many years of work he has devoted to extolling the beauty of cacti and for promoting appreciation of these wonderful plants and other native flora. He has repeatedly stated: "They are the LOVELIEST of flowers."

More Plant Sale News

TREES AND SHRUBS

Avalon. Kosanke

This year's offerings of trees and shrubs should intrigue the most adventurous gardener while reassuring the more practical one. More than half the list is concerned with plants already nature-tailored to this area's peculiar growing requirements. The rest range from the unusual to the highly speculative, for it is the intent of this committee to promote broader use of less known, less grown species through this sale. The committee guarantees only this: With one exception, all plants listed are already being grown successfully by someone in this area.

There will be more than twenty species of trees, and only a few of each. Three oaks appear on the list. First, Quercus gambelii, our rather small, tough, native Gambel oak which can take almost anything Colorado weather offers. Quercus macrocarpa, the bur oak, is to be found in several extensive plantings here. This magnificent tree develops an interesting, irregular head, and its twigs thicken with corky ridges. It is rugged looking and has an excellent reputation for adapting to many different growing conditions. The third oak is Quercus borealis, the red oak, which grows in a more formal manner. It is a living symbol of permanence, the choice of long-range planters. Its thick, green leaves may turn yellow, dull red, orange or brown in fall depending on factors present in the tree itself, in its growing conditions, or even in the weather.

Smog-conscious gardeners will appreciate Sophora japonica, the pagoda tree, long known for its resistance to city toxins. In 1747, it was introduced to France from the Orient where it had long been associated with the temple gardens. Its pinnate leaves and always-green bark attract much attention. Great panicles of creamy flowers are borne from every shoot during August, which is an admittedly quiet time in the garden. Once its roots are established, this aristocratic tree will develop rapidly and likely will outlive its planter, for it tolerates city life and is also disease-and-insect-resistant.

Several patient gardeners have waited three years for Almus glutinosus, the charming little black alder found growing in City Park. Our favorite nurseryman promises just a few of these in five-gallon cans, exactly right for tucking into your yard.

Our exception to the "being grown successfully" rule is the spanking new Malus called 'Royalty' crabapple. This exciting introduction was originated by W. L. Kerr at the Dominion Experimental Station at Morden, Manitoba, Canada. Local nurserymen who saw it growing at Helena, Montana, feel it will do exceptionally well here. Its laced, purple-red leaf and single red bloom followed by persistent red
fruit make it outstandingly see-worthy throughout the growing season. It forms a dense, broadheaded tree about twelve feet tall, just right for our city lots.

Attractive screening hedges are a problem for many homeowners. Three such plants have been selected, each to fill a specific need. For a quick, tall, narrow screening hedge, we suggest *Rhamnus frangula columnaris, 'Tall hedge',* Pl. Pat. 1388. Without trimming, this handsome plant limits itself to a four-foot span and can be grown any height, up to 12 feet here in Colorado. From the ground up, 'Tall hedge' offers a solid wall of glossy green leaves. It is disease-resistant, smog-tolerant, hardy to 20 degrees below zero and has no special soil requirements.

For year-around pleasure, it would be difficult to improve on the less formal *Eryngium alatum compactus,* called burning bush. The interesting cork-winged branches of winter disappear under rich green foliage sparked by yellow flowers. By late summer, the red berries appear and last well into fall when the show-stopping, coppery-red leaf coloring steals the scene.

*Compactus* cues the planter to the dense, low growth habit, never over five feet, which makes burning bush ideal for hedging or ornamental use. Flower arrangers have not been forgotten. They will fall in love with the new "all-fruiting" *Celastrus scandens,* bittersweet, located by one grower. Only a single plant is needed to produce great panicles of bright orange berries. This climbing shrub will screen out a telephone pole or enhance a shed all summer before exposing its ripe orangewealth in the fall.

For unusual landscape effect and flower arrangers, two willows are listed: *Salix sachalinense Sekka,* the Japanese fan-tail willow, and *Salix matsudana tortuosa,* the corkscrew willow. Both will be available in limited supply.

*Cotoneaster opiculata,* the cranberry cotoneaster, boasts the largest fruit of this hardy series. It sends its branches curling and tumbling along a wall. Cold weather brings a burst of glowing red into the leaves which persist well into November.

*Nandina domestica,* Heavenly bamboo, is a luscious tidbit which must be grown in a protected spot. When treated as a perennial, the new shoots become more numerous each year, unfolding luscious, red-tinged leaflets which remain lovely most of the winter. A much harder broadleaved evergreen is *Pyracantha leptophylla,* or firethorn, whose bright orange berries remain all winter until the returning birds clean them off. This variety has proved vigorous here, growing more beautiful each season, even though generously trimmed for enjoying its berries inside.

At least 15 other species of shrubs, including five viburnums, will be available on a "first come, first served" basis.

Some people call them weeds, but to anyone who grows culinary herbs they are interesting and useful garden plants. With their subtle fragrance, ease of cultivation, and practical cooking applications, they are fast becoming popular in Denver gardens.

Herbs are not new. Parsley, mint and thyme are mentioned in the Old Testament, and many herbs are steeped in ancient legends and myths. Adding a few herbs to the garden can lead to fascinating reading, culinary experiments and a collection of interesting houseplants.

For a novice gardener, culinary herbs can be especially rewarding. Most of them thrive in average soil, take up little space and are easy to cultivate. Even in Denver with the limited amount of moisture, a variety of herbs can be grown which will survive the cold weather, and the less hardy plants can be brought inside to be used throughout the winter.

Formal patterned herb gardens, such as the one at Denver Botanic Gardens, are beautiful but require extensive maintenance and usually produce more herbs than the average family will use. If you do your own gardening, it's a good idea to start small and add herbs wherever they will fit into your garden. A small variety, with one or two plants of each species, should be sufficient to begin an herb garden.

