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JULY COVER ILLUSTRATION

Yoshino Cherries (*Prunus yedoensis*) around Tidal Basin, Wash., D. C.—Nat'l Park Service



NATIONAL PARK SERVICE

Flower Garden on West Side of White House, Washington, D. C.

*"The creation of beauty
is a happy experience . . . it adds to one's sense
of self-respect and joy."*

Mrs. Lyndon B. Johnson

PREFACE

The July 1966 American Horticultural Magazine is dedicated to the 17th International Horticultural Congress—held for the first time in the United States. Here in the Maryland suburbs of our Nation's Capital horticulturists from the world over are meeting to hear papers that touch upon horticulture in all its aspects.

We would have those assembled know American horticulture more intimately than can be gained during so short a stay. But our country is so large and time so short that this is not possible. To further what you will see and learn during the Congress, the Board of the American Horticultural Society directed that this issue be devoted to American Horticulture as it exists in 1966. To do this, we asked various leaders in the field of ornamental horticulture and natural beauty to write articles that would be illustrative of the many facets of our American effort. This includes amateurs, professional scientists, commercial representatives, those from societies, our garden writers, and the planners in the cities we are now engaged in beautifying. We think these samples will give you some idea of the complexity of ornamental plant culture in so great and varied a country, and hope that you will return home conscious of the resurgence of interest in garden plants that now prevails in the United States.

We have not solved all of our problems in implementing a beautification program, however, you will read how the redwoods and the saguaro cactus are being saved from partial destruction or extinction. And more of our citizens know of the beauties of a New England autumn as described by Dr. Wyman. We are making progress. Perhaps more so in this year, 1966, than ever before in the history of our country. Our own gracious First Lady, Mrs. Lyndon B. Johnson, is leading the gardeners of America in this crusade to bring to all Americans the knowledge of the natural beauty that has been granted to them. We now have an opportunity to build on the natural beauty of our country by applying man's meager capability to the beautification of our cities.

On behalf of the American Horticultural Society and the garden-minded citizens of the United States, we welcome you to the University of Maryland and the Washington scene. We wish you a successful Congress and a safe return to your homeland.

JOHN L. CREECH

For the Editorial Committee

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New England for Autumn Color

By DONALD WYMAN
Arnold Arboretum, Jamaica Plain, Mass.

New England is one of the prominent regions in the United States where autumn color can be seen at its best. Certainly there are other places where the fall foliage colors magnificently, but, because of its many picturesque mountains and lakes, and its peculiar situation in the well populated northeastern corner of the country, or because of the concentrated efforts of the people who live there to publicize it so well, somehow New England has earned the reputation of having the best. Whether this is true or not, it is that part of the country where autumn color can be seen in all its glory during the month of October.

Much of New England is covered with a mixture of hardwood and conifer forests, chiefly the White Pine, Canada Hemlock, and Spruce. This combination of hardwood and conifer forests growing together is one of the first prerequisites for outstanding color, for when the hardwoods color in the fall, the evergreens provide the green background for contrast.

The White Mountains of New Hampshire, the Green Mountains of Vermont and the Berkshires of Massachusetts are famous vacation spots known everywhere. The mountain lakes and streams, the broad slow moving rivers in the valleys, all add their bit to the general picture, for without this type of topography, there could be no outstanding autumn color with any lasting qualities.

The progress of color from the northern part of New England down to Long Island Sound, is something all the "natives" follow with interest each year. This procedure may take as much as five weeks to progress from the northern most tip of Maine to southern Connecticut. During October, if one follows the news bulletins, one can find some autumn color at its peak in some part of this great area on any single day.

The Reasons for Autumn Color

To understand this procedure, as well as the timeliness of it, one must go to the plants themselves and understand just what makes the color in the first place. As everyone knows who has ever studied botany, plants are green because of the chlorophyll in the leaves. This is being continually manufactured and destroyed but during the warm spring and summer months it is being made at a faster rate than it is being destroyed. It is chlorophyll which manufactures the sugars that are the food so essential for plant growth.

These sugars are manufactured in the leaves during bright sunny days. They are translocated from the leaves to larger branches and roots where they are stored for future use, and this translocation takes place chiefly on nights when the temperature is warm. Hence, through spring and summer, the trees and shrubs are busily engaged in manufacturing sugars during the day, using some of it in their growth of new cells especially during the spring and early summer, and storing it in other parts during the later part of the summer. During all this time, major translocation occurs chiefly at night.

Then in the early fall, night temperatures begin to dip. When they go below 45°F. it has been shown in the laboratory, that the sugars are not translocated from the leaves at night, but are "trapped" there by the low temperatures. Hence, after a "cold" night the leaves are ready to start the manufacture of more sugars as soon as the sun comes out bright and warm, but the accumulation of the sugars from the previous day are still there. This is the signal which triggers deterioration in the manufacture of chlorophyll, and at this time, chlorophyll is destroyed in the leaf at a faster rate than it is manufactured.

Two pigments, carotin and xanthophyll are continually masked in most leaves up until the time comes when chlorophyll is no longer manufactured. They are in the leaf all the time as can be shown by placing a piece of adhesive tape on a leaf for a few days and then removing it, or taking a green leaved potted plant into the dark cellar for a few days. Chlorophyll can only be manufactured in the presence of sunlight. In the dark, the leaves turn yellow, showing that these yellow pigments are omnipresent. Consequently, the yellow in autumn color, comes to the fore as the green chlorophyll gradually breaks down and disappears on the advent of cold weather.

The formation of the red colors in the leaves is complicated, but the basic story is that this also comes as a result of cold weather and the break down of chlorophyll. It is complicated by the fact that though all trees have the yellow pigments, all do not show the red coloring pigments (anthocyanin).

Consequently, as fall approaches and one takes a trip through the forested lake areas of New England, the first bit of color to be seen is usually in frost pockets around lakes or in other low spots, where cold air has settled prematurely during the night and started the phenomenon of autumn color. Occasionally as one drives along in late August or very early September, one may notice a single branch that has started to color, where all the rest of the shrub or tree is still green. If the plant is examined closely, it will probably be found that translocation of sugars on this one branch may have been stopped or at least slowed down by a branch injury of some sort (or in some cases by a girdling wire) but since it was only one branch that started to color and not the whole plant, cold temperature is not the cause.

The mountains, valleys and coastal areas of New England topography, provide excellent opportunity for many variations in the timing of the autumn color, one of the reasons why color can be long-lasting in this area. In parts of the country where the land is flat, au-

tumn color comes and goes quickly, within a week sometimes, but in an area where land elevations go from sea level to 6000 feet, with many sheltered lakes and high mountain tops, there are many opportunities for autumn color to come early to the mountain tops and to linger at lower elevations.

Plants Showing Autumn Color

It is of interest to note that it is the native American trees and shrubs, as well as some of those from the Orient which show the best autumn color. Plants introduced from their native Europe show practically none. Many are like the Sycamore Maple or the English Oak the leaves of which merely die on the tree and drop without displaying any color whatsoever except green. There are some native American plants in this same category. Fortunately our woods and forests are made up of the other kinds, the oaks and maples and birches—those which are vividly colored under the right climatic conditions.

There are always those trees and shrubs which turn yellow. The birches make the greatest display for they are the most numerous in New England. The redbuds, hickories, Witch Hazel, chestnuts, Goosefoot Maple, American Bittersweet, some of the shadblows are all in this group. In the suburban areas where plants have been introduced from other parts of this country (as well as abroad) the Norway Maple, Ginkgo, and Korean Mountain Ash are some outstanding examples of trees turning a pure yellow color in the fall.

It is the plants with red autumn color, or those with both red and yellow which make the magnificent scene so admired throughout the area. The oaks, of course, are outstanding in this respect, but so are the red maples and especially the sugar maples that turn red and yellow. The sumacs growing in poor soils along the roadsides are usually a brilliant red. One of the best of all trees in this respect is the native Tupelo or Pepperidge (*Nyssa sylvatica*) because its leaves turn a glossy scarlet, making this one tree most prominent. The native Flowering Dogwood (*Cornus florida*) with its hori-

zontal branching and bright red fruits, is also an outstanding and colorful fall plant for its vividly colored red leaves.

The native Pin Cherry (*Prunus pensylvanica*) which one sees in an occasional hedge row colors red, and the Sassafras, a tree growing chiefly in poor gravelly soils and known everywhere for its mitten-shaped leaves is a gorgeous orange to red. Of rather columnar growth, and tending to grow in groups, this is one of the best of New England's trees for fall coloration.

Driving through the suburbs where people have had the advantage of selecting from many plants for use about their homes, one frequently sees the vivid red Boston Ivy (*Parthenocissus tricuspidata*) from the Orient climbing up the sides of brick or stone buildings. The oriental maples (*Acer palmatum*, *ginnala* and *mandshuricum*) are vivid scarlet in the fall as is the southern Sourwood (*Oxydendrum arboreum*) from the southeastern United States. Another southern tree, the Sweet Gum (*Liquidambar styraciflua*) has the interesting habit of coloring yellow or red or both in the fall, and can usually be spotted along the highways of southern New England where it has been used as a street tree or as an ornamental about the home grounds.

Mountain Ash (*Sorbus* species) are seen in the forests as natives, but also the European species (*S. aucuparia*) has been used as a specimen tree, and it colors a fine red at this time of year. Many of the viburnums color reddish in the fall and the Rugosa Rose from Japan is usually a fine red and yellow also. These are only a few—there are many others.

It is these red colored leaves in the fall that bring out the best of color contrasts with the yellows of the birches and elms as well as the greens of the coniferous forest trees. These colors are not as pronounced or vivid some years as others. One remembers "good" years and "poor" years of autumn color, and it is true that the weather has a great deal to do with this. If, in the early fall, the days are warm with plenty of sunshine so the leaves can manufacture

a large amount of sugars, and if the nights are definitely cold (below 45°F) then there is bound to be excellent red coloration.

On the other hand, if the days in early fall are cloudy or rainy, without much sunshine, and if the nights are mild but not cold, then there are not the striking differences in color that one could hope for. A prolonged summer drought may adversely effect autumn color also. The leaves of trees and shrubs may have wilted and started to turn brown along the edges and even drop prematurely without coloring much. The autumn color spectacle such years is not nearly as vivid as it is after periods of perfect growing conditions, especially when there has been plenty of rain.

All things considered then, outstanding displays of autumn color are to be seen in areas with beautiful scenery, with the species of plants that color and with the right conditions of climate to produce that color. All these prerequisites are present in New England when, between the start of the last week in September, and the end of the last week in October, some vivid and colorful views can be seen somewhere at any time in this scenic area, by the individual who is interested in looking for them.

Where to Go

New England covers roughly an area 300 by 450 miles, bordered by New York State, Canada, and the Atlantic Ocean. In the summer it is often mentioned by enthusiastic local publicity agents as the "Nation's Playground," for recreation and vacation-living is a multi-million dollar business in each of the states concerned. Mountains, mountain lakes, seashore, and just plain "back country" provide all the possibilities anyone could wish for in spending a relaxing or an energetic sports-filled vacation period. The various chambers of commerce, of course, foster this idea and try to lengthen the period of attractiveness, the reason why so much is now being made of autumn color in October.

The state of New Hampshire publishes weekly autumn color bulletins available

at toll booth stations and various "Information Bureaus" along the highway. Other states keep the public fully informed of the progress of the colorful period from north to south by ample radio and newspaper publicity. The automobile associations actually mark routes tourists may take to see the most outstanding color during certain periods. Consequently, one should keep in touch with available publicity to ascertain the best time for the best color at the best places.

Traveling along the seashore has its interests in the fall, too, but because of the moderating effects of the ocean, temperature gradients are not as marked as they are in the mountains, hence the autumn color may not be as vivid. The burnished red of the Bearberry (*Arctostaphylos uva-ursi*), the colors in the cranberry bogs and plants around them especially in the Cape Cod area have a beauty all their own, but it is not the vivid beauty of the mountains.

Driving through the flat forested areas of parts of Maine can be interesting, especially with side views of lakes and streams as one goes by. The road from Calais to Bangor has autumn color late in September and more inaccessible places like Moosehead Lake and Millinocket probably have it earlier. For those who like the rugged lake areas of Maine, there are the places where one can go but the farther north one goes the larger the areas of purely coniferous forests with a smaller proportion of deciduous forests and hence less autumn color.

