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.
Bauhinia blakeana Dunn
Leguminosae
Boettcher Memorial Conservatory
Hong Kong Orchid
Transparency by D. A. Blades

Flowers are reddish to rose-purple, 5½-6" across, said to be the most beautiful in the genus, seems to be a natural sterile hybrid, named for Sir Henry and Lady Blake commemorating their kindly interest in Hong Kong Botanical Gardens during his governorship.

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DAVID A. BLADES, Editor

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CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needed: Positive Approach to Landscape Planting in Metropolitan Denver — E. Alan Rollinger, L.D.</td>
<td>98</td>
</tr>
<tr>
<td>Low Shrubs for Colorado Landscaping — George W. Kelly</td>
<td>103</td>
</tr>
<tr>
<td>Focus on Pandanus — Peg Hayward</td>
<td>105</td>
</tr>
<tr>
<td>The Need for a Colorado Arboretum — F.L.S. O'Rourke</td>
<td>107</td>
</tr>
<tr>
<td>Chatfield Arboretum — Wayne G. Christian</td>
<td>109</td>
</tr>
<tr>
<td>Denver Loses Mike Ulaski — Francis Novitt</td>
<td>112</td>
</tr>
<tr>
<td>Amur Honeysuckle — Suzanne Ash</td>
<td>113</td>
</tr>
<tr>
<td>More on the Freeze — Dr. James R. Feucht</td>
<td>115</td>
</tr>
<tr>
<td>Do You Have Thyme? — Suzanne Ash</td>
<td>118</td>
</tr>
<tr>
<td>Progress in the Gardens — A. R. Knauer</td>
<td>119</td>
</tr>
<tr>
<td>Exotics of Colorado — Pyracantha — Dr. Helen Marsh Zeiner</td>
<td>120</td>
</tr>
<tr>
<td>History of the Helen K. Fowler Memorial Library — Edith Wilson</td>
<td>122</td>
</tr>
<tr>
<td>Book Review — Dr. Helen Marsh Zeiner</td>
<td>123</td>
</tr>
<tr>
<td>Book Review — M. B. Neil</td>
<td>124</td>
</tr>
<tr>
<td>Subject Index 1970</td>
<td>126</td>
</tr>
</tbody>
</table>

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NEEDED:

Positive Approach to Landscape Planting in Metropolitan Denver

E. Alan Rollinger, L.D.

Landscape planting in Colorado has gone from what is possible to what is not possible. Early residents planted trees which they had known before their immigration to the Denver area. There was no one to tell them what would grow and what would not grow here.

Homes, streets, parks, civic buildings, schools, and cemeteries were planted with a wide variety of trees. In addition to what are now considered hardy species, namely cottonwood, locust, ash, soft maple, and elm; such trees as oak, buckeye, Eastern White Pine, sycamore, and hard maple to name only a few were planted. Through trial and error a sizeable number of these unusual trees were established, and today those surviving trees are evidence of the positive approach these early settlers had toward horticulture in this area as well as evidence of the adaptability of individual trees.

Anyone interested in what trees are growing here rather than what trees are usually recommended will discover fine specimens of a wide range of trees. As result of a recently completed survey conducted by the author, a large number of these trees have been located and recorded.

Residents in Metropolitan Denver are no doubt aware that oak trees are growing here; however, I doubt that many people realize the number and variety of oak species that have adjusted to our climate and are thriving. To date eleven separate species (excluding the native Gambel Oak) are to be seen here. Of the eleven varieties those with the largest number of trees are Bur Oak and Northern Red Oak. Specimens of two feet or more caliper are not uncommon.

When discussing large oaks in this area the “brown” oaks located on South Federal at Stanford must be mentioned first. Named for an early settler on whose farm they were planted, these fine old Bur Oaks having calipers up to four feet are to my knowledge the largest and oldest examples of this species in Colorado.

Northern Red Oaks are to be found at the northwest corner of Washington Park. The park adjacent to the Decker Library at South Logan and Florida
English Oak, *Quercus robur* L.
Fairmount Cemetery, East Denver,
38-inch trunk diameter.

Copper Beech, *Fagus sylvatica atropurpurea* Kirchn.
East Third Ave., Denver,
22-inch trunk diameter.
boasts another fine specimen. Noteworthy is a giant Red Oak in the north Denver area at 4001 West 30th Avenue thought to have been planted before the turn of the century.

One of the most unusual trees growing in this area is the European Beech. The largest of these is located at 1333 East Third Avenue. This particular tree was brought to Denver approximately fifty years ago by its owner.

Several places in Metropolitan Denver are rich in varieties of unusual trees. In addition to City Park already known for its trees, Washington Park contains many species. Noteworthy are the buckeyes near the old Eugene Field home; and the Kentucky Coffee trees within the park opposite Tennessee and South Franklin Streets.

Fairmount Cemetery has a high density of unusual trees. Among these are eight species of oak including some of the finest examples of English Oak in Metropolitan Denver. Also sycamores and a number of very old Norway Maples are to be seen here.

Some observations should be made about the effects of the infamous October 1969 freeze on these trees. It appears that damage and loss are no greater among these than among the more commonly recommended varieties of trees. In fact the freeze seems to have caused more severe damage to the more widely planted Siberian Elm, Weeping Willow, and some species of poplar than to these.

Between applications of plant food, leach away harmful salts by standing house plants in the sink and watering them copiously at the soil surface until water runs freely from the drainage hole. The clay pot is a safeguard against overfeeding, since excess plant food and harmful fertilizer salts can escape through the breathing pores in pot walls as well as through the drain hole.

Low Shrubs for Colorado Landscaping

GEORGE W. KELLY*

NATIVE BROADLEAF EVERGREENS

Arctostaphylos patula, MANZANITA. Evergreen leaves, polished bronze stems and black fruit. Two feet or so high. Difficult to plant.

Arctostaphylos uva-ursi, KINNIKINNICK. Low mat plant with small evergreen leaves and red berries. A good ground cover.

Berberis repens (Mahonia), OREGON GRAPE. A good evergreen ground cover. Yellow flowers, blue fruit, leaves green in shade and red in sun.

Ceanothus velutinus, MOUNTAIN BALM. A beautiful evergreen with thick, resinous, fragrant leaves and heads of small white flowers. Difficult to transplant.

Yucca sp. SOAPWEED. Several varieties are native and all are most useful for their evergreen leaves and spectacular flower stems.

LOW NATIVE MOUNTAIN SHRUBS

Ceanothus fendleri, NEW JERSEY TEA. A low spreading shrub with partly evergreen leaves and heads of small white flowers. A little difficult to transplant.

Rubus parviflorus, SALMONBERRY. Very large attractive leaves, white flowers and edible raspberries. For a moist, shady place.

Rubus strigosus, WILD RED RASPBERRY. Grows in loose soil in sunny places, delicious berries.

Pachystima myrsinites, MOUNTAIN LOVER. This delightful little shrub is not as well known as it justifies. It has evergreen foliage resembling boxwood and grows in well-drained, shady spots.

ED. NOTE. CI indicates a Clone or horticultural development and sp. indicates various species. Mr. Kelly suggests that some of the plants in the original list and those in the supplementary list may be difficult to find in nurseries.

NATIVE DESERT SHRUBS

Artemisia sp. SAGE. Several woody sage shrubs of small size might be used in dry places. All have fine gray foliage and may be quite attractive.

Atriplex sp. SALTBUSH. Several of the desert saltbushes are low enough to classify here. They will grow with little water or care and may be quite attractive.