Following is a list of culinary herbs that should grow in this climate.

"Go, then and plant a tree, lovely in sun and shadow... Blessings of dew and shade, hereafter shall be thine."
(From "The Planting of a Tree" by Marion C. Smith.)
<table>
<thead>
<tr>
<th>NAME</th>
<th>CHARACTERISTICS and CULTIVATION</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angelica atropurpurea</td>
<td>Biennial, 6'-8' tall, white flowers. Shade or partial shade.</td>
<td>Leaves — fish, shellfish. Stalk — like rhubarb, celery.</td>
</tr>
<tr>
<td>*Ocimum basilicum</td>
<td>Hardy annual, 2-2½'; white blossoms. Plant 12'' apart.</td>
<td>Leaves — eggs, fish, game, meats, shellfish, sauces, peas.</td>
</tr>
<tr>
<td>*Monarda fistulosa</td>
<td>Perennial, 2-3'; mauve flowers.</td>
<td>Leaves — tea, garnish for fruit and wine drinks.</td>
</tr>
<tr>
<td>*Borago officinalis</td>
<td>Hardy annual, 2½'; blue flowers. Good for rock gardens.</td>
<td>Young leaves and tips — iced drinks, salad, teas, vegetables. Use in place of parsley.</td>
</tr>
<tr>
<td>*Matricaria chamomilla</td>
<td>Hardy annual, white flowers, 15'' tall. Sow seed early spring; spreads.</td>
<td>Leaves — herb tea.</td>
</tr>
<tr>
<td>Carum carvi</td>
<td>Hardy biennial, self-sows, 2'' tall, yellow flowers; sow 2' apart.</td>
<td>Seed — soups, meats, vegetables.</td>
</tr>
<tr>
<td>*Nepeta cataria</td>
<td>Perennial, blue-mauve flowers. Thin to 12-16'' apart.</td>
<td>Leaves — cheeses, meats, salads, soups, bread, cakes, pastries.</td>
</tr>
<tr>
<td>*Myrrhis odorata</td>
<td>Perennial, white blossoms, 3'' tall.</td>
<td>Leaves — soothing teas.</td>
</tr>
<tr>
<td>*Anthriscus cerefolium</td>
<td>Annual, 18-24'', resembles parsley, white flowers, shade or part shade. Cultivate like carrots, handle carefully.</td>
<td></td>
</tr>
<tr>
<td>*Allium schoenoprasum</td>
<td>Perennial, 8-10'' in clumps. Lavender flowers; bulbs, but can grow from seed. Multiplies.</td>
<td>Leaves — blossoms, seed — seafood. Licorice tang, like Fr. Tarragon.</td>
</tr>
<tr>
<td>*Coriandrum sativum Coriander Seed</td>
<td>Perennial, pink flowers, 10-24''.</td>
<td>Leaves — flavoring and garnish.</td>
</tr>
<tr>
<td>Valerianella olitoria</td>
<td>Annual, 8-10'', mild, blue flowers. Plenty of water, plant in spring, thin to 6''.</td>
<td>Leaves — meat dressing, cheese, eggs, sauces, soups, salad dressings.</td>
</tr>
<tr>
<td>*Chrysanthemum balsamita</td>
<td>Perennial, 3-4'' clumps, yellow flowers. Shade. (For blossom, plant in sun.) Divide every 3 years.</td>
<td>Seed — confections, cheese, fruit, meat, pickles, salad, soups, demitasse.</td>
</tr>
<tr>
<td>*Lepidium sativum</td>
<td>Annual, 3-6'', white blossoms, partial shade or window box.</td>
<td>Leaves — salad, garnish for meat, seafood. Used as vegetable.</td>
</tr>
<tr>
<td>Garlic</td>
<td>Perennial, 18'', space 6'' apart, full sun.</td>
<td>Eaten when few inches tall.</td>
</tr>
<tr>
<td>*Petasites krysanthum</td>
<td>Annual, 3-4', outdoors, loamy soil.</td>
<td>Seed — breads, cookies, cheese, eggs, fish, poultry, game, meats, vegetables.</td>
</tr>
<tr>
<td>*Marshallia vulgaris</td>
<td>Perennial, 18'', white flowers. Tendency to winterkill.</td>
<td>Leaves and tips and seeds — cheeses, fish, eggs, meats, pickles, poultry, salad dressings, vegetables, and soups.</td>
</tr>
<tr>
<td>*Hyssopus officinalis</td>
<td>Perennial, hardy, 2'', blue, pink or white flowers. Plant seed in partial shade. Cut back after first blossoms.</td>
<td>Leaves — fish, salads, soups.</td>
</tr>
<tr>
<td>*Helianthus tuberosus</td>
<td>Annual, yellow flower, 12'' high.</td>
<td>Seeds, crushed — confections, cheeses, shellfish and vegetables.</td>
</tr>
<tr>
<td>Jerusalem Artichoke</td>
<td>Annual, yellow flower, 12'' high.</td>
<td>Bulls — salad dressings, shellfish, meats, pickles, poultry, sauces, soups.</td>
</tr>
</tbody>
</table>

Editor's Note: *Planted in Denver Botanic Gardens Herb Garden.