It is touring through the high roads of the mountainous areas of New Hampshire, Vermont, and Massachusetts where one can see the best of autumn color. This is because these areas are climatically suited to producing vivid colors, the deciduous forests are predominant and the highways skirting the mountains and lakes frequently go to great heights (for New England) where one can see for miles in all directions.

One of the best highways in this category is the Kancamagus Highway from Lincoln, New Hampshire to Conway, New Hampshire, about 34½ miles through the heart of the White Moun-

tain National Forest. Here one can see breath-taking views of mountains and valleys for miles and miles, simply covered with deciduous hardwood forests. In doing this one should remember the potential photographic possibilities of a trip up Cranmore Mountain on the Ski-mobile or a really breathtaking trip up the Cog Railway on Mount Washington. This is the highest mountain in New England, 6288 feet high, but one should remember the autumn color near this high elevation comes and goes very quickly. It is much better to plan to visit the lower mountains when they are at their best, rather than the few tall ones in the Presidential Range.

Another interesting area is in the southern part of New Hampshire in the vicinity of Peterborough. Pack Monadnock Mountain (2288 ft.) just off Route 101 has a paved road all the way to the top and the color here about the first or second week of October is superb. The entire Mt. Monadnock region is noted for its scenery, lakes and winding roads of great rural interest. The chairlift at Mt. Sunapee State Park (off Route 103) is another means of getting to a high elevation and seeing beautiful Lake Sunapee and its surrounding mountains of deciduous forests.

In Vermont there are many beautiful trips to take at autumn color time. Touring up the Connecticut River Valley from Brattleboro to White River Junction, provides much colorful interest. Then Route 14 to Barre, the "granite center of America," and over one of Vermont's most beautiful highways (Route 89) to Burlington or to Stowe and Mt. Mansfield (another chairlift available here) gives one an opportunity to see some of the best and most colorful scenery Vermont has to offer. Returning on Route 89 and turning south on Route 100 down to the Massachusetts border, one follows the base of the Green Mountains all the way down and sees much of the quaint and rural Vermont that has been written about so much. This is not a 6 lane speedway, but it is one of the most beautiful roads in New England at autumn color time.

Much of the Berkshire Mountains in western Massachusetts is worth seeing in October, especially a tour along the Mohawk Highway from Greenfield to Williamstown, Massachusetts (Route 2) then south on Route 7 to Pittsfield and Great Barrington. Connecticut and Rhode Island have their beauty spots too at autumn color time. There are literally hundreds of trips that can be taken to see nature's handiwork in the fall.

Last but not least, and this is not only for native New Englanders but for others who live in the eastern part of North America as well—look around you. After driving for several hundred miles on a weekend looking for the “best” in autumn color, after frustration on packed highways or disappointment on seeing only mediocre color, one often comes near home, only to realize that the color right there is truly best, if it only had been properly appreciated in the first place.

The Saguaro Cactus in Arizona

By STANLEY M. ALCORN¹

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Attaining heights of 30 or 40 feet, the saguaro or giant cactus (*Carnegiea gigantea*) is the largest cactus in the United States and the northernmost representative of the arborescent species of this family.

While it ranges in Sonora, Mexico, approximately to the Rio Mayo, with the exception of three small pockets to the west of the Colorado River, the giant cactus is found only in Arizona. Here, singly, in small clumps, or in forests, they grow between the Colorado River and the western slopes of the Galiuro Mountains, east of the San Pedro River, and northwestward to the southern slopes of the Hualapai Mountains (26) (Fig. 1).

Analogous to the feelings that Californians have for their Redwoods, Arizona has chosen the saguaro blossom as the state flower, and the plant has been repeatedly utilized pictorially from comic strips to westerns, to convey the impression either of the desert southwest or the pleasures of winter living in Arizona.

Dominant on the upper desert landscape this cactus, in truth, has long been utilized by ecologists as one of the prime indicator plants of the Sonoran Desert. In fact, the northern and eastern boundaries of this region are delimited by the saguaro.

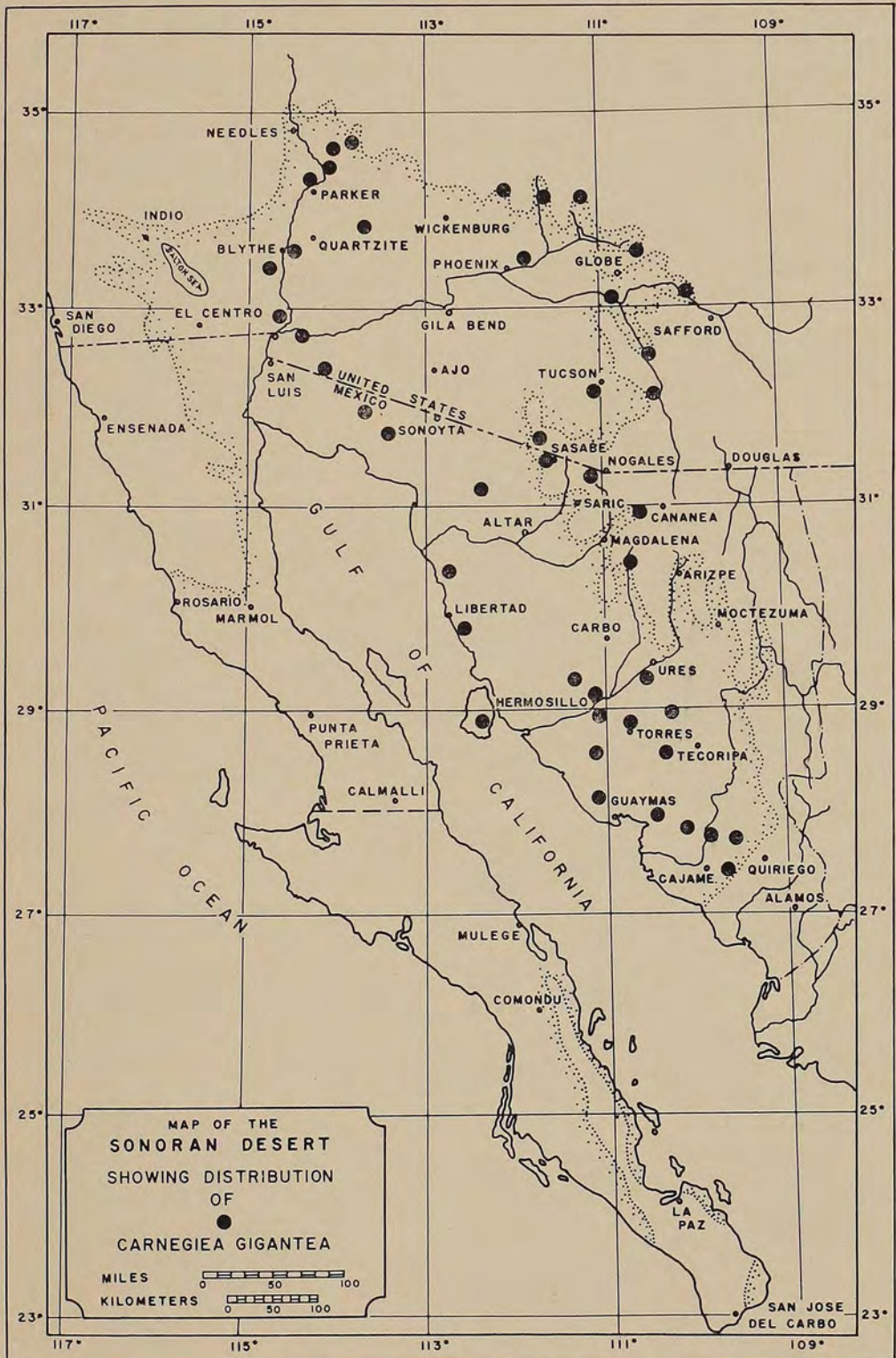
The economy of the Indian tribes of this desert has long been closely tied to the saguaro and related cacti. As early as 1795 Pfefferkorn (22) indicated the use of saguaro fruits as food by the Indians. This was further amplified by the report of McGee (17) that 300 mature individuals of the Seri tribe consumed about 27,000 pounds of cactus fruits per year. Many of these were

from the Saguaro. According to this author and Thackery and Leding (27), seeds were generally used in making a flour, while the remaining pulp was eaten fresh, prepared as a syrup or a liquor, or was dried for future use. The practice of fruit collection is still conducted by the Papago Indians. With such a dependence upon the saguaro fruits, it is little wonder that the Papago year started with their harvest (27).

The Indians also used the woody, vascular elements of the saguaro for fencing and in the construction of homes. Even today on the Papago reservation hogans can be found with saguaro "rib" studs plastered with mud and supporting saguaro "rib" rafters roofed with dirt.

Unfortunately, records relating to the densities of saguaro forests during the Spanish and Mexican colonial periods are not available. However, by 1910 Shreve (23) noted the scarcity of young plants in areas west and north of Tucson and concluded that in neither of these sites was the saguaro stand maintaining itself. Probably in part due to the "pressures" of conservationists stimulated by these observations, President Hoover in 1933 proclaimed that 63,001 acres of Coronado National Forest, east of Tucson, be designated as the Saguaro National Monument (SNM) because of "scientific interest and the exceptional growth thereon of various species of cacti, including the so-called giant cactus." In 1961 President Kennedy added to the Monument an additional 15,640 acres of saguaro forest located on the western slopes of the Tucson Mountains, west of Tucson (SNM-W). Between these two dates President Roosevelt additionally proclaimed that 516 square miles of desert vegetation adjacent to the Mexican border south of Ajo, Arizona, be designated as the Organ Pipe Cactus National Monument for the pres-

¹The author is particularly grateful to Dr. Raymond M. Turner for critically reviewing this manuscript.



ervation of the one stand of senita cacti (*Lophocereus schottii*) in the United States, prime forests of organ pipe cacti (*Lemaireocereus thurberi*), scattered stands of saguaros, and their associated desert vegetation.

In an effort to determine the factors affecting the declining saguaro populations, research was initiated in the late 1930's and early 1940's by personnel of the University of Arizona and of the U.S. Department of Agriculture. Interrupted by World War II, these investigations were expanded in the middle 1950's. While the early interest related to the saguaro *per se*, the more recent studies have, in addition, been concerned with the use of the saguaro as a research tool in attempts to attain answers to the much broader questions of the mechanisms of plant survival in an arid environment and the role of plants in the total ecosystem in such an environment. Thus, the projects have ranged from chemical analyses of the saguaro vascular elements (6) to the identification of bee visitors to saguaro blossoms (18). Collectively, the information garnered to date affords us an insight into the factors influencing the life cycle of one plant in the Sonoran Desert and strongly suggests the complications that affect similar plants.

The saguaro flower opens in the early evening and usually closes permanently the following afternoon (5, 21). Thus, in an approximate 15–18 hour period the pollination requisite for seed formation must be accomplished. It could be appreciated, then, why the early concern as to whether or not a decline in saguaro populations might relate to pollination problems. Kerner (14) had early concluded that flowers of some species of *Cereus* were both self- and cross-fertile. (Although not specifically mentioned, the flowers, described would include the giant cactus.) However, it has more recently been shown that the saguaro flower is, in fact, self-sterile; for maximal set pollen must come from a flower on another plant (2). While wind has been ruled out as a method of dispersing the pollen, there is ample evidence that effective

pollination may be accomplished by nectar-feeding bats at night or by doves and bees during the day. It further seems probable that other similar animals can also act as pollinators (19). From these same studies it was determined that approximately 50% of the flower buds initiated eventually survived as fruits, i.e., about 60 fruits were formed per plant per year. Each fruit averaged 2000 viable seeds.

Thus far, the only method of estimating a saguaro's age is based upon an extrapolation from a curve derived from measured, annual growth of a number of plants (11, 23). A saguaro first blooms when 8 to 10 feet in height or approximately 40–50 years of age. Current information indicates that the majority of saguaros live to be at least 25 feet in height (4, 9, p. 32, and 20, p. 17). This would afford the production of some six million viable seeds over an estimated minimal productive life of 50 years (11). It is axiomatic that for the maintenance of a static population there only must be a replacement for each individual that dies. Therefore, in this case only one of the 6 million seeds must produce a surviving seedling. (Obviously, the longer the seed-bearing plant survives, the more favorable the odds.) From such calculations, it can be assumed that where they exist the problems of saguaro repopulation do not relate to lack of seed production but rather are influenced by the factors affecting seed survival, seed germination, and seedling establishment and survival.