Chrysothamnus sp. RABBITBRUSH. The common rabbitbrush is too tall to be included here but there are several species that grow only a couple of feet tall with ornamental green-gray stems and yellow flowers in fall.

Eriogonum sp. BUCKWHEAT. Numerous species of buckwheat grow in Colorado and several of them are partly woody. They are all low and have heads of very small, attractive bloom.

Europa lanata, WINTERFAT. This shrub appears white-wooly, but grows a little taller than horsebrush.
Forsellesia sp. GREASEBUSH. Very small but numerous green leaves and a naturally compact, rounded shape. Could be very useful in a Japanese garden.

Leptodactylon pungens and others, FALSE JUNIPER. A very low plant with fine evergreen foliage similar to juniper. Blooms in spring, resembles creeping phlox. Could make an interesting ornamental.

Quercus undulata, DESERT OAK. This little oak usually stays under a foot high. It spreads and makes mats of short stems with acorns and fall color like its larger relatives.

Tetradymia sp. HORSEBRUSH. There are two species that are low, attractive and appear to be covered with gray wool.

VINES

Clematis sp. The native white clematis is a vigorous vine which may grow over the ground like a shrub. It bears white, star-like flowers in summer. The yellow oriental species has naturalized itself along the streams and highways near Idaho Springs.

Parthenocissus vitacea, WOODBINE. This common vine may make an attractive ground cover in summer and displays brilliant fall color.

Vitis vulpina, WILD GRAPE. May climb over shrubs or creep over the ground and makes attractive ground cover along streams.

* Mr. Kelly, it has been written, “is one of those rare individuals who has become almost a legend in his own lifetime because of his love for, and knowledge of, horticulture.” A nurseryman for many years, he was one of the founders of the Colorado Forestry and Horticulture Association, was its first director and editor of The Green Thumb magazine for 12 years. In fact, as its principal contributor he used much of his material published here in his first book called “Rocky Mountain Horticulture Is Different,” the original book on gardening in this area. Later revised and indexed the book appeared as “Good Gardens in the Sunshine States” and is now available as “Rocky Mountain Horticulture.” While director at Horticulture House he worked hard for establishment of a botanic garden.

Mr. Kelly is the first dedicated conservationist in the furthance of gardening in this area he taught and continues to teach landscaping classes for homeowners and gives countless talks wherever invited. He originated the Green Thumb radio program and later created the first Denver television programs on gardening in cooperation with C.F. & H.A. and the Colorado Nurserymen’s Association. A dedicated conservationist, he has crusaded for state and national parks, conservation, a botanic garden and the botanical garden outpost on Mt. Goliath, which was established in cooperation with the U. S. Forest Service. He was an early advocate of the use of native plants in landscaping home grounds, public parks and roadside developments. At his Cottonwood Garden Shop he promoted choice plants for particular gardeners and offered sympathy and encouragement to inexperienced ones.

An early participant and backer of the Colorado Garden Show he continues to serve the present organization as coordinator of horticultural displays. He has been landscape consultant for the Air Academy, Martin Company, Marathon Oil and the Colorado Department of Highways. A member of numerous plant societies and conservation groups he is recipient of the Johnny Appleseed award given nationally by the Men’s Garden Clubs, was named Nurseryman of the Year by the Colorado Nurserymen’s Association and was named Man of the Year by the Chamber of Commerce at Cortez, Colorado — his home since “retirement.”

Mr. Kelly is an ardent naturalist he has discovered at least a dozen plants in recent months not previously recorded by Dr. H. D. Harrington at Colorado State University. He continues to write for various local and national newspapers and periodicals. A man of limitless enthusiasm when asked to revise or bring up-to-date his article “Low Shrubs for Colorado Landscapes,” originally published in the October 1948 issue of The Green Thumb and reprinted here with supplemental lists in commemoration of the magazine’s twenty-fifth anniversary.

Pandanaceae is an Old World family consisting of only two genera, Pandanus being the only one which contains trees. Morphologi-
cal evidence suggests that these trees are more primitive than palms. They are the only monocotyledons that offer palms serious competition in the struggle for growing space. Screwpines are widely distributed, being native to tropical Asia, Indian Ocean islands, Polynesia, and Africa.

The derivation of Pandanus is from pandang, a Malayan word meaning conspicuous. The name screwpine comes from the fact that the leaves are arranged in spirals and the fruits and foliage resemble those of pineapple. In Hawaii these plants are commonly referred to as "tourist pineapple" by the tour drivers because of this resemblance of the ripened yellow fruits to pineapples growing in trees.

Many Pandanus are low and bushy but some are tall trees with many-branched trunks. In their native regions some kinds grow 60 feet in height. When mature, these awkward looking trees are usually supplied with characteristic prop roots and the trunks are conspicuously ringed with horizontal leaf scars. The aerial roots originate well up on the trunk and appear to be lifting the tree from the soil. They act as props to reduce the danger of plants being blown down in storms and provide escape from overflows in lowlands. The stout, scaffold-like branches are clothed from the tips back with handsome spirally-arranged leaves. These branches often divide in pairs forming a series of ascending Y's. The ribbon-like leaves, bluish-green with linear sharp teeth along their margins, are sessile without leafstalks. Each leaf claps the stem at its base, then tapers gradually to a point, with a strong keel below matched by a groove above, making an open V in cross section.

Each tree is either male or female, but in each case the flowers are densely clustered. The staminate inflorescence is a drooping, frosty plume of hundreds of tiny flowers, which are loaded with pollen, partially enclosed in a long, whitish bract. Fruits of the female tree are large, globose and woody like a cone. They are the composite product of many flowers each of which contributes one fleshy part with a central armored seed. Its fibrous, prism sections, or drupes, become yellow as they ripen, then separate and fall. The orange-red pulp surrounding the individual parts of the fruits is safe to eat. The seeds, even though difficult to extract, are well flavored and may be eaten in any quantity. Also, the tender growing tips of "cabbage" deeply buried in the terminal parts of the leafy branches are crisp and may be eaten raw or cooked. When no fresh drinking water is available, small quantities of moisture may be had by chewing the tips of the prop roots.

The tough pliable leaves of Pandanus are plaited into mats, baskets, hats, fans, sandals and other useful articles. From the fragrant flowers of some species perfumes and native medicines are prepared. The roots yield fiber for cord.

There are over 200 known species of Pandanus. Two species may be observed in the Boettcher Memorial Conservatory. Pandanus utilis Bory, native of Madagascar, is one of the tallest kinds and its leaf spines are red. Pandanus veitchii Dall. from Polynesia has attractive white-banded leaves and is a popular house and florist plant.

The Need for a Colorado Arboretum

F.L.S. O'Rourke, Horticulturist

The general concept of an arboretum is an extensive area (500 acres or more) where woody plants are grown for determining climatic adaptation, growth response, observation, demonstration, scientific study, beauty, and just plain enjoyment. There is no such facility in Colorado. In fact, there is no really functional arboretum between Chicago and San Francisco.

The East, Midwest, and Far West are well supplied with arboreta but the distance and climatic variations render them of little value to Colorado. Climatic analogs may indicate that certain plants should thrive in other localities but the environmental complex is usually so great that the only way to actually determine plant adaptation is to grow the plant in a local site under constant and controlled observation.

Where arboreta have been established over a period of time they are recognized as a basic source of information for the analyses of arboricultural problems. A large number of professions and industries rely upon such information to guide them in the conduct of their various endeavors. Nurserymen, landscape horticulturists and architects, landscape contractors, maintenance operators, spraymen and arborists keep in close contact with arboreta to observe plant adaptation and the effects of various methods and cultural treatments. They also use the facility to demonstrate the relative merits of specific trees and shrubs to their clients and customers.