<table>
<thead>
<tr>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves — fish, shellfish. Stalk — like rhubarb, celery.</td>
</tr>
<tr>
<td>Leaves — fruit, sauces, soups, shellfish. Seed — cakes, cheese, meats.</td>
</tr>
<tr>
<td>Leaves — beverages, wine cups, teas, meat, salads, sauces.</td>
</tr>
<tr>
<td>Leaves — eggs, fish, game, meats, shellfish, sauces, peas.</td>
</tr>
<tr>
<td>Leaves — tea, garnish for fruit and wine drinks.</td>
</tr>
<tr>
<td>Young leaves and tips — iced drinks, salad, teas, vegetables. Use in place of parsley.</td>
</tr>
<tr>
<td>Leaves — vinegars, teas, salads.</td>
</tr>
<tr>
<td>Leaves — herb tea.</td>
</tr>
<tr>
<td>Seed — soups, meats, vegetables.</td>
</tr>
<tr>
<td>Leaves — cheeses, meats, salads, soups, bread, cakes, pastries.</td>
</tr>
<tr>
<td>Leaves — soothing teas.</td>
</tr>
<tr>
<td>Leaves — blossoms, seed — seafood. Licorice tang, like Fr. Tarragon.</td>
</tr>
<tr>
<td>Leaves — flavoring and garnish.</td>
</tr>
<tr>
<td>Leaves — meat dressing, cheese, eggs, sauces, soups, salad dressings.</td>
</tr>
<tr>
<td>Seed — confections, cheese, fruit, meat, pickles, salad, soups, demitasse.</td>
</tr>
<tr>
<td>Leaves — salad, garnish for meat, seafood. Used as vegetable.</td>
</tr>
<tr>
<td>Leaves — cakes, game, meats, poultry, teas.</td>
</tr>
<tr>
<td>Eaten when few inches tall.</td>
</tr>
<tr>
<td>Seed — breads, cookies, cheese, eggs, fish, poultry, game, meats, vegetables.</td>
</tr>
<tr>
<td>Leaves and tips and seeds — cheeses, fish, eggs, meats, pickles, poultry, salad dressings, vegetables, and soups.</td>
</tr>
<tr>
<td>Leaves — fish, salads, soups.</td>
</tr>
<tr>
<td>Seeds, crushed — confections, cheeses, shellfish and vegetables.</td>
</tr>
<tr>
<td>Bulls — salad dressings, shellfish, meats, pickles, poultry, sauces, soups.</td>
</tr>
<tr>
<td>Leaves — salads. No garlic after-taste.</td>
</tr>
<tr>
<td>Leaves — custard, baked fruits, puddings, ice creams, jellies.</td>
</tr>
<tr>
<td>Leaves and flowers — cakes, cookies, candies, sauces, meat stews, teas.</td>
</tr>
<tr>
<td>Leaves — fruit cocktails, fish, game, meats, pies, salads, soups, stews.</td>
</tr>
<tr>
<td>Tubers used like potato.</td>
</tr>
</tbody>
</table>
FORMAL HERB GARDEN AT DENVER BOTANIC GARDENS
Planted and Maintained by Denver Botanic Gardens Guild
STATUE: Boy with Frog by Elsie Ward Hering
<table>
<thead>
<tr>
<th>NAME</th>
<th>CHARACTERISTICS and CULTIVATION</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lavandula officinalis</em>&lt;br&gt;Lavender, spike</td>
<td>Perennial, shrubby, small. Sunny dry soil. 12-15&quot; apart.</td>
<td>Flowering tips used commercially. Flavoring for beverages, jellies, sachets.</td>
</tr>
<tr>
<td>Allium porrum&lt;br&gt;Leek</td>
<td>Annual. Milder member of onion family. Strong aroma. Started from seed. Thin to 6&quot;.</td>
<td>Fresh tops and roots — soups, salads.</td>
</tr>
<tr>
<td><em>Majorana hortensis</em>&lt;br&gt;Marjoram, Sweet</td>
<td>Perennial, grown as annual, winterkills easily. 12-15&quot;, white blossoms.</td>
<td>Leaves — eggs, fish, game, meats, poultry, salads, sauces, soups, stews, stuffings and vegetables.</td>
</tr>
<tr>
<td><em>Majorana onites</em>&lt;br&gt;Marjoram, Pot</td>
<td>Smaller variety, purple flowers.</td>
<td>Leaves — eggs, fish, game, meats, poultry, salads, soups, stews, stuffings and vegetables.</td>
</tr>
<tr>
<td><em>Mentha pulegium</em>&lt;br&gt;Pennyroyal, English</td>
<td>Tender perennial, self-sows.</td>
<td>Leaves — teas, jellies, vegetables, sauces, lamb, fruits, candy.</td>
</tr>
<tr>
<td><em>Rosmarinus officinalis</em>&lt;br&gt;Rosemary</td>
<td>Perennial, grown as annual. Limy soil, protected spot. Cut slips to bring inside for winter. 2' tall.</td>
<td>Foliage and petals — canapes, salads. Seed and seed pods — mixed pickles. Substitute for capers in food.</td>
</tr>
<tr>
<td><em>Salvia officinalis</em>&lt;br&gt;Sage</td>
<td>Perennial, 2' tall, space 18&quot; apart in sandy, dry soil. Full sun. Do not over-water.</td>
<td>Leaves — same uses as majoram, flavor more pungent.</td>
</tr>
<tr>
<td><em>Satureja hortensis</em>&lt;br&gt;Summer Savory</td>
<td>Annual, 18&quot;, space 6&quot; apart. Full sun. Will re-seed.</td>
<td>Leaves — canapes, eggs, fish, shellfish, meats, poultry, salads, soups, vegetables. Contains: calcium, thiamin, riboflavin, niacin, vitamin B.</td>
</tr>
<tr>
<td><em>Satureja montana</em>&lt;br&gt;Winter Savory</td>
<td>Perennial, 15&quot;, self-sows, deep blue flowers or pinkish-white.</td>
<td>Used mainly for teas.</td>
</tr>
<tr>
<td><em>Rumex acetosa</em>&lt;br&gt;Sorrel or Garden Sorrel</td>
<td>Perennial, full sun, 3'.</td>
<td>Same as Summer Savory.</td>
</tr>
<tr>
<td><em>Rumex scutatus</em>&lt;br&gt;Sorrel, French</td>
<td>Perennial, almost prostrate, space 1' apart.</td>
<td>Young fresh leaves — salads, omelets, soups.</td>
</tr>
<tr>
<td><em>Tanacetum vulgare</em>, var. crispium&lt;br&gt;Tansy or Fern-Leaved Tansy</td>
<td>Perennial, 2½-3', yellow flowers. Mossy soil, rows 3' apart. Spreads.</td>
<td>Young fresh leaves — salads, omelets, soups.</td>
</tr>
<tr>
<td><em>Artemisia dracunculus</em>&lt;br&gt;Tarragon or French Tarragon</td>
<td>Perennial, 18-24&quot; tall, space 18&quot; apart. Sun or part shade. Divide every 3 years.</td>
<td>Leafy tips — omelet, baked fish, meat pie, tea.</td>
</tr>
<tr>
<td><em>Thymus serpyllum</em>&lt;br&gt;(many varieties)&lt;br&gt;Thyme</td>
<td>Perennial, bushy, spreads.</td>
<td>Leaves — eggs, fish, meat, poultry, salads, soups, sauces, vinegar.</td>
</tr>
<tr>
<td><em>Lippia citriodora</em>&lt;br&gt;Verbena or Lemon Verbena</td>
<td>Tender perennial. Full sun. Propagated from cuttings. Truly lemon scent.</td>
<td>Leaves — seafood, cheese, Bouquet Garni, vinegar, eggs, vegetables, stews.</td>
</tr>
<tr>
<td><em>Asperula odorata</em>&lt;br&gt;Woodruff or Sweet Woodruff</td>
<td>Perennial, spreads, 12&quot; tall. Shade or partial shade.</td>
<td>Leaves — fruit salads, iced beverages, jellies, custards.</td>
</tr>
<tr>
<td><em>Asperula odorata</em>&lt;br&gt;Woodruff or Sweet Woodruff</td>
<td>Perennial, spreads, 12&quot; tall. Shade or partial shade.</td>
<td>Leaves — garnish, biscuits, breads, eggs, fish, meat, pastries, salads, soups.</td>
</tr>
<tr>
<td><em>Asperula odorata</em>&lt;br&gt;Woodruff or Sweet Woodruff</td>
<td>Perennial, spreads, 12&quot; tall. Shade or partial shade.</td>
<td>Leaves — herb tea, fruit beverages, garnishes and May wine.</td>
</tr>
</tbody>
</table>