In the vicinity of Tucson saguaro fruits ripen about 30 to 40 days after pollination (19), i.e., mainly during June. However, it is most difficult to find any seeds either on the ground or adhering to the plant by the advent of the summer rainy season, usually in early July (9). Field observations indicate that birds, coyotes, rodents, and even ants contribute to their disappearance. It would thus seem that the problems of repopulation start at this point.

From laboratory studies (3) the germination requirements appear to be rather exact. The seeds must be exposed to light of adequate intensity and quali-

ty to germinate. However, for this mechanism to be triggered, seeds must first have imbibed an optimal amount of water (approximately 24 hours on moistened filter paper at 77°F) and then be concurrently exposed to optimal temperatures (77-86°F) and light. Germination will not occur at 59°F; few will germinate at 96°F. Given otherwise optimal conditions of moisture and temperature, germination is further enhanced in the laboratory at low light intensities (up to 230 fc) by multiple 1/2-hour exposures to light with 24 hour dark intervals. Collectively, these data suggest that in the field seeds must be either on or partially projecting through an opaque germination medium. Further, this substrate should be of such a nature and in such a position that water is neither rapidly removed

by downward capillarity nor lost to the air by evaporation. For germination to occur after the winter rains the physical location would have to be such that the temperature of the micro-environment around the seed would be sufficient to effect germination—e.g., immediately adjacent to rocks on a south facing slope (in the vicinity of Tucson). Conversely, the seed would presumably have to be shaded for germination to proceed during the summer rainy season.

Interpolating from the information presented earlier concerning seed production, it can be estimated that in a saguaro forest averaging 15 plants per acre, a conservative estimate for many forests, (12, 20) and assuming a minimal longevity of 100 years, one new plant per acre would have to become established every 2/3 years to maintain



DR. C. W. FERGUSON

Fig. 2. Saguaro seedlings typically clustered near a "nurseplant" (now dead). Although the shade is a mesquite (*Prosopis juliflora*), the saguaro is more frequently associated with the palo verde (*Cercidium floridum*).

this population. When such an establishment rate is considered in terms of the slow growth rate—a plant 6 inches in height would be approximately 9 years old (11)—it is small wonder that comparatively little is known regarding the initial factors affecting the natural establishment of the saguaro in the field.

While rodents have long been suspected of being involved in the mortality of saguaro seedlings (7, 20, 21, 23), only recently has it been determined that lack of shade, soil types and insects may play an even more important role (28). Superficial samples were removed from the soil beneath the canopies of Palo Verde (*Cercidium microphyllum*), Mesquite (*Prosopis juliflora* var. *velutina*), Ironwood (*Olneya tesota*), and from an open desert site. These were placed in separate, rodent-proof plots, half of which were shaded by a layer of window screen. All of the non-shaded plants died within one year, most dying in May and June. Survival of the shaded plants related to the soil type, with a greater percentage surviving on the lighter colored "open" desert and palo verde soils. From correlated temperature measurements it has been hypothesized that the shade effect is at least in part due to a reduction in summer temperatures in the proximity of the soil surface, with the degree of temperature change relating to the physical structure and color of the soil type. However, plants that did survive in the darker ironwood and mesquite soils attained a larger size than the survivors in the other soils. Such growth may be a result of the higher nitrogen content of the dark soils (28). These data thus provide an explanation for the frequent close association of saguaros with woody perennials of the desert (Fig. 2) and particularly the palo verde (30).

It was further determined in these tests that the larva of the *Gerstaeckeria* weevil attacked small seedlings. Penetrating the plant, the feeding insect would leave only a "hollow shell". As many as 13 percent of the young cacti were destroyed by this agent in some spots.

The physical location of the seed is important from two other aspects, if the

potential seedling is to survive. Although experimental evidence is lacking, field observations, coupled with climatological evidence, suggest that the western geographic boundaries of the saguaro are determined by rainfall (12, 16, 24). Conceding that the possible detrimental effects of high temperatures *per se* in these areas also must be considered, minimal moisture will not only affect germination but also the longevity of the newly germinated seedling.

Conversely, the eastern and northern boundaries of the saguaro are probably determined by low temperatures (12, 16, 24). Shreve (12) concluded from a series of temperature measurements that "the occurrence of a single day without midday thawing, coupled with a cloudiness that would prevent the internal temperature of the cactus from going above that of the air, would spell the destruction of *Carnegiea*." In seeking verification of this conclusion Hastings and Turner (12, pp. 19-20) have used Arizona weather records to determine those localities where the *maximum* 24 hour temperature *did not* rise above freezing for at least one day during the year. An isotherm drawn between those stations recording and not recording thawing temperatures in a 24 hour period nearly duplicates the northern and eastern boundaries of the saguaro as depicted by Shreve (26, p. 148; Fig. 1).

It has been known at least since the late 1800's that saguaros are susceptible to a soft-rotting condition (13). However, nearly 40 years elapsed before the disease was determined to be caused by a bacterium, (*Erwinia carnegiana*) (15). Carried from saguaro to saguaro by the night flying moth, *Cactobrosis fernaldialis* (7), it was originally thought that *E. carnegiana* was restricted to the saguaro (15). However, more recent information indicates a broader host range (1, 8). While it is known that seedling saguaros are susceptible (1, 7), the available field data indicate that mortality is greatest among the flowering plants (i.e., plants 40-50 or more years old; 4). In established plots at SNM more plants (29.3%) were lost to this disease between



U. S. DEPARTMENT OF AGRICULTURE

Fig. 3. A giant cactus dying from bacterial necrosis. The skeleton of a previously stricken plant is to the right.

January, 1942 and January, 1961 than to any other cause (4). Ordinarily the saguaro is able to contain infections by the formation of a highly lignified (6) callus tissue around the site (7). However, under circumstances which are yet imperfectly known, although prolonged exposure to cold may be a factor (20), callus is either not formed or the bacterium is able to breach the barrier. The end result is the death of the plant (Fig. 3). It is rather trite to say that an individual will sooner or later die from one cause or another, but during the 1942-1961 period 2.4% of the saguaros under observation were blown over by heavy winds. However, aside from reasons of aesthetic and scientific interest, the loss of a mature plant is only significant where such a loss will reduce the seed source for repopulation, in a population that is otherwise static or declining in numbers.

From studies of a number of saguaro

forests throughout the northern Sonoran Desert, Hastings and Turner (10, 12, and 20, p. 17) have confirmed, on the basis of the relative numbers of tall to short plants, that saguaro populations are declining in some portions of the SNM, an observation first recorded by Wilder (29), and SNM-W and in certain areas along the south slopes of the Catalina Mountains. However, these plants are increasing in numbers in other portions of the Catalinas and in the vicinity of Ventana Cave (approximately 50 air miles west of Tucson). The forests seem to be static in MacDougal's Crater and in the Pinacate Mountains of northwestern Sonora, Mexico.

As part of a larger study of vegetation changes in the Sonoran Desert, with the aid of a remarkable series of repeat photographs (12) these authors have also determined that although the saguaro population has remained static, there has been a general decline of other veg-

etation in the Mexican sites. A general reduction in vegetation also occurs at the SNM sites (Figs. 4, 5, 6, 7). In contrast, with the exception of the SNM-W area, palo verdes have increased in the Tucson Mountains.

Broadly speaking, they (12) suggest that a changing climate of increasing temperatures and decreasing moisture over the last 80 years, coupled with overgrazing by cattle and the associated reduction in ground cover, are primarily



H. L. SHANZ COLLECTION, COURTESY OF DR. W. S. PHILLIPS

Fig. 4. *This photograph of a low lying hill in the north forest area at Saguaro National Monument shows the concentration of desert flora in 1935.*



DR. JAMES RODNEY HASTINGS AND DR. RAYMOND M. TURNER

Fig. 5. *Twenty seven years later (1962) the hillside in Fig. 4 appeared as this. Note the reduction in numbers of saguaros and the thinning of the woody shrubs in the foreground.*

Fig. 6. Taken about one-half mile east of Figs. 4 and 5, this photo indicates the degree of desert growth, in 1936, on flat terrain.

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Fig. 7. By 1960 the populations of saguaros and woody perennials had also decreased in this area. (The saguaro at the extreme right died by 1962.) In addition fewer barrel cacti (*Frocoactus wislizenii*) and the smaller desert perennials exist.

responsible for the reduction of the desert flora in the more arid regions and the appearance of such flora at higher elevations (i.e., the desert boundary has been shifted upwards). Secondary to this has been the invasion of the deteriorated range lands by mesquite. Rodents and jack rabbits are also felt to be of secondary importance, their impact as foragers merely accentuating the state of decline.

With this background some conjectures might be made with respect to the survival of the saguaro. For successful establishment the seeds must be exposed to sufficient moisture, appropriate temperatures, and light. The seedling particularly must be insulated from cold, sheltered from intense summer light (probably because of the heat factor), and protected from animals.

Apparently the northern Sonoran Desert ecosystem before the late 1800's was sufficiently "in balance" to meet the requirements of the saguaro. Rainfall was timely and sufficient; the normal flora provided the canopy necessary for protecting the seedling from the summer sun and the winter cold, and the small, foraging animals had their preferred foods. However, with the introduction of cattle and subsequent overgrazing the

normal desert vegetation was reduced or destroyed. As late as 1960 as many as 20-30 goats have been seen browsing in the saguaro forest at SNM. Water rapidly evaporated and/or quickly ran off. Rodents turned to secondary food sources, including saguaros. With increasing temperatures and aridity, the populations of saguaro forests (particularly those in marginal circumstances) became static or began to decline in numbers. Under the latter circumstances, the imposition of additional, perhaps local, stresses (as a reduction in the numbers of animals preying on rodents or a high incidence of bacterial soft rot) would accelerate the demise of a given forest. This appears to be the case with respect to the north forest at the SNM. A statistical evaluation of available survival data indicates that if present conditions continue to prevail, this stand will become extinct by approximately 2000 A.D. (4).

Shreve felt that slow growing, long lived perennials gave "the desert an extremely stable character" (25). The various studies indicate that the saguaro populations are not so stable, and some forests seem destined for extinction; they also indicate that the giant cactus, itself, should live on.

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Some Aesthetic and Horticultural Aspects of the California Redwoods

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Many decades before the launching of the present campaign to conserve beauty, far sighted men and women saw to it that generous samples of the primeval redwood forests and groves were preserved for all time. Both the Sierra and the Coast redwood species, ever since their discovery in California, have excited the imagination and wonder of scientists and laymen.

Mariposa Grove of Sierra redwoods was made "inalienable for all time" in 1864 by Congress along with Yosemite Valley. There probably never was more than 50,000 acres, if that much, of the Sierra redwood. A small amount has been cut, but, at present, at least 95 percent of these great trees are preserved in public parks and forests, never to be cut.

The Coast redwood was, originally, of greater extent—1,500,000 acres of forest, plus another 400,000 acres of small outliers and thin stands. In 1890, Armstrong Grove in Sonoma County was preserved and, in 1900, the state acquired the Big Basin redwoods in Santa Cruz County. In 1918 the Save-the-Redwoods League was organized and, due to its efforts, the total acreage of primeval coast redwoods preserved has grown to over 50,000 acres, plus another 50,000 acres of collateral lands—young forests and protection belts. The League has concentrated its efforts on acquiring small or large stands that are deemed to be superlative in every respect. Since such stands are not to be found except on river benches and on the lower portions of adjoining slopes, the state redwood parks, fortunately, are distributed in each of the redwood counties from the Santa Lucia Mountains, south of San Francisco, to near the Oregon border. This distribution, like that of the

Sierra redwood groves, gives the traveler an opportunity to visit only the grove nearest him or all of them in one south-north tour. It spares him also the inconvenience of being funnelled into a crowded reception area.

The Sierra redwood is easily the most impressive individual of the two redwoods. It is the mastodon of trees. Its majesty is enhanced by the stateliness of two of its associates, the sugar pine and the ponderosa pine, the world's largest pines. Nothing, forestwise, is more enrapturing than a group of mature specimens of these pines and a few big Sierra redwoods. Generally, the Sierra redwood is a "loner"; it does not average one specimen per acre, whereas the Coast redwood is gregarious, with 20 to 30 large specimens per acre on the best soils. A lone Sierra redwood stands out among its neighbors of other species like a craggy, brawny super giant among a group of fine-limbed athletes. In very few groves does this species outnumber its associates to make a forest of redwood.