The establishment and scientific management of an arboretum is a specialized phase of horticulture. All the factors of growth and development of various trees and shrubs are studied under various site conditions and occasionally under controlled environments.

Educational institutions which teach botany and do research in the plant sciences rely upon the arboretum as an outdoor laboratory. The ecologist has the opportunity to study and report the various effects of the environment, the taxonomist may study the morphological features of plants and interpret the systems of classification, the physiologist the influences that affect biochemical reactions, and the pathologist the differences in response to diseases and the abnormal influences of the environment.

The geneticist and plant breeder considers an arboretum of prime impor-
An arboretum attracts wildlife. The variety of food and shelter furnished by trees and shrubs in the relative tranquility of the area make it an ideal habitat for birds and small mammals. Ornithologists, birdwatchers, and nature-study groups find that the grounds of an arboretum are ideal for study purposes. It serves as a laboratory to both the conservationist and the naturalist.

Likewise, teachers of science and nature-studies find in an arboretum the resources they require in instructing students and most of all, in instilling in their being the love of nature and awareness of ecological harmony that is so important in the lives of modern citizens.

There is a segment of the general public which prefers what has been termed "meditative recreation" to more strenuous pursuits. In the arboretum such persons may relax amid the tranquility of the trees, listen to the soft undertones of the living environment, and depart refreshed in body and spirit. To others the arboretum is a place of natural beauty where they may admire the flowers in spring, the deep shadows in summer, the brilliant foliage in autumn, and the stark silhouettes of the trees in winter. The York Street headquarters of the Denver Botanic Gardens will provide many of these amenities with the fulfillment of the current development plans but the need for the broader area concept of an arboretum will still remain.

The need, then, for a Colorado Arboretum is apparent. On a long term basis it is the only way to implement testing, trial, development, and distribution of woody plants specially suited to the high plains region. Outstanding individual trees and shrubs which have a long history of good performance in this region can be vegetatively propagated and the resulting clone planted out for further controlled evaluation, development and distribution. Further, these plants together with new species and clones growing in the arboretum may be used as a basis of a plant breeding program specifically designed to develop plants of proven merit for our unique climatic conditions. The results of such a program can be an entirely "new" group of plants for Colorado gardens, parks and roadsides.

The need for a Colorado Arboretum is evident but there are other worthy projects which absorb the mind and attention of people. A sufficient number of persons must be convinced that an arboretum in Colorado should have a high priority before it can become a reality. Concerted efforts must be made to popularize the arboretum concept.

In several states interested citizens have formed groups known as "Friends of the Arboretum" and "Arboretum Associates," in order to stimulate interest and secure financial support. In other states a sponsoring organization has been formed and incorporated before land was obtained. Apparently the need became available soon after.

Could not Colorado do likewise? Is a Colorado Arboretum just a dream? Can we not enlist the interest and financial support of enough Coloradans to make the dream an actuality? Should the Denver Botanic Gardens not assume the responsibility of spearheading such a development?

Chatfield Arboretum

Wayne G. Christian

Chatfield Dam, approximately 15 miles southwest of the State Capitol Building, was authorized in 1950, after extensive studies by the Army Corps of Engineers. Unfortunately, at that time, too few people were concerned to encourage Congress to appropriate the necessary construction funds. The serious flood of June 16, 1965, provided the "push" that aroused public interest to the point that many importuned Congress to act favorably. While construction funds have been curtailed part of the time the project is well under way and should be completed within three more years.

The flood, that summer day, also opened the eyes of many of Metropolitan Denver's citizens to the fact that the Platte, and its tributaries, wonderful potential assets for learning and recreation, were being so damaged by misuse that repair would be costly and difficult. That belated awareness was translated into action by various groups, both private and public, and thus the stage was set for efforts to be made to obtain lands west of Highway 75, on the drainage of Deer Creek for Denver Botanic Gardens to develop a satellite station: specifically an Arboretum and, as a part of it, a Demonstration Farm and an Ecological Study Center.

After several conversations and communications with representatives of the Army Corps of Engineers — instigated by members of the citizens committee which the Corps helped to establish to study problems related to flood control and land use — the Botanic Gardens Board authorized a formal letter of request to the Corps for the setting aside of nearly 500 acres for an arboretum, demonstration farm and ecological study center.

The prime function of the arboretum is to be the care and development of native plants and the study of exotic plants which might be adapted or adaptable to climatic conditions existing in that part of Colorado. The site is an excellent natural one for such studies since life zones ranging from prairie grass-lands to the montane zone are either on the land or immediately adjacent.

Members of the Botanic Gardens Education Committee worked out an abbreviated "master-plan" which was submitted to the Corps of Engineers earlier this year. While many modifications will probably be necessary it is expected that that plan will be the nucleus from which the final plan will evolve.

The plan envisions a multi-use facility, in keeping with modern concepts of land utilization. Changing atmospheric conditions in crowded urban centers are affecting natural vegetation as well as imported ornamentals. It should be one of Denver Botanic Gardens goals to seek ways to
combat this unwanted deterioration of our environment. In addition to strictly utilitarian values, such as that just mentioned, there should be areas devoted to scientific studies that may not reach fruition for a half century or more. Too, the site is well suited for ecological research and its close proximity to a major population center which expects to have, in a few years, a college and graduate school population of 100,000 makes it an ideal facility for long range studies for many students. Some educators and scientists have dreamed of the day when the colleges and universities of the metro area will combine certain of their research and teaching facilities to establish a School of Ecology second to none.

Presently on the grounds is a complete farm complex that can well serve as the headquarters for many years without extensive rebuilding or remodeling. Too, the farm buildings will become important parts of the overall plan which envisions a small working farm to demonstrate to urban children actual farm life conditions. Children, in small groups, would be encouraged to work on the farm for brief periods of time. This would in no way compete with the City Zoo's Children's Farm since that unit makes no pretense of being a functional operation.

Slight modifications of existing buildings would make it possible for small groups of graduate students to live-in during the summer, or other times, to carry on their studies — to the mutual benefit of the arboretum and the students.

The Denver Water Board has already agreed to provide sufficient water at reasonable rates for the long-range development of the site. The present wells will serve the area for a time, for human consumption needs, but will not be capable of being pumped heavily for irrigation.

Along the west side of Highway 75 there are a series of odd-shaped pieces of property owned by the Government — lands which the highway did not need for right-of-way. It is proposed that those parcels be utilized to demonstrate, with the cooperation of various state and federal agencies, what can be done for highway beautification using native drought-resistant plants.

Above the flood line of the property it is proposed that greenhouses be constructed and test plots established. Test plots in such a protected location could be used for carefully planned scientific studies over the years.

A one-room frame school house (now being used as a private dwelling) is on the property and it is hoped that it can be preserved and with the help of the Historical Society or other interested groups or individuals restored for its historical value. While this may seem removed from the conventional aspects of a botanical garden or arboretum it does represent an early day educational institution and should be retained for the benefit of the school children who will use the area in years to come. It would be possible to preserve and use the structure without expensive on-duty guards since it would be within the grounds of the arboretum and not left unprotected.

Recreational factors will not be overlooked. Along the lower portion of the property a bridle path could be established without disturbing the planted areas. Through the remainder of the site, motor traffic will be restricted to the main parking area and guests will be permitted to walk over the grounds along defined trails. Control will be needed over the location of trails to protect the animals still living in the area (such as deer, raccoons and small rodents as well as many species of birds).