Editor's Note: *Planted in Denver Botanic Gardens Herb Garden. **Suggested for a beginning herb garden. Lemon balm, catnip, chives, costmary, oriental garlic, mint, sorrel, French sorrel, tarragon, thyme and other herbs will be available at the Annual Plant Sale.
Most herbs want full sun, sandy soil and good drainage. In too heavy, rich soil they run to lush foliage but lose some of their essential leaf oils and fragrance. By all odds, Denver gardeners should have some of the best herb gardens in the country, for most culinary herbs do not need a great deal of water. Dry heat will help develop the leaf oils. Most popular culinary herbs are also free from plant diseases, especially when they are grown in small quantities and not over-crowded. Even if your gardening space is limited to a window box, you can grow culinary herbs.

Herbs may be used fresh, dried or frozen for winter use. Besides their usefulness in the kitchen, some of them may be used for sachets, pot-pourri, lotions and sweet-scented moth preventives.

A complete list of all herbs that have been or are being grown for culinary purposes is impractical for they fall in and out of favor with different generations and eating habits.

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**More Plant Sale News**

**Rock Garden Plants**

**BERNICE PETERSEN**

For the sun-parched slope or protected shady nook more than 50 kinds of rock garden plants will be offered at this specialized booth.

Among the choice plants grown especially for the sale are three low-growing bellflowers: *Campanula garganica*, graceful sprays of starry blue flowers with white eye; *C. muralis*, light blue-purple, bell-shaped flowers; and *C. poscharskyana*, larger and more vigorous than *C. muralis*, with up-facing, lavender-blue flowers in profusion.

*Androsace lanuginosa*, rock jasmine, is appealing with lacy green leaves and umbels of dainty pink or white flowers. *Saxifrage umbrosa*, 'London Pride', grows in neat rosettes bearing clouds of pink, starry blossoms. All of the foregoing plants prefer light shade.

Seldom available is *Carlina acalis*, stemless thistle of the Alps, a dwarf perennial with silky, white flower heads about 2" across. Another jewel is native blue-eyed grass which blooms only in sun in the forenoon and likes moisture.

Included in the best ground covers for this area are the following natives which retain foliage all year: *Atriplex*, pussytoes, grey foliage, flowers pink or white, excellent between flagstones; *Eriogonum*, sulphur flower, green or grey foliage, yellow blossoms, also ground-hugging. *Mahonia repens*, hollygrape, good in sun or shade, drought or average moisture, will grow 12"-15" high, but stands vigorous pruning. Its yellow flower clusters are followed by blue berries suitable for jelly.

Visitors to this booth are invited to look and learn. Lists suggesting plants suitable for various growing conditions will be given to interested persons.

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**Perennial Plants**

**PEG HAYWARD**

A variety of perennial plants will be available at the 1967 Denver Botanic Gardens Plant Sale. Included will be plants for both sunny and shady spots in the garden. Some of the familiar favorites suitable for the perennial border which will be offered are: *Achillea*, yarrow — *Anchusa italica*, dropmore — *Anthemis*, golden mariguerite — *Aquilegia*, columbine (McKana Hybrid) — *Chrysanthemum maximum*, shasta daisy — *Delphinium*, Pacific giant — *Dianthus spectabilis*, bleeding heart — *Heuchera*, coral bell — *Lupinus*, Russell's Hybrids — *Papaver nudicaule*, Iceland poppy — *Pyrethrum*, painted daisy, *Phlox decussata*, hardy phlox, peonies and others.
The perennial booth will carry some of the more unusual varieties for the gardener who wishes to try something different. Included will be Asitbe, Geum, avens, Lythrum, Penstemon barbatus — Palemonium, Jacob's ladder — Dictamnus, gas plant — Saxifraga bergenia and others.