The coast species is the taller of the two redwoods by 50 feet. In the primeval forest on the same 40 acres, there may be trees of all ages—from under 100 years to over 1000. It is called an "alleged forest" and also a "climax forest"—one which always presents the same general appearance although constantly remaking itself. To the stranger there may appear to be too few saplings to replace trees that fall. But in a forest in which trees can live beyond 1000 years, there is no need for but one sapling here and there. A sapling the size of a broom handle may be 30 to over 50 years old, barely remaining alive, but so persistent, that it is ready to take the place of a veteran, "sticking it out" like

a battalion surrounded by enemy soldiers. This characteristic is an eloquent manifestation of coast redwood's ability to endure shade and has given many people the impression that the tree is a slow grower. Actually, it can make very rapid growth, given a chance, a factor that makes possible reforestation for continuous lumbering, i.e., the replacement of the forest when it is cut. Bret Harte has called the Coast redwood the "poor relation" of the Sierra redwood. This is surprising because Bret Harte, for a short time, lived in the redwood forest and should have been deeply impressed by the heavy stands.

Both species of redwood have been planted outside their small natural range, not only in California, but also in Oregon, Washington, British Columbia, Germany, France, Spain, Australia, New Zealand, South Africa, and elsewhere. Apparently, when discovery of the trees became known to the world, public and private gardeners everywhere wanted specimens to ornament their surroundings. Now that many of the planted trees, particularly Sierra redwoods, have approached or past 100 years they accentuate their presence in the landscape by overtopping the other trees. Driving the roads of Germany, France, and England, they attract immediate attention wherever they have been permitted to remain that long. They not only add to the general beauty but excite interest and become conversation pieces when approached closely enough to see their massive trunks.

After the above general comments the horticulturist will want to know more about individual characteristics of redwoods for guidance in using them for landscaping or specimen trees. For this purpose emphasis will be placed on young trees planted for ornamentation.

The Two Redwoods as Ornamentals

Sierra Redwood (*Sequoiadendron giganteum*)

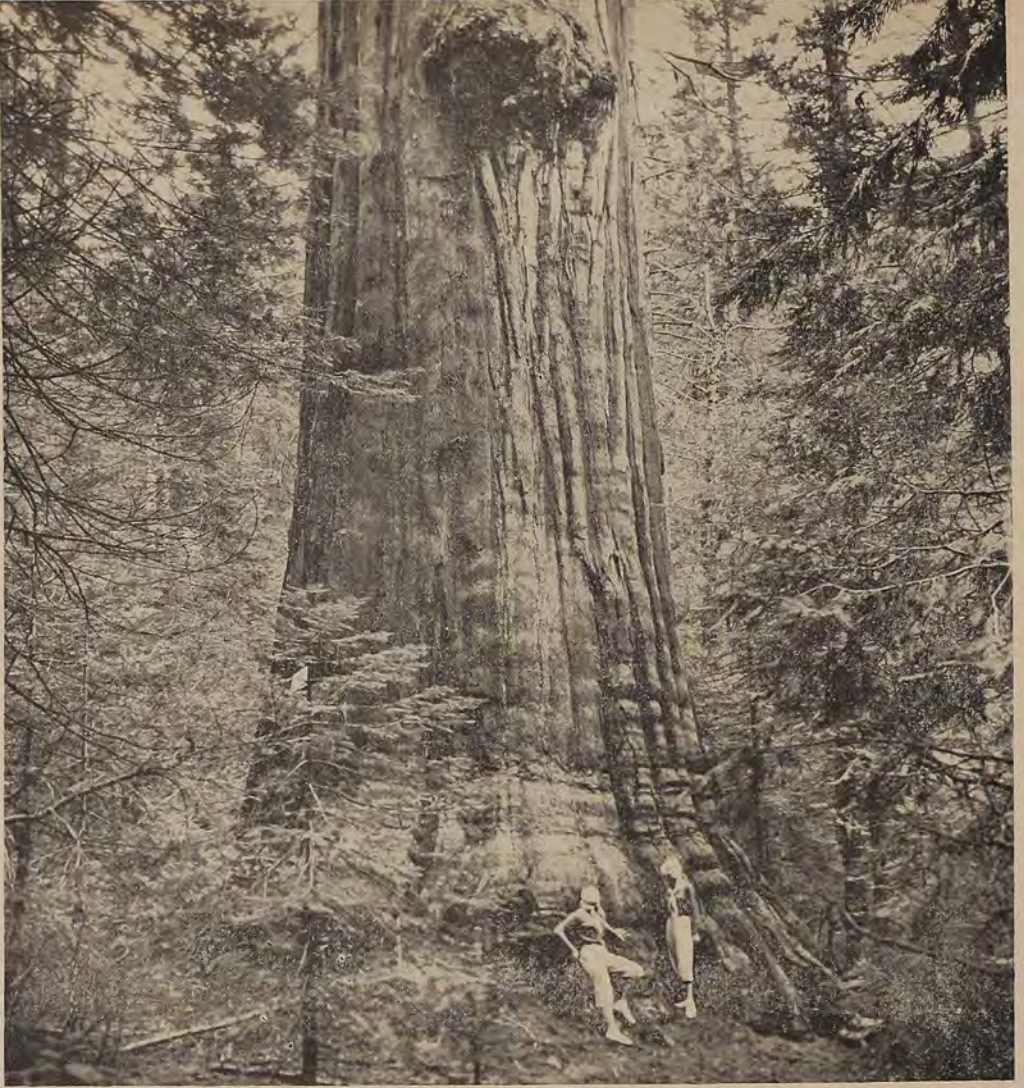
Sierra redwood is also called Bigtree, Giant Sequoia and, in Europe, Wellingtonia.

The names used in this article are preferred because they convey an un-

derstanding of where each species grows naturally as a primeval forest and that both have been regarded for nearly a century as being of the same genus and have been known in common parlance as redwood since their discovery.

Its needles are quite short, $\frac{1}{4}$ inch, and are so close to the twig as to give the appearance of a Juniper. Young trees present a feathery aspect. Many are now reared for Christmas trees. In its native habitat, Sierra redwood grows at elevations between 4500 and 8000 feet and can endure considerable freezing temperatures provided that the freeze does not endure long and is not accompanied by dry winds. It will not endure the occasional dry and long continued cold of a northeastern United States winter. Such weather may not occur but once in 50 or more years. There was a fine specimen on Wells College campus, on Cayuga Lake in New York State, which lived about 70 years. I saw it in 1930 and, about 2 years later, it was killed in a long, exceptionally cold winter. The northernmost Sierra redwood in eastern United States, more than 70 years old, stands in Painter Arboretum near Lima, Pennsylvania. On the Pacific Coast, the climate is more favorable north into British Columbia. At Parliament Park in Victoria, just opposite the boat landing, is a fine specimen of about 5 feet diameter. On a nearby street are several of the same and larger size. In Tualatin Valley, east of Portland, Oregon, is the largest and oldest plantation, some 40 trees planted in the 1850's along a farm lane.

In Europe, Sierra redwood dots the landscape from the Mediterranean north through France and Germany. Take a boat ride on Lake Geneva, Switzerland, and you can count near a hundred. In Germany many a chateau has one or two at the main entrance. In the experimental forest at Weinheim, is a stand of about 130 very tall trees resembling very closely the young U.S. stands that followed early-day logging. These trees were upwards of 75 years old. The European experience teaches that this tree should be planted only where it has a chance to remain 50



*The Sierra Redwood, **Sequoiadendron giganteum**, is the world's bulkiest tree, reaching diameters of over 20 feet at breast height and a height of 300 feet. The specimen here pictured, stands in Calaveras Grove State Park in the Sierra Nevada, where this species made its debut to the world in 1852. Though sometimes occurring in close groups it generally stands alone, screened by sugar and ponderosa pines and white fir. Many firs have crowded into the forest in the past century as a result of fire protection and, possibly to the detriment of the redwood's vigor.*

years or more, and where it will have plenty of room. The European specimens also indicate by their form and leader that they are far from having reached their ultimate height.

Sierra redwood has a rather dense crown, broad at the base and sharp-pointed at the peak. The crown density obscures the branches. In its natural habitat the form is more slender. This species does not sprout from the stump and only ephemerally from the trunk. Its growth rate in good soil is very

rapid. In early life, if it gets as much water as it can use, it can increase its diameter from one to two inches per year and an average of 12" to 18" per year in height. It appears to do best in climates of cold but not severe winters, and warm to hot summers. But it requires considerable moisture. Its roots extend well beyond the diameter of its crown and are, compared with the size of the tree, rather shallow. Most of them are in the top four feet of the soil. There is no tap root.

In its native habitat Sierra redwood has no tree-killing disease or insect. Its heartwood, however, is subject to attack by *Poria sequoiae*, a wood-rotting fungus. Some of the great trees are heavily infected. Working only in the heartwood it does not affect vigor. In recent decades a disease has been noted on ornamental Sierra redwoods in California that attacks some twigs and kills them. This disease works in the cambium region and may have been introduced from Europe, where it has seriously disfigured some otherwise fine specimens. In the park of the Kur Saal near Interlaken, Switzerland, is a tree of 7 feet breast-high diameter, and 100 feet high, which has suffered seriously from the disease. Its height growth has been arrested and many branches have died. The disease could become a serious enemy and therefore should be kept under observation and study. One can only hope it will not invade the primeval groves.

Coast Redwood (*Sequoia sempervirens*)

This species of redwood exhibits some marked differences from its Sierra cousin. Young trees up to over 100 feet high are generally more slender than those of Sierra redwood and the trunk is more gently tapered. The crown is more open and the branch architecture is therefore plainly visible from a distance, while Sierra redwood hides its limbs behind a wall of leafage until after it is 100 years old. The needles are from one-half to a little over an inch long and occur in two ranks. Actually they originate spirally around the twig but their short petioles are twisted to bring their flat side to the light. A spray of twigs and needles makes a very attractive fern-like pattern. Strangely, some specimens of this species have two kinds of needles—the type just described and one, usually only in the upper crown, resembling the needles of Sierra redwood so closely as to have lead casual observers to claim them as such. This dual leaf form occurs on old trees in the primeval forest as well as on young trees, but is in the minority. The more common flat sprays are popular for

Christmas wreaths.

Coast redwood is a very graceful tree in youth. But there are several forms of branching and of leaves that horticulturists should consider for propagating or even avoiding. The most common leaf type is the deep green small-needled type variety. The crowns of such trees are often rather broad at the base, at 50 or more years; the branching is likely to take on a ragged appearance and the cone crop is often heavy. This form is suited to large lawns although the falling cones can be objectionable. Then there is the blue-green variety 'Glaucæ' with many needles above an inch long, thicker, broader and stiffer than those of the deep green variety. The branching of these two varieties varies from horizontal, to down-turned at the trunk and upward at the ends forming an ogee (S-shaped) curve. The branches of 'Glaucæ' are stiffer than those of the main type, and in the author's opinion, is the most desirable for ornamental uses. There is also a much less numerous pendulous variety with branches drooping sharply. In all varieties the annual leaf shedding begins in mid-summer and the needles and twigs of 3 or 4 years fall intact as sprays. After a strong wind, a garden will be well littered with them.

Growth is rapid on good moist soils. A 45-year old coast redwood in the author's garden is already 44 inches in diameter at breast height and 105-110 feet high. Coast redwood, despite its natural home in the coastal fog belt thrives, as an ornamental, in the very hot interior valleys where ground waters are available. One of the most effective plantings is in the spacious State Capitol grounds in Sacramento, California, where surface sprinkling is regular to maintain the lawns. Coast redwood stores large quantities of water in its heartwood, as much as two and occasionally three times as much water as the weight of wood substance. Very likely, the tree is able to draw upon this stored supply in locations where free soil water is very low in summer time.