The entire operation will endeavor to protect existing plants and animals and permit maximum feasible use by interested individuals. With Greater Denver's population expected to pass the two million mark before the end of this century the need for open space will be greater than ever. Space for tomorrow must be set aside today.

It is not intended that the use of the facilities would be restricted to Denver Area citizens, but will be open to the general public whether local or tourists. The land will remain the property of the U.S. Government and will be administered by the State Game, Fish and Parks Department which in turn will assign the land to the Botanic Gardens under the terms of a long-time use lease.

The site could well serve as the headquarters for nature study programs using adjacent lands, both private and public. That development will await the establishment, by the Botanic Gardens, of an education unit headed by a qualified person who will direct his full attention to the educational aspects of the various units of the gardens. (At first a caretaker-farmer could be employed.)

The Gardens already are uniquely endowed with educational facilities under their ownership or control — a site above Evergreen, Mt. Goliath near Mt. Evans, the Pinetum in City Park.

Think what can be done in the future with the development of lands at Chatfield Dam and other sites now available if constant efforts are expanded!!

In the past far-sighted members of the Board of Directors have pointed the way — it is my firm conviction that the present and future boards will be no less eager to make these plans a reality.

---

Give a Membership to a Friend for Christmas…

DENVER BOTANIC GARDENS
909 York Street, Denver, Colorado 80206

[Check boxes for membership type and enclose payment]

Enclosed is $_______ for my annual dues.

Class of Membership desired: (check one)

- Regular $ 5.00
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I hereby apply for membership in the Denver Botanic Gardens

I wish my membership in the Denver Botanic Gardens extended

Name
Address

City  State  Zip Code
July 16, 1970 marked the passing of one of the best plantsmen in this part of the country. Mike Ulaski died suddenly of a heart attack while at work as superintendent of Denver’s City Park Greenhouses.

Mike came to the Denver Parks Department in 1949 and by 1957 had taken charge of the City Park Greenhouses. He had been overseer of the colorful displays at Elitch Gardens. At City Park, he directed a large and complex operation which produces over 200,000 annuals and perennial flowering plants for the gardens in the city parks and the Denver Botanic Gardens on York Street. These colorful displays contribute much to Denver’s reputation for beauty.

He was very aware of the need for more interest, trials and experimentation with untried plant varieties here in the Rocky Mountain area. He was also aware of the widespread need for more trained men in this field. He contributed much of his own time and effort toward the training of those interested in horticulture and floriculture.

Mike took charge of the greenhouses and they soon reflected his way of doing things. The buildings themselves were amazingly clean and neat, as were the careful methods, complete records, conscientious follow-through which he and his men carried out.

Mike was a charter member of the Men’s Garden Club of Denver, some 25 to 30 years ago. He was always an active member, and served as president in 1966. He was a member of an organization now called the National Recreation and Park Association, and took an active role for many years in its Southwest Training Institute programs. He was one of the few active members in this area of the International Society of Plant Propagators. He did attend the Field Days of the George Ball Seed Company in West Chicago, where there are trial gardens displaying the newest and best flowers.

He took his vacations to attend meetings of these professional groups, and his hobby of photography was used to help his work. His beautiful pictures were often incorporated into the talks he gave about plants and how to grow and maintain them.

He was a friendly, helpful man who was always willing to talk over a plant problem and recommend a treatment.

One of the last new flower displays established while superintendent is the new bed at the corner of 14th and Bannock Streets in the Civic Center. It shows the figure ‘76, and the five interlinked circles from the Olympic symbol. It was planned too late in the season to have plants grown especially for it and had to be filled somehow with plants already on hand. That its complicated design was rendered so well reflects much credit on Mike.

Establishing boundaries and privacy are only two of the problems that confront the new homeowner, but they are very important ones for the enjoyment of a new home.

In attempting to solve these problems I was led to some interesting shrub research and the ultimate discovery of a plant new to me. Hedges, unfortunately, can take many years to make any significant growth in our Colorado climate and poor soil. Too, they can be expensive. Two widely used hedge plants, Russian olive and Tatarian honeysuckle, were unsatisfactory to me. A large acreage of Russian olive presents no problems, but on an average lot with small children it often becomes overgrown and can be a menace to children. Both Tatarian honeysuckle and Zabel’s honeysuckle grow too leggy as a hedge. After a good display in spring their foliage becomes rather dull.

Here are the requirements hedging material should possess for my landscaping purposes:

1. Good root system, holds slope well.
Trials at two new gardens over a 10-year period proved that this species deserves wider use and the glowing description. An honest recommendation for Amur honeysuckle can be found in Farmer's Bulletin #2105, Ornamental Hedges for the Northern Great Plains: "Amur honeysuckle is hardy and drought-resistant. It has dark green foliage that does not assume the dull color in midsummer that is so often found in varieties of Tatarian honeysuckle. Its bloom consists of rather coarse, large white flowers. Its red fruits persist to mid-winter. It attains a height of 6 to 9 feet and a spread of 6 to 7 feet. Because of its comparatively large size, it is suggested that it be grown in the untrimmed form. One noticeable characteristic of Amur honeysuckle is the very rapid growth of the young plants."

This rapid growth of Amur honeysuckle is not exaggerated. Newly planted shrubs grow in thickness as well as height. In one year 15-18 inch rooted cuttings grew to a bushy 3½ feet and in two years to a dense 7 feet. They received only natural rainfall and water from the adjacent lawn. On a sloping area with only natural rainfall it grew to a branched 4 feet in two years. Other advantages are: it remains attractive in the fall and suffers minimum breakage during heavy snows. Planted without care at about 2½ feet apart these shrubs do fantastically on their own. Loss was only about 10 per cent of all planted.

Amur honeysuckle can be of real value to the suburban homeowner who wishes to define the boundaries of his property and gain privacy at a moderate cost. Those with established landscaping will also find this shrub quick to replace a hedge that has outlived its usefulness. I hope you will try it.

In the winter issue of Green Thumb, Vol. 27, No. 1 (Pp. 30-31), appeared an initial summary of the freeze damage which occurred as a result of last October's storm. At that time most of the observations had to be based upon speculation because it was difficult to see the full extent of the storm damage. We are now in a better position to really see what happened.

While the damage from the freeze varied considerably from one area to the next, there is no doubt that the extent of the damage is considerable. It is of a greater magnitude than any similar event in the past.

Introducet Species Hurt Most

General observations in the Greater Denver Area as well as in Colorado Springs, Pueblo and Fort Collins, show that the most severe damage occurred to the Siberian (Chinese) elm, Ulmus pumila L., various forms of the weeping willow, Salix blanda Anders., the golden weeping willow, S. alba vitellina, (L.) Stokes and also the shrubby goat willow, S. caprea, L. Also showing varying degrees of injury were certain types of cottonwoods, primarily the introduced varieties and clones such as Carolina poplar, Populus canadensis eugenei Moench, and the selections of Populus nigra L. such as the Lombardy poplar.

It is interesting to note that little or no damage has occurred to the native willow, Salix amygdaloides Anders. and the native plains cottonwood, Populus sargentii Dode.

Injury to soft or silver maples, Acer saccharinum L. was most severe in trees which were less than 10 inch caliper. Many of these were frozen to near the ground level. In larger trees, some in excess of 50 feet in height, damage was confined to the upper branches. This is what we are now seeing as a stag-horn or a dieback condition. In many cases it has been observed that the damage occurred primarily to the bark tissues on the lower sides of the branches, and on closer examination one can find a narrow strip of healthy bark on the upper portion of the branch. This is apparently a result of protection from the heavy snow which covered the branches at the time of the freeze. A similar type of damage has been observed in some of the more vigorous specimens of American elm, Ulmus americana L., and in some green ash, Fraxinus pennsylvanica lanceolata (Borkh.) Sarg.