A special feature will be a variety of colorful hardy chrysanthemums, a favorite for the autumn-flowering garden.

Colored pictures of the perennials for sale will be displayed in order to help the buyer in making a choice. Information about the plants and their culture will be available.

Annual Plants

DOCTOR CARROLL

Whether new or "tried and true," the best varieties of annuals suited to this area will be offered at the 1967 Plant Sale, May 12 and 13.

'Golden Jubilee' marigold, 1967 All-American selection, boasting giant golden-yellow blossoms on compact, bushy plants, as well as 'Sun Souffle' and 'Tangerine', both outstanding at the Denver Botanic Gardens test trials, will be among the various marigolds ranging from dwarfs to 30" plants.

Among the best of the 100 varieties of petunias tested here last year a newcomer, 'Red Cap', will compete with reliable 'Comanche', a leading red. At least a dozen varieties of petunias will be available including the all-time favorites at the Gardens 'Seafoam', large single white, and 'Sonata', double white. Among the delicate colors is the charmner 'Pink Cheeks'. Yellows, blues, purples and bi-colors have been chosen to mix or match.

Ageratums 'Blue Blazer', deep blue, and 'Blue Mink', powder blue, both heat-resistant and sturdy, make neat edging plants.

Introduced at last year's sale, 'Bright Butterflies' snapdragons delighted gardeners with their open and appealing faces (the lip does not close). Rocket snapdragons, best by test in this area, will be offered in many colors. Dwarf 'Floral Carpet' is equally adaptable as an edging plant or for use in patio planters.

Combine fountain grass and cannas to duplicate the effect created in city parks last year. If space is limited a few will provide unusual interest in the flower border.

For contrast in foliage choose fragrant 'Dark Opal' basil or dusty miller. Coleus give quick color in sun or shade. Geraniums, ivy-leaved Martha Washington, or the hardy Irene strain, in many colors are offered for borders, hanging baskets, planters or Mother's Day gifts.

Your chance to buy choice locally-grown plants at this annual sale will further the goals at Denver Botanic Gardens. Let's grow together!

How Did Those Dandelions Get Here?

M. WALTER PESMAN

Aunt Tany Cummings was homesick. She had come to the ranch near Elizabeth, Colorado, as a bride. It was a desolate region back in the seventies — a far cry from New England where she had spent her girlhood.

If only she could surround herself with some of the New England flowers and other plants, she figured, it might be more like home. So she sent for an assortment, some to be used for ornament and some for food as in salads and relishes.

Among the arrivals was Taraxacum officinalis, the bright and cheery dandelion which she had used as greens back home. The French to this day advertise dandelion seed in flower catalogues for that purpose since one grows dandelions in the garden along with lettuce, endive and parsley.

Elizabeth's soil was to the dand- elions' liking; they grew, they thrived, they scattered their seed wide and far. Where no golden heads had appeared before, now arose gorgeous fields of luscious leaves and bright blooms. This, according to Dr. Edward R. Mugrage of the Colorado University Medical Center, was the beginning of the "ornery pest" around 1873.

At present, there is hardly a spot in the high mountains and on the widespread plains where the golden carpet does not delight the eye at some time from May to July. Taraxacum officinalis likes it here and intends to stay after its long trek from Europe.

Of a slightly more recent date is Dr. Mugrage's story of the arrival of Salsola pestifer, Russian thistle, around 1885. Here his own cousin in Radium, Colorado — Mr. Ohio Columbus Mugrage — noted amidst the grass "a very pretty plant growing up bushy, which stood out as large as a small keg and which in fall turned color, broke off and drifted across the meadow finally to disappear." The next spring its path was well marked with hundreds of small Russian thistle plants, and he felt certain that this was the beginning of the seed, at least in Grand County.

Few other records are available about the spread of this common pest, appropriately named Salsola pestifer, at least as far as Colorado is concerned. A simple statement in the herbarium of the Colorado A. & M. College says: "introduced in Colorado near the waters of the Arkansas Valley in 1892, and by 1896 had been carried half-way across Kansas by the Arkansas River."

According to Professor Burton O. Longyear, (in his "Rocky Mountain Wild Flower Studies") the farmers in South Dakota first noticed this "tumbleweed" invading their flax fields in the years 1873-74. It had come in from the plains of eastern Russia, together with imported flax seed. Before long, the newspapers began to warn farmers to be on the lookout for this rapidly-spread- ing pest. Farmers' bulletins and circulars were distributed with suggestions for clean cultivation, seed prevention and other remedies against annual weeds. But the Russian thistle
won out and now can be seen by the millions as it is swept by plains' winds after having been detached at its slender base.

They pile up in windrows against wire fences and collect in great masses in protected corners. Every change of wind puts them on the march again, hopping and rolling, scattering seeds at every jump!

No modern plains picture is complete without evidence of this new invader. Another adventive has been added.

Here, then, are two striking examples of recently introduced pests within knowledge of some of the pioneers who are still alive.

One more plant immigrant of even more recent date should be particularly mentioned: *Sisymbrium altissimum*, tumblemustard, an old-time resident of Hungary and other European countries, which migrated to the rest of Europe and then spread over a large part of the temperate zone of Europe, Asia and North America.