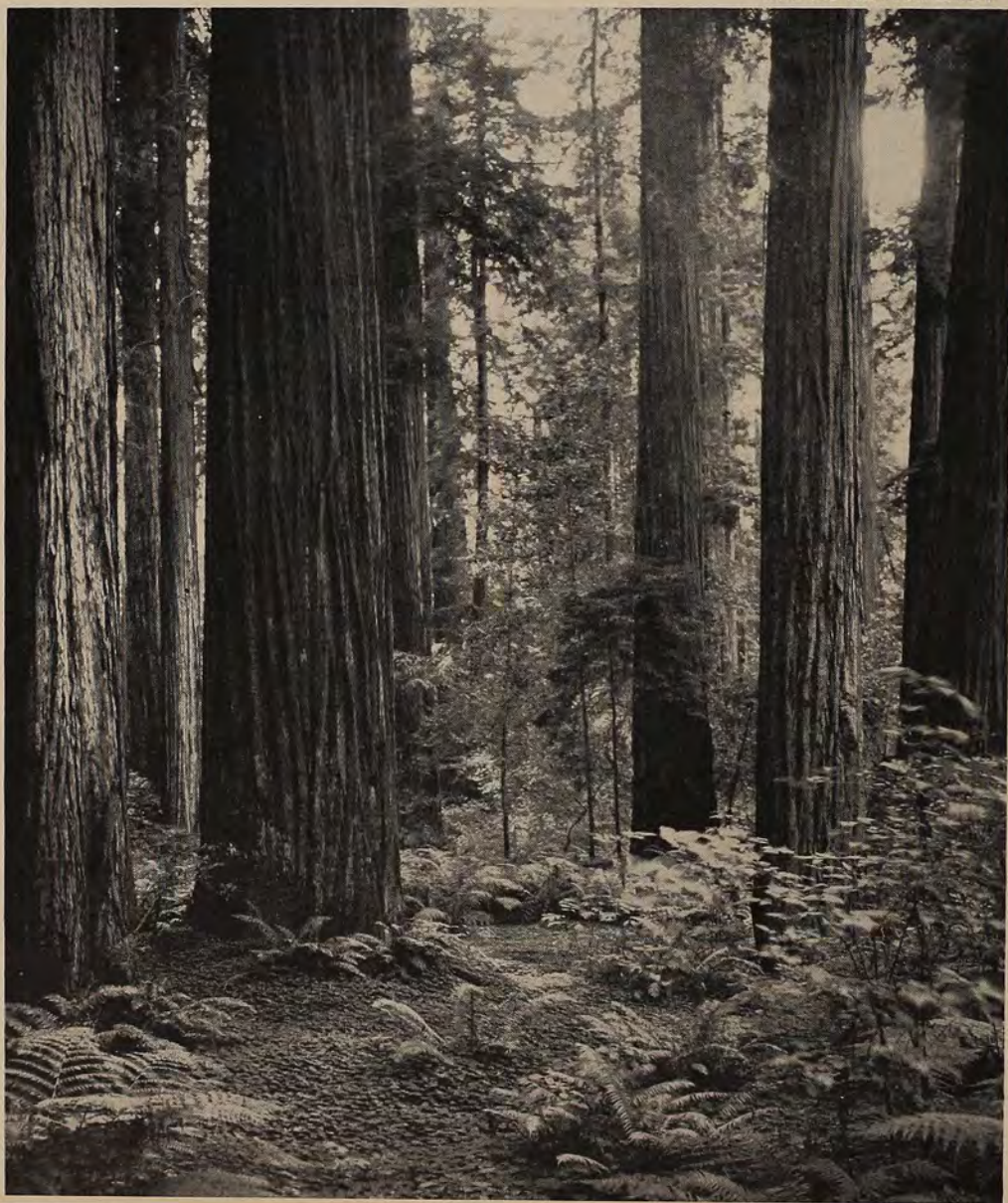
Coast redwood possesses an important characteristic not found in its Sierra

relative—the ability to sprout from the stump of a felled tree. In fact, should the foliage of a standing tree be killed by heat rising from a surface fire, the trunk itself and some of the larger branches will burst out with new twigs, giving the tree, for many years, a colum-

nar form, similar to that of a Lombardy poplar. The new twigs arise from dormant buds. These buds originate at the pith and extend outward each year as much as the trunk grows in radius. Any injury caused by fire, or excessive pruning, can stimulate the buds to pro-

A Community of Coast Redwood, Sequoia sempervirens, of varying diameters in Humboldt State Redwoods Park. In the background are several tall slender redwoods, while in the middle distance are three saplings which, because of the shade of the large trees, have grown very slowly and are about 50 years old. In time, one of them will likely replace a giant that has fallen. The ground cover is oxalis, sword fern, berried shrubs, and an occasional tanoak.

SAVE-THE-REDWOODS LEAGUE



duce twigs. Sometimes a bud bifurcates, developing twin buds, and these in turn can proliferate to form a mass of such densely congregated buds as to cause lateral annual extension to exceed the thickness of a growth ring and eventually produce a wart-like protuberance, or "burl." Basal burls sometimes weigh many tons and are sought out for the production of novelties. Smaller ones, if sawed from the tree and placed, sawed-surface down, in a dish of water, will sprout vigorously to produce a fern-like bouquet of twigs.

Seeds are produced between the cone scales, as in other conifers, but in the case of redwood, are surrounded by tannin which, when dry, falls out as flakes. Being readily soluble in water, it can stain clothing a blood-red. Occasional trees in California, during periods of heavy dew and while the cones are still green, permit the tannin to dissolve in the cone and drip to garden furniture and parked cars.

The red heartwood of Coast redwood, like that of Sierra redwood, is subject to infection by *Poria sequoiae*, but young trees protected against root or basal damage are not likely to be attacked. Other than this, coast redwood is singularly free from disease or insect enemies that affect vigor or cause death. But, in squirrel areas, young trees may be disfigured by these tree climbers girdling the main stem in early spring when the thin bark is easily stripped.

The coast species of redwood cannot endure as much cold as the Sierra species. About 20°F, if not sustained too long, can be endured with no more harm than leaf damage. For this reason one finds coast redwoods planted only in relatively frost-free localities. In Europe they are found mainly in Spain, Italy, southern France and England, and not as commonly as Sierra redwood. Several seen in Germany were badly crippled in especially cold winters; had they not the ability to sprout they would have been killed. In the United States, the coast species has not given much success except in the Southeast (a fine specimen stands in Magnolia Gardens near Charleston,

South Carolina. One is reported in S.E. Virginia.) * Trying to plant it farther north is a waste of effort. In South Africa, New Zealand, Australia, and Hawaii, it has been tried for commercial forestation with prospects of success.

Culture

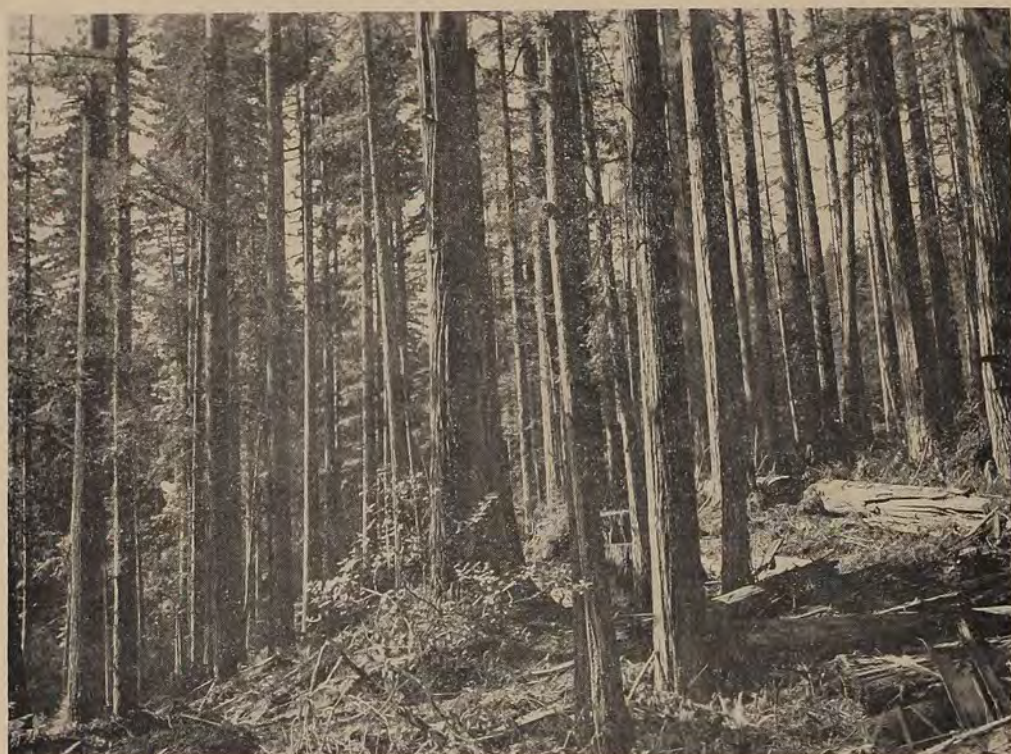
Both species of redwood respond to ordinary techniques and care in raising seedlings. Of course, the seed should be tested for viability. A pound contains about 100,000 seeds but only from 3 to 40 per cent are viable. Seed from cones cut off and dropped to the ground by squirrels, usually is the best. New seedlings are delicate and must be defended against dessication and "damping off." Some seed suppliers advertise in *American Forests* and the *Journal of Forestry*. Growers interested in buying seedlings can obtain names of suppliers by addressing Chambers of Commerce in Davis, St. Helena, Ukiah, Fort Bragg, and Eureka in California. The Garberville chamber can direct one to a supplier of burlwood and burls for sprouting.

Several precautions are in order: Redwoods, because of their ultimate size, should not be planted along narrow streets or in small gardens. As they grow larger they cause concern for safety and objectionable interference with views. Sierra redwood can be thinned of branches to restore views without danger of resprouting. If Coast redwood obscures a view, interfering branches should be removed over a period of years to reduce or prevent sprouts immediately closing in. Neither species should be topped. Should it become necessary, a new multi-branched top should be expected.

Coast redwood can be reared also from cuttings in the usual manner but the cuttings should be from terminal, erect, twigs.

Coast redwood, because of the basal burl, should be defended against trunk and root damage to avoid basal sprouting. If it does occur, the sprouts can be

*A specimen of some size stands on the campus of William and Mary College, Williamsburg, Va. (Ed.)



EMANUEL FRITZ

Selective cutting in a Coast Redwood stand after the large mature trees have been cut. Appearance of such a stand after logging depends on the number of small trees in the forest—in this case, a large number. Otherwise, the residual stand would look much thinner but a new crop from the seeds of the standing trees would become established earlier. After logging and release from competition the residual trees grow more rapidly in diameter and quality. About 80 percent of all redwood is cut in this manner. Where this method is not feasible because of windthrow, cutting is clean and the cutover land, after debris burning, is either planted or reseeded for the next crop.

sheared and treated as a hedge to make what would then appear to be a bench surrounding the trunk. And, finally don't believe the stories that either redwood can be planted outdoors anywhere.

Primeval Redwood Parks

Ever since the discovery of the redwoods, there was an appreciation of their uniqueness and for the wonder and inspiration they arouse and, consequently, efforts were made to preserve sample areas. As already stated, 95 percent of the Sierra redwoods are preserved. Of the Coast redwoods, it is reported that 300,000 acres of primeval forest remain.

Of this area more than one-sixth, or about 53,000 acres, is preserved in parks, largely the result of the work of the 50-year old Save-the-Redwoods League. Another 50,000 acres of light stands, reforesting and open lands mingled with or adjoining the parks, also have been acquired. Based on the remaining *cubic volume*, the public parks already include one third; the State Parks include the very best groves and are worth a transcontinental journey for a visit. In Rockefeller Forest of some 13,000 acres, are stands often described as the "acme of perfection" for Coast redwood. Still in private hands but

held available for addition to the parks are about 6000 acres of similar stands. These were voluntarily by-passed by the owners in their lumbering operations, some for more than 25 years, until the Save-the-Redwoods League obtains the purchasing funds. In 1964, Californians voted a bond issue of \$150,000,000 for parks, a large part of this sum is destined for more redwood purchases. Last year 2100 acres were added. There is no likelihood that the "ear-marked" groves will be cut before the purchase money becomes available. Future generations will have plenty of opportunity to view primeval redwood forests. In addition, young forests for general recreation are multiplying. These are on former cutover lands. Those that have passed or are approaching 100 years

have a beauty of their own and offer inspiration as well, though in an ecological sense—the terrific battle constantly being waged among the trees and with other vegetation for ascendancy. It is a survival battle that has many parallels in private and business life, such as the constant change and adjustment and the influence of hereditary and site factors. It is as fascinating a study as seeing humans grow from childhood to old age.