Branches Still Wilting

Many trees continued to show sudden wilting of branches even though they resumed growth in the spring in an apparently normal manner. The more severely frozen branches failed to resume growth at all. Others wilted
soon after growth began in the spring and still others continued to develop apparently normal foliage only to wilt as hot weather continued.

Close examination of branches which resumed normal growth in spring and wilted later reveals a clear picture as to what happened. A cross-section of a branch will show that only a small portion of the upper part of the branch contains living cells. In many cases it will be found that wound callus is forming from that portion of the branch which still had active cambium. There were sufficient live tissues in the branch to maintain growth until a point was reached where the total foliage surface was completely out of balance with the amount of vascular system needed to support this foliage with water and nutrients. Thus the foliage wilts.

Branches which had only small amounts of freeze damage are in general showing satisfactory recovery. Small hairline cracks caused by the freeze and not visible earlier in the year are now showing up. From these small hairline cracks have developed massive amounts of callous or wound healing tissues. In one case observed, a golden rain tree, Koelreuteria paniculata Laxm., there were so many ridges of callous tissue forming on the main trunk that the plant took on the appearance of a cylinder of corrugated cardboard.

Some Surprises

Earlier in the year many observers predicted that there would be massive losses to such species as the Newport plum, Prunus ‘Newport,’ several of the domestic cherries and peaches. The extent of the damage to these plants is not as severe as was once thought. This varied from one location in the metropolitan area to the next, however. In some places it was difficult to find a peach, cherry or plum that was not damaged or killed. In other areas fruit trees showed no damage at all or, at worst, some minor dieback of side branches. It is believed that air drainage patterns were responsible for the variations in damage throughout the metropolitan area. Some of the most severe damage occurred in low-lying areas, particularly in southeast Denver.

A surprising amount of freeze damage occurred to the black walnut, Juglans nigra L., even in large mature trees. While the black walnut has long been considered a fairly hardy species in this area, it does have a tendency to grow rapidly late in the season and thus may occasionally have tender shoots which would be subject to freeze injury even in more “normal” years.

Hardiness Not Necessarily a Factor

The reported cold hardiness of a plant did not seem to be a major factor in the ability of the given species to survive the October freeze. For example, the Siberian (Chinese) elm is rated for Zone 4 hardiness, which means that it is capable of taking temperatures as low as minus 20° Fahrenheit. Yet it has been estimated that greater than 75% of this species were severely damaged in the freeze and in some areas as high as 90% were frozen near to the ground level and not worth salvage. On the other hand, a more tender species such as the golden rain tree, rated in Zone 5, and growing in the same area where severe damage to Siberian elms occurred, often escaped with little or no damage.

Trees which were in high vigor as a result of excessive amounts of fertilizer or an ample water supply at the time of the October freeze, were in general more severely damaged than those that were in drier soil and had been more or less neglected during the growing season.

Damage Severe in Evergreens

The amount of freeze damage to many evergreens was of sufficient magnitude to render many of them useless. Others will be so deformed that they will never regain the same shape they once had.

Many of the pines, including ponderosa, pinyon, bristlecone and Austrian, lost entire tops or, in some cases, one side. This is an almost irreparable loss because needle evergreens rarely, if ever, replace lost branches. If they do, it is very slow.

In some cases blue spruce and Douglas fir also sustained damage. Many are showing remarkable recovery from some of the lateral buds which were apparently not damaged. In others, however, no regrowth has occurred.

In cases such as spruce, where the main leader has been damaged, it is advisable, particularly in smaller trees where the top can be reached, to train a new tip from the closest and strongest lateral bud that is in good condition. This can be done simply by tying a splint to the main trunk so that it extends beyond the bud or to a side branch that is to be saved. As the new top develops, it should be carefully tied with soft twine or “twist-ems” to the splint to form a straight top. The splint should be removed after the new growth has hardened off in late fall.

Injury to junipers seems to be greatest in the Chinese varieties, including the Pfitzer and some of the upright varieties. Little or no damage has been observed in the prostrate, or creeping, types. The “Tammy” juniper, Juniperus sabina tamariscifolia Ait., escaped injury in most areas. Where injury occurred it was usually in isolated small branches. Many of these were not as a result of the freeze but more as a result of minor breakage from the weight of the snow.

Disease Incidence High

As was predicted earlier, the incidence of disease, particularly the canker-type diseases, is much higher than normal. Diseases such as cytospora canker were very prevalent in cottonwood and willows. This is a result of the freeze causing cracks in the bark of trees, thus exposing the vulnerable tissues beneath. In some cases, cottonwoods and willows were so heavily covered with the cytospora canker that the branches appeared to be velvety red orange in color. The coloration comes from the sport or fruiting bodies of the canker disease.

The amount of fire blight in crabapples, domestic apples and mountain ash was also high despite the fact that many of them did not flower this year. Normally, in a flowering year we can expect fire blight to be high simply because the disease enters through the flowers when transmitted by honey bees and other insects. It is believed that the damage seen this year on nonflowering branches is a result of the bacterium being washed or blown into freeze-caused cracks in the bark. The disease, as in cytospora canker, enters through any open wounds in the tree.

Dutch Elm Disease Threat High

The most serious problem arising from the freeze is a bewildering amount of dead or dying elm wood which is now most certain to become a target for the European elm bark beetle. The progress of Dutch elm disease in the Denver metropolitan area, now in its apparent second year, has been declared to be of epidemic proportions. October’s storm will most certainly contribute to this problem and it will require an intensive community-wide sanitation and selective chemical spray program to stem the spread of this dread disease.

Disposal of elm wood, in fact any
kind of tree logs, is now an acute problem. Municipal dumps in many areas are becoming piled high with quantities of tree logs and limbs, and these in themselves are now breeding sites for the European elm bark beetle and sources for the further spread of the disease. It is hoped that these areas can be promptly cleaned up before the next beetle hatch, which occurs in late summer.

You as an individual citizen can help by first seeing to it that you have cleaned up all of your property and disposed of all elm logs to which bark is still firmly attached. Any elm branches two inches in diameter or greater present a serious hazard in the spread of Dutch elm disease. You can also help by supporting your community in local clean-up campaigns.

Don't take your trees for granted. Trees in a community are a definite and valuable asset. You should do everything you can to protect them from destruction.

**Do You Have Thyme?**

**SUZANNE ASH**

"WHAT GROUND cover do you have that will grow fast on a dry slope?" This question is constantly asked of the personnel at the Rock Garden booth at the annual Plant Sale.

Plant problems that confront us are seldom easy, but one group of plants fills these needs and, unfortunately, is often overlooked by all but herb gardeners. Thyme, with its many varieties, is an excellent seasoning but is an equally valuable rock plant. It grows anywhere and requires no care. New plantings, of course, require water until they are established.

The bloom is insignificant but the foliage color and texture are not! Even in winter, the russet tones create interesting patterns among the rocks. Thyme forms a very tight, compact mound, is excellent for combating erosion and yet, it is not invasive as are some ground covers.