As it happens, I had the opportunity to personally report it first from Denver in 1913 (to Dr. Aven Nelson of the Rocky Mountain Herbarium in Cheyenne). I had been struggling desperately to trace it down in Coulter and Nelson's Manual, insisting in my mind that such a common plant must be listed. Failing to find it listed there, I identified it in a Flora of the Netherlands and then, later, was informed by Dr. Nelson that it had already spread over many parts of Wyoming. The herbarium specimen is from Sulphur Springs, dated August 8, 1907. The Colorado University Herbarium has no record until May 27, 1919 (from Denver). Even as late as 1945 the Colorado A. & M. Herbarium failed to list it.

When did it arrive in North America? The earliest authentic record is a specimen in the National Herbarium collected in Philadelphia in 1878. In 1883 it was seen near Kansas City, Missouri; in 1892 it was well established near Aberdeen, South Dakota, and the following year was collected at seven different points within ten miles of that city.

Appropriately, tumblemustard is called Jim Hill mustard in the northern part of the country, in reference to James J. Hill, whose Great Northern Railroad transported seeds of tumblemustard (yes, free of charge!) along with hay, grain and livestock, thus speeding up its spreading.

It wouldn't be difficult to multiply examples of newly introduced plants. A region, such as this, which is comparatively "new" as far as human habitation is concerned, offers a fruitful field for the tracing of new plants from other regions. Europe and even New England have had a long time to be inoculated with introductions from almost the entire world. Only occasionally does a plant from out-of-the-way places find its way here now.

Sometimes the new plant carries its history in the name given to it after its introduction. Russian thistle is an example. Even the name of its introducer may be attached to it. As an illustration we may draw attention to the colorful *Linaria vulgaris*, commonly known as butter-and-eggs or yellow toadflax, which now flourishes along many roadsides in the foothills — significantly common in the neighborhood of our early mining towns. It is sometimes called Ramsted weed and said to be so named after the person who introduced it into the United States.

Just a few years ago, in late July, my attention was drawn to a dainty, pretty plant in Bear Creek Canyon, east of Morrison, near Denver. Its white flower clusters with four-petaled blossoms, showed it belonged to the mustard family. Unlike most of its close relatives, it has split petals and very interesting winged stamens, toothed at their base.

This plant had not been reported in any manual of the region. Again, it could be traced in a European Flora as *Berteroa incana*, falsealysum. Dr. H. D. Harrington of Colorado State University verified this identification. How did it get to Bear Creek Canyon, where it evidently feels at home? How rapidly will it spread? Has it appeared in other, similar spots where the local climate is like the climate in its original home? Who knows?

Another fairly recent introduction is a pretty spurge, *Euphorbia esula*, with greenish-yellow flower clusters and many willow-like leaves. It likes moist roadsides in the neighborhood of Boulder and Denver. I called it leary spurge after failing to find it listed in the earlier manuals. It must have come in around 1910 (according to my guess).

Very definitely escaped from the nursery and now thoroughly at home in the bottom of river and creek beds is *Tamarix gallica*, the French tamarisk, with fine-textured foliage and light-purple flower plumes.

More recently *Eleagnus angustifolia*, Russian olive, and since 1940 or thereabouts *Ulmus parvifolia*, Chinese elm, are commonly found in similar moist places.

Less pleasant, but equally interesting, is the gradual invasion of noxious weeds into a new country. In some cases we can pinpoint their first occurrence, especially since government and state agencies are on the lookout for them. Thus *Halogeiton glomeratus*, halogeton, came into this state about
These Florissant Beds contain some of the most widely known fossil plants. Harry D. MacGinitie made a comprehensive study of them, using modern techniques in the interpretation. He recognizes as many as 114 species distributed among 44 families. Some of these are no longer native in North America. There is, for instance, Ailanthus, Tree of Heaven, now found in Asia, and Koelreuteria, Goldraintree, of China and Japan.

Evidently, the climate was warmer then. Along stream courses there was a copious forest growth, requiring considerable rainfall. Interestingly enough, we notice among these fossils a number of eastern and southern trees, not now found in the region. Among these are soapberry, acacia, redbud and walnut. Most prevalent of all was Fagopsis longifolia, a member of the birch family.

Willows, cottonwoods, alders, oaks, hackberries, Juneberries, sumacs and a number of others left their leaf imprint, clearly enough to be recognizable. We must count them among the First Families of the region.

On higher ground pines and evergreen oaks dominated open scrub forests. Even some laurels are found.

When did all these trees flourish here? MacGinitie concludes that the Florissant Beds date from the Oligocene age — shall we say some twenty million years ago? It is more than likely that these forests continued through the Pliocene and Pleistocene eras into the present day. Man, the parvenu, did not appear until the late Pleistocene which brings us down to only a million or so years ago.

The facts related here have been and still are of great interest to botanists and nature-lovers and it is hoped that they will be of equal interest to the reader.

In connection with the foregoing article by Mr. Pesman, the following news item should be of interest to our readers.

A bill to designate the fossil beds at Florissant, Colorado, as a national monument was introduced in the House Thursday by Rep. Frank Evans, D-Colo. Evans said the valley is the bed of a prehistoric lake and "is one of the most important paleontological resources in the world. . . . During the oligocene period fine volcanic ash spewing from nearby volcanoes settled layer by layer in the lake. As it settled, the ash encased and preserved the various flora and fauna which lived around the lake. Today, just a few inches below the sod, you can find beautiful fossils ranging from delicate butterflies and tiny spiders to the leaves and massive trunks of giant redwood trees. The unique process of fossilization which took place at Florissant preserved many forms of life which are never been seen in fossil form elsewhere." From the Denver Post, February 17, 1967.