About 20,000 acres of lumber industry forest lands recently have been made available to the general public for recreation. The tourist should visit not only the primeval state parks but also young forests for a more complete picture of forest beauty in the redwood region.

The "New Look" of our Nation's Botanic Gardens and Arboretums

BY HENRY T. SKINNER

Director, U.S. National Arboretum¹

Days of the staid botanical garden, with a decaying greenhouse or two, and with static collections of the favorite plants of a past generation, are numbered. Competition is an all important ingredient of the modern age, and in an era of spiralling costs even botanic gardens find that they must modernize and adapt—both to compete for adequate funding, and to promote successful programs. A vast, urban, small-home-owning society is in desperate need of easily assimilated information about plants and the culture and use of plants around their homes. But to be fed this information, Mr. John Q. Public must first be attracted. If the lure is successful, each John Q. (with his wife or daughter) will arrive in an automobile or bus which requires parking. And the fun starts.

Research remains an important behind-the-scenes activity of several major United States botanic gardens and arboretums. However, in attempting to judge the current trend in botanic garden programming, I would say that educational objectives are, fortunately, winning out over passive recreation, with research still running a rather poor third.

Because attraction and interest are the vital precursors to mass education, we find that botanic gardens—new and old alike—are placing renewed emphasis upon attractive design in buildings and plantings, and upon the appeal of color. Because first impressions have proved all important, we find reception and information centers, where the public can also satisfy its needs for booklets, postcards, and slides, increasingly important. A review of the total garden operation seen through the medium of films in

small theatres designed for this purpose, both attracts and enlightens the public.

The educational process, which has its own requirements, results in more auditoriums and class rooms for formal instruction, and in emphasis on nature trails and all kinds of educational plant groupings. Trails and plantings may be "self-help" exhibits, explained by signs, leaflets, or electronic recordings, or orally by paid or volunteer guides.

To encourage longer visitation, and to add more pleasure to the process, the question of food provision enters increasingly into the picture. Restaurants and terrace cafés have long been a welcome feature of the larger botanic gardens of Europe, and the trend here is undoubtedly in this direction. The pattern may begin with a controlled picnic area, and proceed via drink and sandwich machines to the snack bar or seasonal restaurant which may be under garden management or operated as a commercial or charitable concession.

Finally, all but the smallest city-surrounded botanic gardens and arboretums have been forced to meet—head on—the ever-expanding problem of access, car parking, and visitor transportation. The traffic systems of larger arboretums have called for much study, resulting often in uni-directional routing patterns, and in automobile admission charges to discourage the "hot-rodders" and less interested clientele, and to provide financial support for additional guards and attendants. Gardens of "walking" size may still have to face the problem of outside parking—and lose space as a result. Other, larger ones are preferring to assign such space and provide interior transportation by a variety of gasoline or electrically powered conveyances. These range from jeep trains, minibuses, model trains and autocarts to

¹Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C.

more occasional boats and barges plying man-made waterways and lakes.

I believe the most striking botanic garden innovations of recent years—ones to which most of us would award the palm—are the new spheres and domes of concrete, aluminum and Plexiglas which more than serve the purpose of the traditional conservatory. As the crystal palaces of a new age, these forms exert a public appeal which cannot be discounted. As marvels of mechanical artistry, they also possess the potentials for providing a hitherto unattainable variety of controlled growth conditions both for display and for research exploitation.

A second notable innovation of a different kind is found in the Sunset-induced flowering of an old idea—the display of demonstration home gardens. An affluent small-home-owning society may have become especially receptive to

projects of this kind, but new artistry, imagination, execution, and promotion have counted heavily in making the latter-day versions so successful.

So many new botanic gardens and arboretums are coming into being, and older ones are making so many changes, that the few accompanying illustrations serve to provide no more than a sampling of some of the more conspicuous kinds of changes to be seen on all sides. Each phase could be elaborated, from design and programs, to the use of new plants in new ways, and the description and recording of these plants by new techniques.

It is evident that botanic gardens and arboretums are abundantly conscious of a horticultural awakening of the general public. They are preparing to play a strong role in providing the education and research so essential to long-term success of a nationwide beautification program.

Visitor parking at the Longwood Gardens, Kennett Square, Pennsylvania, has been resolved by installation of this area accommodating 1,000 cars. Visitors are led by the broad crosswalk to the Reception Center, which also includes an information center, an auditorium, a tour coordinator's and security officer's headquarters, rest rooms, and public telephones. The whole is screened from the gardens proper by a long soil bank appropriately graded and planted. The garden is entered through a pedestrian tunnel, skillfully designed for its decorative effect and impact.

LONGWOOD GARDENS

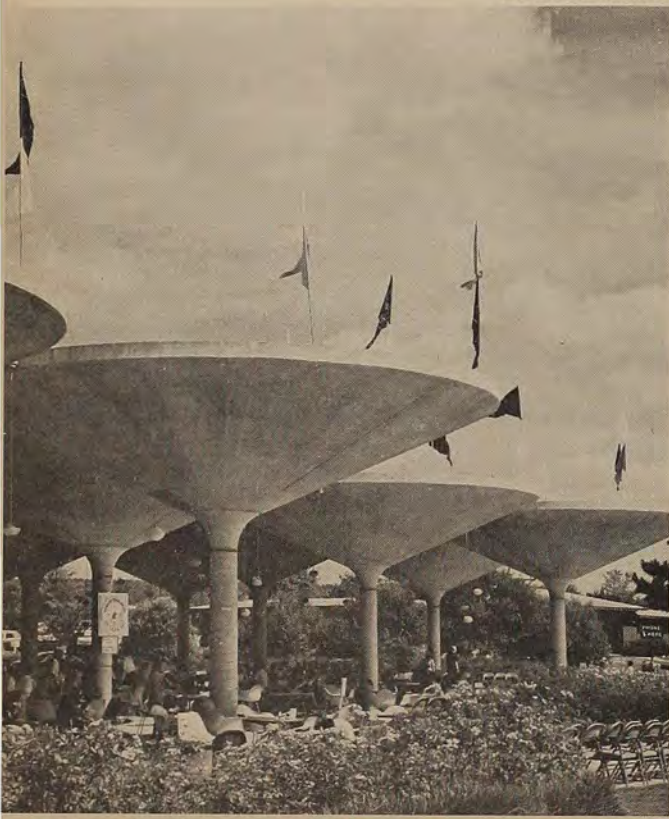




U. S. DEPARTMENT OF AGRICULTURE

A corner of the new administration-laboratory building at the United States National Arboretum. With outwardly deceptive provision of 37,500 square feet of floor space, this building combines a lecture-exhibit hall (left), with library, offices, general and cytological laboratories, and a two-story herbarium wing with a capacity for upwards of a million specimens. The water-surrounded auditorium is especially attractive under night illumination of fountain jets and columns. The design by Deigert and Yerkes won an award from the American Institute of Architects, and has been judged as one of the best of the Washington, D. C. area.

CALLAWAY GARDENS

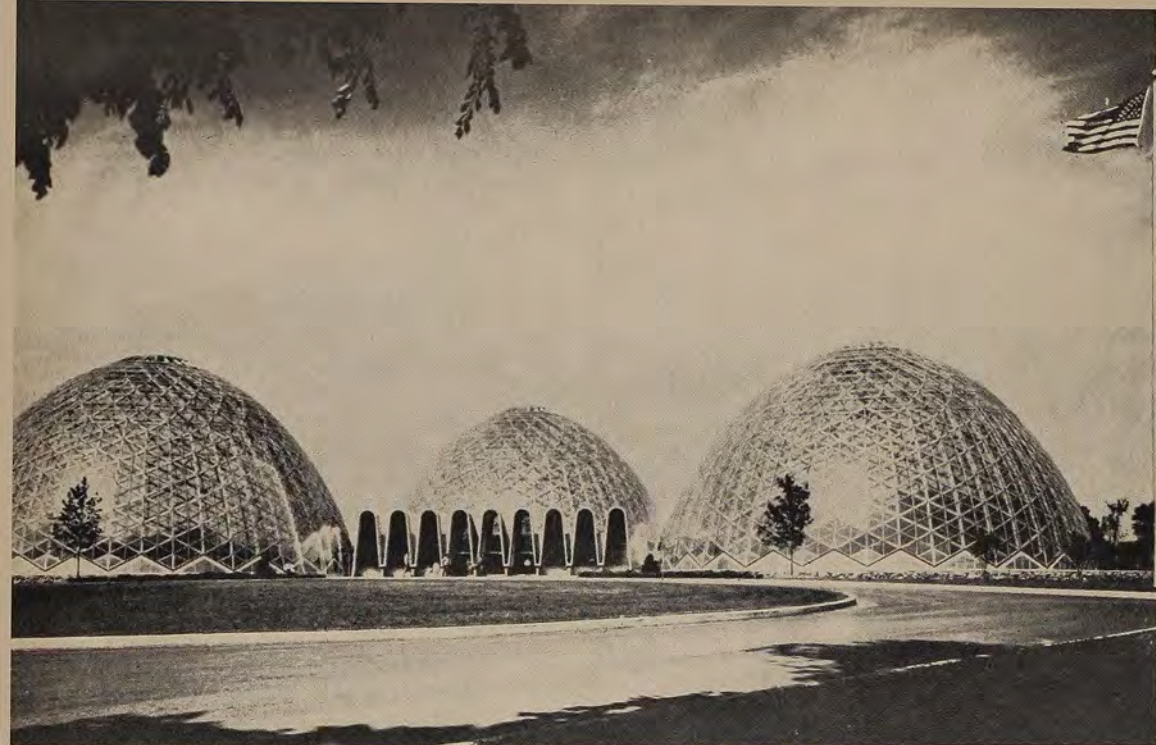


A solution for the dining problem at Callaway Gardens, Pine Mountain, Georgia. This unique modern facility commands a view of a recreation swimming lake. Twenty-one mushroom-like units, each 24 feet in diameter, can accommodate a large number of guests. Refreshments are prepared and served from two enclosed units. Comfort facilities are also provided in another closed-in mushroom section. The Pavilion, placed as it is, in a delightful setting, has drawn favorable international comment. Designed by Aeck Associates, Atlanta, Georgia.



MISSOURI BOTANICAL GARDEN

Opened in 1960, the Climatron of the Missouri Botanical Garden presaged a new era in the design and functioning of botanic garden conservatories. The Climatron is a Buckminster Fuller geodesic dome composed of aluminum tubing arranged in hexagonal patterns, lined by a layer of $\frac{1}{4}$ inch thick Plexiglas suspended just below the dome framework. Measuring 70 feet high and 175 feet in diameter, it covers a ground surface of 23,000 square feet. Climate is controlled by two independent air circulation systems with temperature, humidity, and volume of air automatically regulated by fans, dampers, and water spray nozzles activated by pneumatic switches. An unusual interior feature is the break in terrain levels which, like the Palm House at Kew Gardens, permits a viewing of jungle vegetation from tree-top height. The Climatron achieves phenomenal growth of tropical vegetation and is popular with the public. Admission is fifty cents.



MILWAUKEE COUNTY PARK COMMISSION

Carrying conservatory design into new areas of originality, the triple domes of the new Mitchell Park horticultural conservatory have become a striking feature of the Milwaukee, Wisconsin, skyline. To reduce snow accumulation in Milwaukee's northern latitude, and for maximum sunlight, the conoidal dome was chosen in preference to the lower geodesic pattern. Each dome is 87 feet high and 140 feet in diameter. Construction is of reinforced concrete supporting a skin of glass and aluminum. No shading is required since the 750,000 cubic feet of air of each structure can be changed, if necessary, in $3\frac{1}{2}$ minutes. The present three-dome complex for tropical, dry climate, and show plantings has been installed at a cost of four and one-half million dollars. A fourth dome will be added. The design is by Donald L. Grieb, Milwaukee.

More conventional in shape, but again incorporating many new features of construction and air conditioned operation, is the year-old Boettcher Memorial Conservatory of the Denver Botanic Gardens, Denver, Colorado. This structure is 160 feet long by 72 feet wide and 51 feet high, and construction is of concrete, poured in place to support a coverage of $\frac{1}{4}$ inch thick Plexiglas panes which becomes progressively smaller from base to ridge. Design of the conservatory is by Hornbein and White of Denver, and the cost has been about one million dollars. With support greenhouses, it is part of a complex planned also to include a horticultural hall for transient exhibits.