The varieties I have grown and found successful under these conditions are:

- **Thymus serpyllum**, Mother-of-thyme, fragrant, pink flowers. 3-4 inches.
- **Thymus s. aureus**, golden thyme, variegated foliage, lemon-scented, part shade if the golden color is to predominate. In full sun foliage will be green. 3-4 inches.
- **Thymus s. lanuginosus**, wooly thyme, nice texture, pink flowers. 2-3 inches.
- **Thymus s. coccineus**, crimson flowers, hardy. 2-3 inches.

The next time you shop for rock garden plants, I hope you'll take THYME!

**PROGRESS! in the Gardens**

A. R. KNAUER

Phase I in the reconstruction of the gardens is under way! On September 15th the plans for this project underwent a final review by the Denver Botanic Gardens Board of Trustees, and resolutions were passed authorizing immediate execution of a contract with the firm of Langfur Construction Corporation for the actual work and with Wright McLaughlin Engineers for supervision, inspection and construction administration. On September 28th construction on this long-awaited step in the garden development began.

The scope of this work entails regrading of almost all of the land between the parking area by Botanic Gardens House to the Conservatory, and from the east fence at York street to the west fence at Cheesman Park. Elevations will change as much as ten feet in this area. In addition to the grading, an extensive network of water conduits designed to provide a frost-free source of water to every portion of the garden will be installed. Probably the most significant aspect of this project will be the complete installation of the decorative waterways which form the backbone of the entire garden.

The waterways, a major feature of the Master Plan as designed by Eckbo Dean Austin and Williams arise from fountain heads in tall pylons near the present herb garden, flow into an upper lake there and subsequently via various cascades, shoots, waterfalls and auxiliary fountains, through lower lakes, into an informal natural channel in the Japanese garden, then eventually into the present Gates pool. At this point the water will be picked up by a large recirculation pump and returned to the pylons in the upper lake. The water ways will not only provide a visually pleasing aspect but the entire garden will be within the delightful pale of sound created by running water.

The first big step has been taken toward the long awaited realization of the magnificent plan conceived by the landscape architects working with the Planning and Executive Committees, the Board of Trustees, the staff and many other interested groups and individuals.

Efforts of those dedicated individuals directing the Denver Botanic Gardens Development Fund Drive have now been redoubled. Together with the Board of Trustees they are determined
to reach the minimum goal of $850,000 so that all steps through the completion of the entire garden may be taken in an orderly fashion. At present the Fund Drive totals over $650,000.00 in pledges and cash.

The Education Building

Scheduled for completion late in 1970, the Education Building, designed by Hornbein & White Architects, has been a subject of amazement to all who enter the unfinished structure. Appearing very small from the outside (seemingly dwarfed by the Conservatory) the structure “opens up” amazingly on entering. Over 20,000 square feet of floor space is available for a multiplicity of educational functions. The main room, called “Horticultural Hall,” will comfortably seat over 400 persons or contain flower shows of any scale. The library contains shelf space adequate to more than triple the present book collection and has provisions to double even that in a lower level. A generous stage, storage, preparation room, lounge, walk-in cooler and beautiful garden court completes the first floor room arrangements. Below, at the garden level, three generous classrooms, a large storage area, mechanical room, a special Gift Shop storage room, dark room and research laboratory occupy most of the area with the library expansion area comprising the remainder.

On a partial second floor there is a special display area on a balcony overlooking the garden court, and a large herbarium room and projection booth which opens into Horticulture Hall.

The day of opening, not far off, is eagerly awaited by all. Prepare yourself for a real treat and plan to visit early in 1971.

Exotics of Colorado...

Pyracantha

Dr. Helen Marsh Zeiner

Not many years ago the shrub Pyracantha Roem. or firethorn was a novelty in Denver, the bright orange-red fruits are now a familiar sight during the fall and early winter.

When this author first joined a garden club in Denver, about twenty years ago, very few members were trying to grow Pyracantha because it simply was not hardy and seldom survived for any length of time. At that time one member of the club had a very durable pyracantha bush, and she kindly brought cuttings for others to try. In ways such as this, in addition to the efforts of local nurserymen, hardier varieties have been introduced and many pyracanthas are now growing quite well in protected locations in Denver.

There are six species of Pyracantha, all from southeastern Europe to the Himalayas and Central China, plus numerous horticultural varieties. It is easy to understand why some pyracanthas are harder than others. Pyracantha coccinea Islandii Dipp., Laland firethorn, seems to be a sturdy form which will endure here. However, if you are interested in a pyracantha, it is suggested that you patronize a local nurseryman who is in a position to know which varieties are suitable for this area.

Pyracantha is grown primarily for its attractive orange-red fruits which hang on well into the winter, usually until they are eaten by birds. The shrub is classed as a broad-leaved evergreen with dark green, glossy leaves. If the winters are too cold, the leaves may turn bronze and drop off. Tender varieties may winterkill to the ground.

Pyracantha is a member of Rosaee, the rose family. Examination of the fruits will show that they resemble tiny apples. They are, botanically speaking, the same type of fruit — a pome. The white flowers borne in compound corymbs (a type of flat-topped cluster) resemble those of many other members of the rose family. They are sometimes described as miniature white wild roses.

The name Pyracantha comes from two Greek words, “pyr” meaning fire and “acanthos” meaning thorn. Thus the name alludes to the bright orange-red fruit and to the spiny branches. Pyracantha is an example of a genus name that is also used as a common name. The name firethorn is simply a translation of the genus name. Firey thorn and everlasting thorn are occasionally used as common names.

Pyracantha is often recommended in the literature for use in a shrub border or as a high hedge, but here it does well trained on a wall or a building which gives it extra protection. It appears as an evergreen vine when handled in this way.

Legends often spring up about plants which have been cultivated from very early times. This is true of Pyracantha. A very old French legend explains the origin of this shrub. According to this legend, an unhappy tree-sprite who lived in a hawthorn tree wanted to be left the hawthorn. In this same land a donkey went from one monastery to another, carrying messages and parcels. One day the green wolf met and ate the donkey. Just then a monk came among, saw the green wolf whom he believed to be the devil in disguise, and held up his cross. At the sight of the cross the green wolf repented and offered to take the donkey’s place. One day, while conscientiously carrying out his duties, he was trapped in a forest fire. When he escaped, half of his green fur was flaming red. At this instant the tree gods changed him into a bush with green leaves and flame red berries, and also with thorns to remind him of the hawthorn tree where he had lived as a tree-sprite. Thus, so the legend says, the firethorn came into being.
The Helen Fowler Library continues to increase in size and usefulness, thanks to all those who share their knowledge, books, funds and countless hours of voluntary service. The library is a source of reliable information for the Gardens’ staff, association members, students and researchers, public parks and forest officials, landscape architects, as well as many home gardeners. Each year more high school and college students draw on reference sources not available elsewhere.

The library encompasses literature in the fields of botany, horticulture, forestry, agriculture and subjects necessarily interrelated. Now containing well over 5,000 books, 100 current periodicals and a large pamphlet file, the Helen Fowler Library is recognized as a most outstanding collection of its kind. The list of generous library donors who have contributed toward this goal is legion. A five-volume collection of 197 water colors of Colorado wild flowers by Emma Armstrong Ervin (1874-1957) is on permanent display here. A rare and unusual collection of books, which includes limited, autographed and out-of-print editions, is kept in a specially constructed case donated by Mrs. Alexander Barbour, a devoted friend to the library. The Denver Botanic Gardens Guild prepared and presented a large volume of dried, mounted and classified herbs accompanied by a descriptive text. A fine collection of books on cacti was acquired through the generosity of the Colorado Cactophiles. More recently, Dr. D. W. Mitchel donated a large part of his valuable library of mycology, adding substantially to the library’s research literature. Since the opening of the Boettcher Memorial Conservatory, the collection has grown to include a wide selection of literature on tropical plants and flora of the world. The popularity of the Children’s Garden has necessitated enlarging the collection of texts for the younger generation.