AN ORNERY 'CRITTER'

Dermacentor Andersoni

Dr. Fred N. Zeiner

There are many types of ticks (ties), and the terms mean very different things to the clock-maker, the physician, the taxonomist and the woodsman. With the hope that Green Thumb readers really get out of our beautiful conservatory and into the woods in the hinterland of Denver, it becomes appropriate at this season to discuss our common wood-tick, Dermacentor andersoni, even if it is merely a member of the animal kingdom.

At a distance, it appears as a small (3 mm.) brownish object. Closer inspection shows it to be a rather handsome, reddish-brown beast, with the larger dorsal shield of the male and the smaller one of the female having obvious markings of silver (really a dirty gray). There are eight legs in contrast to other insects which have six. The body is very flat.

Dermacentor andersoni, is prevalent in the northwest quadrant of the United States. Larvae and nymphs feed on the smaller mammals, e.g., ground-squirrel, cotton-tail rabbit, squirrel and other small rodents. The adults prefer the larger mammals such as deer, elk,
The wood-tick is capable of carrying and transmitting several different pathogens to humans. Rocky Mountain spotted fever and Colorado tick fever are the diseases of concern in this area. Spotted fever is an acute infection producing fever, joint and muscular pain and, sometimes, delirium, coma, convulsions, tremors, muscular rigidity and jaundice. There may be persistent effects and death can result. Adequate and prompt medical treatment alleviates distress. Fortunately, the incidence of spotted fever in Colorado is very low. The number of infected ticks is highest in western Montana and eastern Idaho.

Colorado tick fever is more prevalent. Luckily, it is a much less serious disease; in severity it may be likened to a case of influenza.

Ticks deserve respect, but they are certainly not to be feared if reasonable precautions are taken. Without question, the person spending long periods in tick country during the tick season should be immunized. Immunization is recommended for anyone apt to be exposed to ticks. For those who only infrequently visit tick country and don’t like “shots,” for whatever reason, there are “horse-sense” precautions. Strip and have a tick hunt two or three times a day. Wear clothing of hard-surfaced material, rather than woolly material that gives the tick an easy foothold. Ticks are much easier to spot on light-colored clothing and they can be removed before taking hold of you. Stuff your trouser legs into your boots to foil easy access to your person. The tick you find may be merely crawling around to see if it likes you. However, if it is attached, remember that it takes about two hours for it to dig in to the point of reaching your bloodstream. Only then can it introduce the pathogens responsible for spotted fever or tick fever if it carries these. To be sure, as any break in the skin opens a pathway for general infection, apply your favorite antiseptic following removal of the tick.

This raises the problem of removing the tick that has taken hold. Rough treatment will decapitate the “critter,” leaving its head embedded, with the probability of general infection resulting. With gentle retraction it will often back out. Mild heat, as from the glowing tip of a cigarette, hastens the process; however, the emphasis is on mild—a cooked tick won’t back out!

Reservations for guided tours of the Conservatory at Denver Botanic Gardens may be made by calling the Conservatory number, 297-2348, between 9:00 a.m. and 4:00 p.m. daily.

BYRON MIER

Retires From Washington Park Flower Garden

FRANCES NOVITT,
Landscape Architect
Denver Department of Parks and Recreation

The Denver Department of Parks and Recreation has lost one of its most valuable members. Byron Mier, who since 1927, has spent most of his summers caring for the big flower garden in Washington Park, retired January 31, 1967. We will miss seeing him down in the big garden when summer comes, but we hope he will be enjoying some well-earned leisure.

Byron remembers the early days when the Washington Park crew went over to the greenhouse in City Park to get plant material by horse and wagon. In those days the garden was filled mostly with perennials and roses. Today it features annuals, and every summer it is so beautiful it can truly be said to be one of Denver’s prominent tourist attractions. Byron’s wisdom, interest and conscientious care of the big Flower Garden and the Martha Washington Garden at the south end of the park have helped to bring this about.

As the garden has grown in beauty and fame, people from all over the country have come to photograph it. Pictures of it are in innumerable private collections, and it appears in numerous commercial films. Many tourists and professional photographers return again and again to see the garden and visit with Byron. They often bring him copies of their pictures. He is surely one of the people directly responsible for Denver’s reputation as a beautiful, friendly city.
HYBRID FLOWER Seed
Production in Colorado

Gene Milstein

In the last ten years or so many new varieties of flower seeds have been introduced to the home gardener and many of these have been hybrids. In fact, hybrids have, in many cases, dominated the scene by pushing the original inbred varieties into the background, making some of them almost unobtainable. Petunias are probably the most striking example of this trend, and pansies, snapdragons and marigolds are others showing this tendency.

In Colorado, Charles Weddle has had a great part in hybrid flower seed production. He began plant breeding research on petunias some 20 years ago and has developed many of the best known hybrids. Over the years his company, Pan American Seed Company, Paonia, Colorado, has been the source of about 80% of the new hybrids on the market.

Mr. Weddle has recently transferred the activities of Pan American to another organization and built a new operation at Palisade near Grand Junction to begin intensive work on the production of reliable hybrid zinnia and chrysanthemum seed. Until now most chrysanthemums were available only as plants from commercial growers who started them from cuttings. The zinnias are now on the market are almost all inbreds. So the effort to produce large quantities of F₁ hybrid seed in zinnias, chrysanthemums and other members of the Compositae family is relatively new.

The new facilities for this undertaking consist mainly of greenhouses and include a special testing laboratory in which the climate can be controlled down to the exact desired temperature, humidity, light and amount of CO₂ in the air. In these facilities Mr. Weddle hopes to bring the "old" flowers back into the spotlight which others have had for the last five or ten years.