DENVER BOTANIC GARDENS



Oriental gardens had a considerable vogue in this country toward the close of the last century. A current resurgence of interest parallels an unmistakable impact of the Orient upon Western architecture and the decorative arts. New Japanese gardens are also appearing. Complete with lake and Japanese Tea House, this garden was recently constructed at the University of Washington Arboretum, Seattle, Washington. The view is to the northwest, with the Yukimi-Gata lantern in the foreground, and with the Kobe lantern, Kasu-Gata, in the middle distance. Separately fenced, this leading arboretum attraction draws 42,000 visitors per year at a charge of ten cents per person.



BRIAN O. MULLIGAN



LOS ANGELES STATE AND COUNTY ARBORETUM

Upon the installation of four instantly successful demonstration home gardens by the Los Angeles State and County Arboretum in cooperation with Sunset Magazine, a new era in home demonstration gardens was inaugurated. Each garden, evolved around a distinctive-use theme, has been designed to show visitors the new ideas, new plants, and new construction materials which can be used in home landscaping. This is a view of the garden designed for a family that likes to entertain. Besides the deck area shown, there is also a covered lanai and fire pit. It is visualized that in actual use of the garden the guests may congregate at each of these areas for conversation and a social hour. Designed by Bettler Baldwin and Owen Peters.

Among new arboretum plantings, an effective development at the State University of New York's Planting Fields Arboretum near Oyster Bay, L. I., New York, is the Synoptic Shrub Garden. Encompassing five acres in area, the garden has been designed to present a synopsis or selection of the finest ornamental shrubs recommended for Long Island and the New York Metropolitan area. From the outset of its construction an important goal has been to present more than 400 selected species and varieties in an artistic and tasteful arrangement, one which will stimulate interest among students, professional horticulturists, and the public. The variety of fine plants merits particular consideration by garden designers.

GOTTSCHO-SCHLEISNER, INC.





BELLINGRATH GARDENS

Camellia Planting—Bellingrath Gardens, Theodore, Alabama. *The growing specialization, by botanic gardens, in one or more plant genera particularly adapted to their soil or climatic conditions, is desirable. One good collection, properly recorded and maintained, may be worth far more for study and research purposes than a dozen haphazard or partial groupings. As certain older arboreta have specialized in lilacs, crabapples, palms or succulents, so certain newer gardens are building comprehensive collections of hollies, pyracantha, eucalyptus, rose species, and others. Renowned for its show plantings of many kinds, Bellingrath Gardens of Theodore, Alabama, have elected to specialize in camellias. Illustrated here is a portion of the new camellia arboretum, which provides opportunity for the comparison of flowering and growth habits of upwards of 900 varieties, all growing under quite similar conditions.*

GORDON MITCHELL

Solving the problem of within-gardens transportation at the Norfolk Botanical Gardens, Norfolk, Virginia. *Car parking is restricted to fee parking lots, but interior transportation affords a choice of jeep trains or awning-topped canal barges. There is a charge for each, and both are very popular. The boarding point is near the garden teahouse seen in the background of this picture. A contemporary-style headquarters building, with library, offices and auditorium, is nearby.*



Norfolk's Contribution Toward a Beautiful America

By FREDERIC HEUTTE

Formerly Director, Norfolk Botanical Gardens, Norfolk, Va.

From time to time as we travel throughout America, we are attracted by a community which unwittingly seems to reflect pride as distinguished through its individual homes. This is not usually dictated by the size of the village or city, nor does it seem to be influenced by per capita wealth. No community has an exclusive on beauty.

I have lived in Norfolk for thirty years as a gardener. This great naval city of 300,000 people is made up at least of one-fourth transients. I have had a chance to analyze the source of its qualities in response to the American Horticulture Magazine's request to cite Norfolk as representative of man's attempt to beautify his living and working environment.

If I were limited to giving one good example or formula, I would say, "That beauty in any community can only be realized through the combined effort of its individual homeowners." In the case of Norfolk, for instance, the majority of the lawns are sown in winter rye every fall, to give the winter greenness so noticeable to visitors . . . simple but effective, although I am told by reliable sources that it takes 3,000 tons of seed, tons of fertilizer and countless numbers of man-hours, mostly from week-end gardeners, to do the job. One new-comer remarked "they shame you into this job here."

I should explain that tidewater Virginia is considered a transitional turf area, where evergreen grasses do not prosper, (such as blue-grass), and bermuda which thrives, browns out from November to May. So six million pounds of rye grass is sold over the various counters.

Our City and its environs, where this yearning for beauty abounds, has long

been known for azaleas and camellias which hold sway during March, April, and May. Home owners participate to the extent that one leading nurseryman told me he had been trying for 20 years to keep ahead of the demand, but by May was always sold out.

About 20 years ago, oleanders made their appearance in Norfolk gardens. It was said then, that the first hard winter would get them. However, a record 9°F. several years ago did not prevent their sub-tropical splendor from adding a colorful interlude during June and July. They vie with crepe myrtles which bloom between July 4th and Labor Day.

The story of the crepe myrtle in the Norfolk area however, is a saga unto itself. It arrived here nearly a hundred years ago, as some of the knarled old specimens testify, eventually escaping cultivation from abandoned farms in nearby counties. Around 1930 the garden clubs asked the City of Norfolk to adopt it as a city emblem and flower. This was done with the proviso that it be planted wherever possible along streets and public properties. Since then, no less than 100,000 have been planted, and because of this, the entire city takes on a festive appearance during the tourist season. One street, one mile long, boasts 1001 trees over 15 feet tall—a fair record for a city which rose out of mudflats as an incorporated town in 1682 on 11 acres of land!

During the depression of the mid 30's, Norfolk decided to build a garden that would rival Charleston azalea gardens, taking advantage of federal funds. It chose as a site 125 acres of land bordering a new municipal airport surrounded by water-shed properties and abounding in loblolly pines and dogwoods. It was

to become a most ambitious project. By May 1947 it made the national headlines. The National Geographic Magazine featured our City under the title "Nautical Norfolk Turns to Azaleas." In natural color, the story said in part "75,000 azaleas burst into bloom in this youthful addition to the nation's floral show places." Since then, these have grown to be over 12 feet tall and with others number over 250,000 plants, bordering on 11 miles of trails. Other species of plants have been added, among the most notable of which are 50,000 camellias in over 800 varieties and 12,000 rhododendrons, numbering 185 varieties and species.

This garden became the site for the annual International Azalea Festival. The 13th such festival was held this year on April 23, 1966 and Miss Kari Borton, daughter of Prime Minister and Mrs. Per Borton of Norway, was crowned Queen. A ceremony takes place each year at this time in honor of NATO whose headquarters are located in Norfolk. Last year's Queen was Luci Baines Johnson, crowned by her father, the President.

With this background and publicity, the City of Norfolk embarked on another ambitious beautification project in 1958, adding a further 125 acres of land to the gardens, and changing its name to the Norfolk Botanical Gardens (or "Gardens by the Sea"). By 1966 over a million dollars has been spent, half of it on buildings to be used for flower shows and a horticultural center.

This development has had one goal—to help its citizens who are interested in beauty decide which plants they would like to grow. The botanical gardens have become the information center from which we hope to further develop a more beautiful Norfolk.

We were told that our climate was not suited to grow lilies. But through the help of Jan de Graff of Oregon Bulb Farms, we found out differently and progressed to the extent that the 1967 National Lily show will be held here. Norfolk has played host to several national plant society meetings, including the American Horticultural Congress.

When Mrs. L. B. Johnson started her drive to make America beautiful and

The Norfolk Redevelopment and Housing Authority has been one of the biggest contributors to local beauty.

FREDERIC HEUTTE





FREDERIC HEUTIE

Norfolk has attempted to preserve the past through its gardens. The Adam Thoroughgood House built in 1636, America's oldest brick house with its restored colonial garden.

appealed for help, Norfolk responded with 500 mature azaleas along with some Japanese Black Pine, to landscape a small triangle near the Nation's Capitol. Perhaps our greatest contribution however has been the raising of 25,000 azaleas from cuttings. These will be ready to set out in the spring of 1968.

This is not really a gift on our part, but a "thank you" to the Federal Government, for sponsoring a gardeners training program during 1965, utilizing 20 retarded young men. The therapy of gardening worked wonders with these boys. It is hoped that other communities will develop similar programs. This year we have 35 in training, and the azaleas destined for Washington will be under their special care. We have hired permanently four of these apprentices, and are proud to have pioneered this particular project.

Norfolk has long realized that the beautification of any area must stem from a well informed public. To develop beauty through plants, we must

train both professionals and amateurs, and guide the often misled home gardener who falls prey to glamorous advertising of plants which are not adapted to their particular climate. In the past thirty years the Parks Department and the botanical garden have dedicated their efforts to serve the public and circulate timely information. We also act as trial grounds for new and better plants. We have been most fortunate to have been chosen as collaborators in this particular climatic zone for the USDA plant introduction and evaluation program. Other botanical gardens provide plants on an exchange basis. While again we do not claim to be exclusive in this field of endeavor, we have tried not to remain just plant collectors, but attempt to distribute and popularize those plants we felt would best serve our area. We have done this through our local nurseries, with which we have had excellent relations. Until such time as our city fathers became convinced that beautification was meritorious the local

nurseries helped generously in establishing islands of beauty in our city in co-operation with garden clubs and civic leagues. They realize now that it paid off. One landscape job alone around the Civic Center cost over \$50,000.

In this connection one of our biggest contributors to local beauty has been the Norfolk Housing Authority. While the housing itself is standard on a national scale, the landscaping and the maintenance of the grounds has been recognized as the finest in America. The Executive Director pronounced from the beginning that proper housing itself was not sufficient to rehabilitate people. They must be surrounded with beautiful plants. I remember how higher authorities condemned the practice of planting camellias and azaleas around the projects, but again with the help of local nurseries, these were supplied at the same cost as privet.

The Authority has encouraged the tenants to form garden clubs and has sponsored lectures on the subject. Hints on gardening and other information is

published monthly. Under a redevelopment scheme, new boulevards and streets are evolving, planned by the famous Sasaki firm. In the overall planning of the new Norfolk, the City wisely placed on the planning commission a landscape architect, who himself heads one of the large nursery firms in the community. In this manner beautification is not likely to be neglected.

Perhaps no facet of a City's life is as important as the school system. Here again it is believed Norfolk set a first in having school grounds designed and maintained by the Department of Parks & Recreation. Since children from all walks of life congregate at the schools it is hoped that they will be influenced by their surroundings. At first this was not easy to sell the idea to the school board and authorities, but the people through their parent/teachers associations spoke up in favor . . . at first they supplied the meager funds to buy a few shrubs, and the local nurseries supplied the trees on Arbor Day. This has become so popular that the school board

Fifteen years ago a streetcar right of way 5 miles long, now a parkway featuring camellias, azaleas, crepe myrtle, and bulbs.

FRED J. HABIT, JR.



now is the first to insist on proper planting and maintenance.

While Norfolk did not meet the national standard in park acreage per capita when it started this practice, it used every acre to the best advantage. On the basis that school grounds are not only used during school hours, but are a vital force in community recreation, both passive and active, this philosophy has since been emulated in many other communities. It was started here 25 years ago, when children could not even play outdoors after a rain until the ground dried out. Most of our playing fields now form a part of that winter rye carpet mentioned in the beginning of this article.

One of Norfolk's first horticultural show cases was planted on its main artery, "Granby Street," over which trolley tracks had hauled many generations of citizens. When this was discontinued in the 1940's a thirty foot media strip was left, five miles of which has been planted. Perhaps this planting has done more than any other project to stimulate that sense of pride which must prevail before you can harness the spirit of a community. At the time it was planted this parkway was not an ordinary planting. It featured azaleas, camellias, the City's emblem, the crepe myrtle, and a greensward that was the envy of all who saw it. There are many such parkways in America today, but perhaps only few which have developed so mature a display of beauty.

To plant a city of lasting beauty, often we are tempted to use short-lived plants. The live oaks of Norfolk were in most part started from nine bushels of acorns from trees that were here when Captain John Smith landed in 1609. This sandy spit of land is now preserved as a park called "Sarah Constance Shrine" in honor of one of his ships. It is nice to feel that many of these trees may still survive 500 years from now as a legacy of what had been done by this generation . . . beautification must be inspired.