The future of the Helen Fowler Library appears even brighter in the new Education Building, adjoining the Conservatory. The library will continue to add books and to the growing mountain land with which Mrs. Zwinger became completely enchanted and about which she has learned a great deal. We are fortunate that she has chosen to share her knowledge with us by writing Beyond the Aspen Grove.

Beyond The Aspen Grove

ANN ZWINGER
Random House, N.Y. 1970

Coming at a time when we are all being made aware of ecology and its importance in our lives, Beyond the Aspen Grove is a most significant book. It all began seven years ago when the Zwingers purchased 40 acres of
Beyond the Aspen Grove describes an area of varied habitat as seen through the observant eyes of an artist with a true love of nature, curiosity, and a great deal of insight into the relationships of all living things. It is natural history at its best.

The book conveys a wealth of good information in a manner which even the most uninitiated can understand. It should inspire interested nonprofessional persons to learn about their environment; for Mrs. Zwinger, who learned so much about the land and all the life upon it, was in the beginning an artist by training and a layman ecology-wise.

Beyond the Aspen Grove is a book for leisurely reading so that one can savor every word. Not only is Ann Zwinger an artist with a brush, she is also an artist with words. Her descriptions are truly exquisite. The book is also full of unexpected and delightful bits of humor which the hasty reader might miss.

The many beautiful drawings are artist's drawings, and they do not always depict with the 100% fidelity of the true scientific illustration (nor were they intended to). The artist, however, has a feeling for the objects drawn and the drawings always catch the true character of the plant or animal. Anyone could identify plants or animals from these drawings, and they add a great deal to the beauty and to the usefulness of the book.

Beyond the Aspen Grove is a delightful book in every way and it is a "must" for all interested in the mountains and in nature.

— Dr. Helen Marsh Zeiner

A Treasury of American Indian Herbs

VIRGINIA SCULLY

A Treasury of American Indian Herbs; Their Lore and Their Use for Food, Drugs, and Medicine, By Virginia Scully; Crown Publishers, Inc. New York, 1970 $6.95

Inspired by the plants growing around her Wyoming ranch home and with an acute awareness of the Indian's herbal knowledge, Mrs. Scully has compiled a record of the uses of the plants and herbs of the Rocky Mountain region.

Knowing a daisy from a columbine, but not an Erigeron from an Aquilegia, as a first step she purchased M. Walter Pesman's Meet the Natives and began her research at Denver Botanic Gardens' Helen Fowler Library. She traveled by bus to interview Indians and descendants of pioneers. From libraries and historical societies she compiled much information.

In the first half of the book plants are listed alphabetically from Absinthe to Yucca as used for food and drink by the Indians. In the second half the herbal uses for maladies and medicines are given.

Botanical names are used only when necessary for clarification. This decision may upset scientific minds.

The bibliography is extensive. Illustrations are from Gerard's Herbal (1636) and Dr. W. Beach's The American Practice Condensed (1849).

This herbal will impress the reader who views nature as an organic whole and who respects the Indians' reverence for working with nature instead of against her. — MBN

Note: Pesman's Meet the Natives, published by Denver Botanic Gardens, and A Treasury of American Indian Herbs are also available in the Conservatory Gift Shop.
### Subject Index, 1970

**ALL-AMERICA ROSE SELECTIONS**
- *All-America Rose Selections, B.M.P.*, Spring, P. 37

**ANNUALS**
- Exotics of Colorado — *Dipsacus, Teasel*, Dr Helen March Zeiner, Summer, P. 72

**ARBORETUM**
- A Need For a Colorado Arboretum, *F.L.S. O'Rourke*, Autumn, P. 107
- Chatfield Arboretum, Wayne G. Christian, Autumn, P. 109

**AWARDS**
- A. C. Hildreth Receives Award, Summer, P. 91

**BOOKS**
- Book Review, Dr. Helen Marsh Zeiner (Beyond the Aspen Grove, Ann Zwingler), Autumn, P. 123.
- Two Book Reviews, K.B.C. (Handbook of Rocky Mountain Plants, Ruth Ashton Nelson) and (Plants of Rocky Mountain National Park, Ruth Ashton Nelson), Summer, P. 84

**BOTANICAL CONGRESS**
- The XI International Botanical Congress, Dr. Moras L. Shubert, Winter, P. 9

**DENVER BOTANIC GARDENS**
- Denver Botanic Gardens Annual Plant Sale, B.E.P., Spring, P. 59
- History of Helen K. Fowler Memorial Library, Edith Wilson, Autumn, P. 122
- New Director for Denver Botanic Gardens, A.W., Summer, P. 70
- New Dreams, New Reality, B.E.P., Winter, P. 26
- Plant Sale Thanks, Summer, P. 79
- Progress in the Gardens, A. R. Knauer, Autumn, P. 119
- Trustees for Denver Botanic Gardens, Summer, P. 83

**DUTCH ELM DISEASE**
- Control of Dutch Elm Disease — A Community’s Responsibility, Dr. James R. Feucht, Winter, P. 14

**EXOTICS OF COLORADO, Dr. Helen Marsh Zeiner**
- *Dipsacus, Teasel*, Summer, P. 72
- *Harison’s Yellow Rose*, Spring, P. 42

**FLOWERS**
- A Garden of Perennials, Evelyn F. Johnson, Summer, P. 66
- Common Poisonous Plants, Dr. James R. Feucht, Summer, P. 92
- Hydroponics, Charles M. Drage, Winter, P. 7
- Selection and Care of Dry Land Trees, A. C. Hildreth, Summer, P. 75
- Strawberries and Colorado Horticulture, S. R. DeBoer, Summer, P. 73

**GARDENING**
- Annual Garden Show, Wendy Burns, Summer, P. 89
- The Markley Garden, Katharine B. Crisp, Winter, P. 2

**GLADIOLUS**
- Drumbeats, Lee J. Ashley, Winter, P. 20

**HERBS**
- Do You Have Thyme, Suzanne Ash, Autumn, P. 118

**HYDROPONICS**
- Hydroponics, Charles M. Drage, Winter, P. 7

**LANDSCAPING**
- Low Shrub for Colorado Landscaping, George W. Kelly, Autumn, P. 103
- Needed: Positive Approach to Landscape Planting in Metropolitan Denver, E. Alan Rollinger, LD, Autumn, P. 98
- Outdoor Lighting, John Dillavou, Summer, P. 82
- Roses in the Landscape Plan, Frances Novitt, Spring, P. 4

**LIBRARY**
- History of the Helen K. Fowler Memorial Library, Edith Wilson, Autumn, P. 122

**LIGHTING**
- Outdoor Lighting, John Dillavou, Summer, P. 82

**NATIVE PLANTS**
- Colorado’s Columbines, Claire Norton, Summer, P. 85
- Low Shrub for Colorado Landscaping, George W. Kelly, Autumn, P. 103
- Native Roses of Colorado, Dr. Helen Marsh Zeiner, Spring, P. 97
- Selection and Care of Dry Land Trees, A. C. Hildreth, Summer, P. 75

**OBITUARIES**
- Denver Loses Mike Iflaski, Frances Novitt, Autumn, P. 112
- P. F. S. O’Rourke, Autumn, P. 107

**PEOPLE**
- New Director for Denver Botanic Gardens, A. W., Summer, P. 70
- The Markley Garden, Katharine B. Crisp, Winter, P. 2
- Plant Sale Thanks, Summer, P. 79