Exactly why some of the Compositae flowers have not received more attention and yielded more F₁ hybrids is an interesting question. Especially so, because some of them have been well known for many years. It is not because they lack the potential for producing good hybrids. On the contrary, considering the number of inbreds available and assuming they were crossed as was done with other flowers, the number of hybrids possible far exceeds even petunias. The answer seems to be that the Compositae flower heads are more complex than most others, physically (not genetically). How they differ from others and what kind of production problems result from these differences can be explained by comparing zinnias (Compositae) and petunias (Solanaceae).

Each petunia flower consists of one set of stamens and one stigma, while each zinnia flower is made up of hundreds of tiny flowers called florets. Each floret has one petal. These florets do not all mature at the same time on any given head. Usually, one circle of them opens up each day near the center of the flower. Consequently, it takes from one to two weeks or more for a zinnia flower head to develop fully.

Therefore, if one desires a zinnia cross or hybrid, the stigma of each floret must be touched with pollen from another plant as it matures. To hybridize a petunia, one merely has to emasculate the pollen-laden stamens from the flower and touch the stigma with the desired pollen and results will become evident in two or three weeks. A seed pod will grow and mature where the flower was. This pod will contain from 150 to 200 tiny seeds.

Each zinnia floret, however, produces only one seed, thus necessitating much more work to produce the same amount of seed. Therefore, if it costs $200 to $300 to produce one ounce of petunia seed (about .01 per seed) the cost of zinnia seed by this type of hand pollination could be astronomical. There is also to consider the fact that the pollen belonging to the flower serving as the female parent must not be allowed to touch any stigma on that flower head or the desired cross will not be achieved. Clearly, the labor costs would be extremely high for producing large quantities of seed; besides, a few oversights would certainly contaminate the hybrids with inbreds.

In spite of these obstacles, there are already a few zinnia hybrids on the market for the home gardener but, in order to understand how they were produced, we must take a closer look at the physiology of the zinnia flower. It is very complex as nearly every Compositae flower head will prove to be made up of two different types of flowers. One is called the ray floret and it has the colorful petal but is not bisexual as might be expected; it is female and the stigma is split at the end. The other kind is bisexual, has no petal and is called a disc floret. It is found in the central region of the flower head and a mass of these appear as a brown ball with yellow fuzz on top. The stigmas and stamens are yellow and the sheaths around them are brown. Zinnias, as well as other members of the Compositae family, may have flower heads consisting of all ray florets or all disc florets or any degree between the two extremes. When there is only one ring of ray florets the flower is called single. If the flower head consists mostly of ray florets with only a few discs it is called double. The seeds of the two types of florets are easily distinguishable, but the plants they produce are identical. The disc flowers produce pollen and can self-pollinate, while the ray flowers must receive pollen from other florets to produce seed.

In the course of research, plant breeders have come across a mutant form of the flower which is all female (ray) and has no petals. When in "full bloom" the flower is a brown head with yellow stigmas all over it. This development somewhat simplified making the cross for a hybrid. All that was necessary was to cover the stigmas with pollen from another normal plant.

In spite of this discovery, the commercial production of zinnia hybrid seed is not really economical and that is why there are only three or four available. Undoubtedly new methods of pollination will be developed and, when they are, we can expect a wide choice of new colors, plant foliage and more disease-resistant varieties. The problems discussed are somewhat the same with the other members of the Compositae family, and they give us an idea what men like Mr. Weddle are confronted with when they go from the simple to the more complex flowers. His success in this venture will mean many more beautiful choices for those of us who enjoy the world of flowers.
THROUGHOUT the world the hibiscus is known for its captivating beauty. Hibiscus is an important genus of over 200 species of herbs, shrubs and trees of the Malvaceae family. Many are ornamentals, some are useful for fibers, okra, rose oil (used in making an acid drink for jams, jellies, sauces and marmalades), wood, medicine, perfume and dye. The hibiscus is the outstanding flower of the South Seas and it was made the floral emblem of Hawaii in 1923 by joint resolution of the legislature.

Hibiscus rosa-sinensis, rose of China, in many of its hybrid forms, may be seen blooming at the Boettcher Memorial Conservatory. H. rosa-sinensis is a shrub which attains a height of from three to eight feet when grown in a greenhouse, but grows much higher under subtropical conditions. Its alternate, shiny, broadly oval leaves are three to four inches long, tapered at the tips, and are unlobed but often toothed. The flowers are usually solitary in the upper leaf axils. The blossoms range in hue from yellow through various shades of red and usually have a deeper colored throat. They are about five inches in diameter. Hibiscus flowers have five flaring petals and five lobes to the calyx. The stigma is branched into five parts and is usually a bright crystalline red, like a bit of coral at the top of the central column. The prominent stamens, which grow on the sides of the column, yellow it with their pollen.

Hibiscus plants bloom most of the year. Each blossom, however, remains fresh and lovely for the brief span of only one day whether left on the shrub, picked and placed in water or laid dry on a table top.

The generic name hibiscus is Virgil's name for mallow. A common name, shoeblack plant, is derived because of a black dye obtained from the flowers which is used by tropical bootblacks and also for dyeing hair.

The exquisite blossoms of the hibiscus will capture attention whether seen worn in the hair of Hawaiian women, tucked over the ear of Samoan men when they dance, formed into huge cascading bouquets, or seen by visitors to the Conservatory at Denver Botanic Gardens. Specimens in the Conservatory are numbered 130.
DENVER BOTANIC GARDENS
DENVER, COLORADO
This is a non-profit organization supported by municipal and private funds.

A botanic garden is a collection of growing plants, the primary purpose of which is the advancement and diffusion of botanical knowledge. This purpose may be accomplished in a number of different ways with the particular placing of emphasis on different departments of biological science.

The scientific and educational work of a botanical garden center around the one important and essential problem of maintaining a collection of living plants, both native and exotic, with the end purpose of acquisition and dissemination of botanical knowledge.