**PLANTS**
- Denver Botanic Gardens Annual Plant Sale, B.E.P., Spring, P. 59
- Plant Sale Thanks, Summer, P. 79

**POISONOUS PLANTS**
- Common Poisonous Plants, Dr. James R. Feucht, Summer, P. 92

**PLANTS FOR THE DENVER AREA**
- Amur Honeysuckle, Suzanne Ash, Autumn, P. 113
- Low Shrub for Colorado Landscaping, George W. Kelly, Autumn, P. 103
- Needed: Positive Approach to Landscape Planting in Metropolitan Denver, E. Alan Rollinger, LD, Autumn, P. 98
- Selection and Care of Dry Land Trees, A. C. Hildreth, Summer, P. 75
- Suggested Trees for the Denver Area, George W. Kelly, Winter, P. 21

**ROSES**
- A Fertilizing Program for Roses, Dr. Warren Kirkley, Spring, P. 61
- All-America Rose Selections, B.M.P., Spring, P. 37

**SHRUBS**
- Amur Honeysuckle, Suzanne Ash, Autumn, P. 112
- Exotics of Colorado, *Pyracantha*, Dr. Helen March Zeiner, Autumn, P. 120
- Low Shrub for Colorado Landscaping, George W. Kelly, Autumn, P. 103

**STRAWBERRIES**
- Strawberries and Colorado Horticulture, S. R. DeBoer, Summer, P. 73

**SUBJECT INDEX**
- Subject Index, Autumn, P. 126

**TREES**
- The Need for a Colorado Arboretum, F.L.S. O’Rourke, Autumn, P. 107
- Chatfield Arboretum, Wayne G. Christian, Autumn, P. 109
- Control of Dutch Elm Disease — A Community’s Responsibility, Dr. James R. Feucht, Winter, P. 14
- Exotics of Colorado, *Pinus strobus*, Dr. Helen March Zeiner, Winter, P. 27
- Focus on Araucarias, Peg Hayward, Winter, P. 11
- My Favorite Tree, Venola Lewis Bivans, Winter, P. 24
- Needed: Positive Approach to Landscape Planting in Metropolitan Denver, E. Alan Rollinger, LD, Autumn, P. 98
- Suggested Trees for the Denver Area, George W. Kelly, Winter, P. 21
- The Markley Garden, Katherine B. Crisp, Winter, P. 2

**WILDFLOWERS**
- Colorado’s Columbines, Claire Norton, Summer, P. 85
- American Rose Society Meets in Denver, Ross V. Lahr, Spring, P. 35
- Exotics of Colorado, Harison’s Yellow Rose, Dr. Helen Marsh Zeiner, Spring, P. 45
- How Good is My Rose, G. E. Casey O’Donnell, Spring, P. 47
- Native Roses of Colorado, Dr. Helen Marsh Zeiner, Spring, P. 57
- Old-Fashioned Roses to Know and Enjoy, Joan Franson, Spring, P. 51
- Rose Week Proclamation, Spring, P. 34
- Roses in the Landscape Plan, Frances Novitt, Spring, P. 49
- The Wee Ones, C. Lee Campbell, Spring, P. 45
# Author Index, 1970

<table>
<thead>
<tr>
<th>Author</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash, Suzanne</td>
<td>113, 118</td>
</tr>
<tr>
<td>Ashley, Lee J</td>
<td>20</td>
</tr>
<tr>
<td>Bivans, Venola Lewis</td>
<td>24</td>
</tr>
<tr>
<td>Burns, Wendy</td>
<td>89</td>
</tr>
<tr>
<td>Campbell, C. Lee</td>
<td>45</td>
</tr>
<tr>
<td>Christian, Wayne G.</td>
<td>109</td>
</tr>
<tr>
<td>Crisp, Katharine B.</td>
<td>2, 84</td>
</tr>
<tr>
<td>DeBoer, S. R.</td>
<td>73</td>
</tr>
<tr>
<td>Dillavou, John</td>
<td>82</td>
</tr>
<tr>
<td>Drage, Charles M.</td>
<td>7</td>
</tr>
<tr>
<td>Feucht, Dr. James R.</td>
<td>14, 30, 92, 115</td>
</tr>
<tr>
<td>Franson, Joan</td>
<td>51</td>
</tr>
<tr>
<td>Garrey, A. R.</td>
<td>13</td>
</tr>
<tr>
<td>Hayward, Peg</td>
<td>11, 58, 80, 105</td>
</tr>
<tr>
<td>Hildreth, Dr. A. C.</td>
<td>75</td>
</tr>
<tr>
<td>Johnson, Evelyn F.</td>
<td>66</td>
</tr>
<tr>
<td>Kelly, George W.</td>
<td>21, 103</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirkley, Dr. Warren</td>
<td>61</td>
</tr>
<tr>
<td>Knauer, Andrew R.</td>
<td>119</td>
</tr>
<tr>
<td>Lear, Ross V.</td>
<td>35</td>
</tr>
<tr>
<td>Neil, Bern</td>
<td>124</td>
</tr>
<tr>
<td>Norton, Claire</td>
<td>85</td>
</tr>
<tr>
<td>Novitt, Frances</td>
<td>49, 112</td>
</tr>
<tr>
<td>O’Rourke, F.L.S.</td>
<td>107</td>
</tr>
<tr>
<td>Petersen, B. E.</td>
<td>26, 59</td>
</tr>
<tr>
<td>Pincoski, B. M.</td>
<td>37</td>
</tr>
<tr>
<td>Rollinger, E. Alan, LD</td>
<td>98</td>
</tr>
<tr>
<td>Shubert, Dr. Moras L</td>
<td>9</td>
</tr>
<tr>
<td>Willis, A.</td>
<td>70</td>
</tr>
<tr>
<td>Wilson, Edith</td>
<td>122</td>
</tr>
<tr>
<td>Zeiner, Dr. Helen</td>
<td>27, 42, 57, 72, 120, 123</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh</td>
<td>27, 42, 57, 72, 120, 123</td>
</tr>
</tbody>
</table>

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## Officers
- **President**: Mr. John C. Mitchell
- **Vice-President**: Mr. Harley G. Higbie, Jr.
- **Vice-President**: Mr. Charles C. Nicola
- **Vice-President**: Mrs. James J. Waring
- **Secretary**: Dr. Moras L. Shubert
- **Treasurer**: Mr. Richard A. Kirk

## Staff
- **Director**: Dr. William G. Gambill
- **Assistant Director**: Andrew R. Knauer
- **Conservatory Superintendent**: Ernest A. Bibe
- **Assistant Conservatory Superintendent**: David A. Blades
- **Botanist-Horticulturist**: Beverly M. Pincoski
- **Publicity**: Frank A. Keppelmann
- **Secretary**: Iris Nakagawa
- **Receptionist**: Jeannette J. Bone
- **Director Emeritus**: Dr. A. C. Hildreth

## Botanic Gardens House
- Botanic Gardens House: 297-2547
- Conservatory Superintendent: 297-2810
- Conservatory and Gift Shop: 297-2348

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## Illustration Sources
- **Cover**: Transparency by D. A. Blades
- **Pages 99-102**: Photos by A. R. Kaauer
- **Page 105**: Drawing by Phil Hayward
- **Page 112**: Photo by Howard Brock, Courtesy Rocky Mountain News
- **Page 114**: Drawing by Suzanne Ash
- **Page 122**: Plate design and execution by Suzanne Ash
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.