But in a larger sense, the 1400 acres or so of public properties which have been landscaped within the city of Norfolk are but a small portion of the 63

square miles containing 300,000 people. This is an area traversed by the many estuaries which determine the main physical patterns of a tidewater region, where many homes border tidal basins and backwash rivers. Many gardeners have learned how to cope with this situation, and use what we are beginning to call amphibious plants. These will grow alongside such natives as the *Baccharis* or Salt Water Bush. So far *Pittosporum tobira*, *Ilex vomitoria*, all quinces hortensias, fig trees, many species of *Euonymous*, *Elaeagnus*, *Hemerocallis* and others, thrive under saline invasions, which occur periodically when planted only a foot above high tide. Again necessity is the mother of invention even in dealing with nature. Some day I am sure, the tidal waters of Virginia will be resplendent with color, carefully woven within the patterns of native marsh grasses—perhaps another first for this City by the sea.

The beauty of America depends upon such trials and tribulations as are only mentioned here to prove that it must be promoted through people, and not only those who claim distinction in the field of landscaping and horticulture. The sooner we learn that the creation of beauty through plants must be inspired, the quicker there will awaken that capability which is dormant in most of us. As in the case of dormant buds, it will spring to life when creative light is given.

On this chord I end my plea that horticulture should be dramatized so as to inspire youth to make it a career. Let us not forget that we are competing with the space age, but that everything in horticulture does not depend on test tubes. Never before in the history of our country has beautification had a better sponsor. The First Lady of our land, and our Federal government has accepted the idea that beauty is important to every day living.

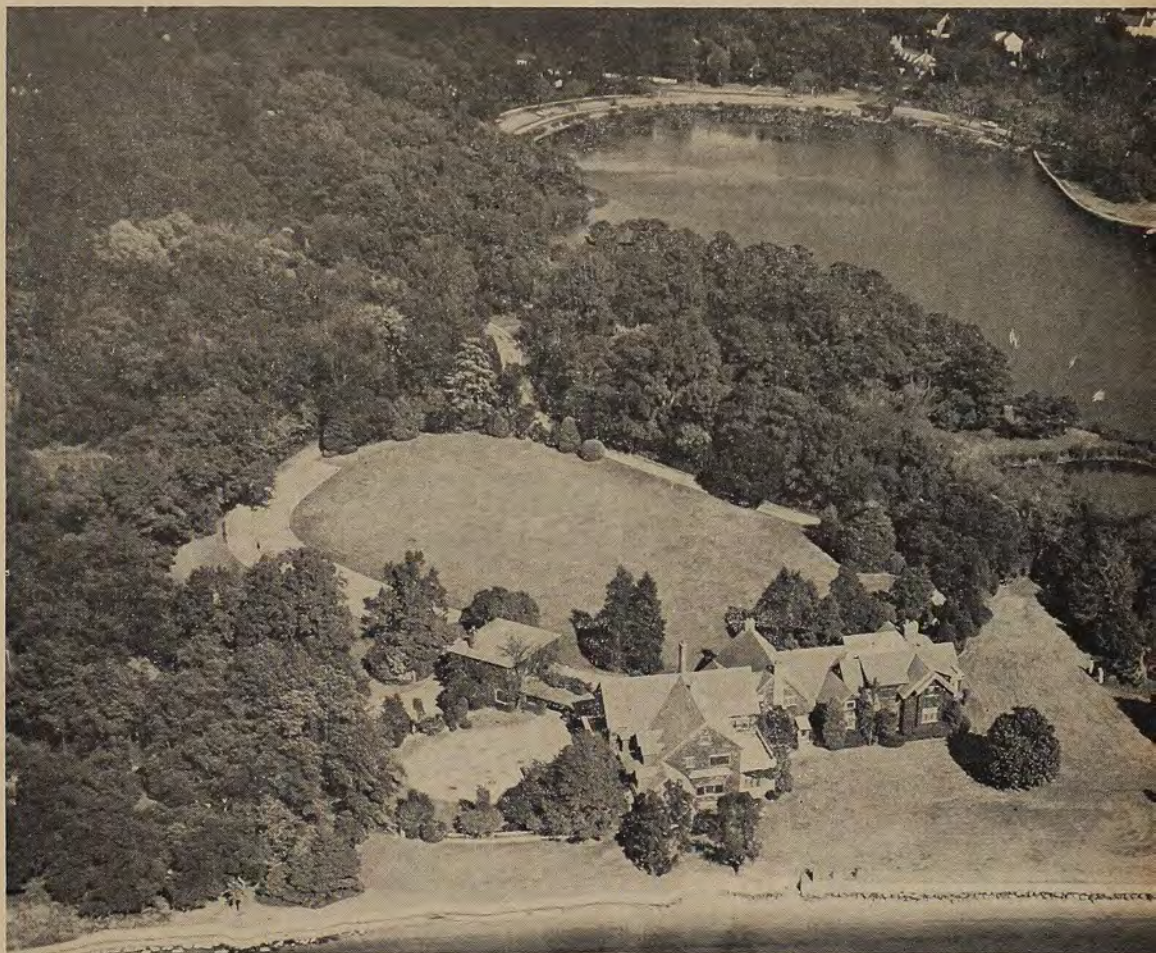
In America there has developed a tremendous vacuum between college training and laboring in the field of gardening and horticulture. We should strive to fill this void with garden technicians or whatever we choose to call them. Europe has done this for centuries and un-

less we can succeed in training people to become custodians of our great American dream, with its thousands of miles of landscaped super highways and beautification projects, we may defeat our purpose. Norfolk, in a very small way, has been able to lift herself by her own bootstraps, as have many other similar communities, but now we are talking big, and therefore must act and think big, without losing our perspectives. Here we have a challenge, one that will require the nimble hands of the housewife who tends her pots of geraniums, no less than the knowledge of the scientifically-oriented college professor. Somewhere along the line we need educated

muscles as well as minds dedicated to the task before us.

This is a challenge that must be accepted not only by the colleges, but the many fine proving grounds throughout America, parks, botanical gardens and arboretums. I hope that the 17th International Horticultural Congress, meeting for the first time in America, may give some thought to this problem.

We, here in Norfolk, hope that by the time this article is read, that our two year "professional gardener's training program" will have been ratified by the authorities in whose hands it now rests. Perhaps we may start another first, at least in the State of Virginia.



HAYCOK PHOTORAMIC, INC.

The Heritage, an exquisite riverside estate turned into a treasure-house of oriental art, surrounded by a typical English manor garden.

Tulsa, Oklahoma and Beautification

BY ELEANOR HILL
American Horticultural Society

There are three factors that contribute to Tulsa's beauty—its youth, the use of natural gas for heating, and the fact that because it is located in a prosperous oil and gas area its growing pains have not been complicated by serious money problems. In less than 70 years Tulsa has developed from a tiny prairie town to a city of one-third of a million people. There are few old buildings and these are constantly being wrecked to make room for new and more modern ones or parking facilities as the quick step of progress goes forward. Owing to the heating medium there is no soot problem—a fifty year old building is as clean as if it had been built yesterday.

Tulsa has been beautified in three areas—private, civic, and commercial. Special accolades should go to a nucleus of experimental gardeners and a few nurserymen who have consistently tried new and unusual material in the effort to find plants that will grow where rainfall may be insufficient at times, winds high, and winter temperatures may fluctuate. The trend in private landscaping is to have open public and private areas enclosed by walls or fences with espaliered trees or vines trained on them in patterns. This makes possible the growing of some plants that require a little more protection than they would receive in open areas. Owing to the increased difficulty in acquiring competent gardeners the tendency in landscaping is to have well-designed green gardens with a few bulbs or flowering shrubs for accent through the year. This makes for easy maintenance.

Church landscaping is no longer limited. As churches have moved to the suburbs adequate landscaped parking space has been provided. Many churches have purchased enough acreage so that they can have large lawns and trees. Older churches in downtown areas have

acquired additional property to convert into beautiful parking areas. In some instances the city has allowed streets to be closed near churches to make for better landscape effect if the street was not an artery of travel and used principally by churchgoers.

A mall has been created by prohibiting parking for three blocks on the main street of the downtown area. Planters contain yaupon holly (*Ilex vomitoria*), azaleas, and Harry Lauder's Walkingstick (*Corylus avellana* 'Contorta'). Shade trees have been planted in openings in the side walks in the rest of the business area. The new civic center to the west of the business district has three large reflecting pools with fountains in a block-long flag allée where the flags of the city of Tulsa, the state of Oklahoma, the tribal flags of the Choctaw, Chickasaw, Seminole, Cherokee, Creek, and Osage Indians, the flags of the United States during different periods of its history, the flags of France, Spain and other national flags relating to the history of Oklahoma fly on special occasions. Each flag was a gift and each pole is marked with the donor's name and the identity of the flag. Trees have been placed in planters in the parking lot and the grounds near the library are landscaped with flowering crabapples and tree wisterias. There is a fine specimen of Atlantic Cedar (*Cedrus atlantica*) to the northeast of the library. These plantings are lighted at night.

The bypass connecting two turnpikes has been planted by subscription. Through donations the more hardy varieties of trees and shrubs were provided as memorials and honoriums. Care was guaranteed for two years after which time the planting should be able to survive under normal conditions.

Tulsa has 87 parks, 27 of which are undeveloped. They comprise a total of



LEROY RANDALL

The Tulsa Rose Garden showing the first five terraces.

3,996 acres. Mohawk Park, the largest, comprised of 2,823 acres contains two 18-hole golf courses, the zoo, many picnic areas and the reservoir for the city's water supply which is brought from the mountains 60 miles away. Zeigler Park which covers 22 acres has a recreation center with an indoor gymnasium and swimming pool. Frank H. Reed Park, named for an early day Tulsan who had a great interest in children, contains a recreation center with an indoor gymnasium and swimming pool and the first of the 23 wading pools built in the city parks by a trust fund set up by Mr. Reed. McClure Park has a large gymnasium, recreation center building, sports field and an Olympic swimming pool which is the pride of the city. Maxwell Park, the most recent park, contains a junior swimming pool, a ball diamond, tennis courts, and recreation center. La-Fortune Park, the gift of Jos. A. LaFortune contains an 18-hole golf course and

swimming pool to serve the southeastern section of the city. John Zink Park will contain a large rock garden planted with many ferns and native plants when completed. This park was a gift from John Zink and the rock garden is being constructed at his expense to control erosion on an embankment.

Woodward Park contains the city rock garden, the herb garden of Anne Hathaway Garden Club, the test garden of the National Chrysanthemum Society for garden chrysanthemums, the petunia test garden of the Tulsa Council of Garden Clubs, the All American Rose Selections test garden, and the Tulsa Rose Garden. The rose garden was established by the Tulsa Garden Club in 1934 on terraces built in the park with the agreement that it would provide the roses if the park department would care for them. In 1938 this planting was given Better Homes and Gardens' "More Beautiful America Achievement Award" and the Tulsa Gar-

den Club was cited for 'outstanding accomplishment in civic improvement and in recognition of vision, industry and civic pride.' In the intervening years five terraces have been completed and more than 10,000 roses have been planted. Pools are featured on several of the terraces which range in size from 100 x 210 feet to 227 x 210 and plantings of ornamental trees and shrubs are used in the landscaping. This planting has had much publicity and as a result many roses, some still under number, are provided by various companies prior to introduction. The success of this garden resulted in the establishment of the All American Rose Selections Test Garden on the sixth terrace in 1945. For 20 years it was under the supervision of Arthur F. Truex, a former president of the American Rose Society and is now supervised by Homer L. Spencer of the Men's Rose Club. On any sunny day during the growing season the garden will have many visitors making notes about the performance of individual varieties. As a result Tulsa has truly become a city of roses.

South of and adjoining Woodward Park is the Tulsa Garden Center. In 1953 at the instigation of garden club members a 15-room mansion on nine acres of ground was acquired through a bond issue and is operated under a 15-year lease from the City Park Department. An auditorium that seats 450 people was added in 1957. In this building are held garden club meetings, flower arrangement classes, horticultural and landscape design lectures in addition to two large spring flower shows, a chrysanthemum show, a Christmas display, the annual orchid show, and many smaller shows. The building is staffed by a paid receptionist, librarian, custodian, secretary, and a volunteer director. The expenses of this staff, maintenance and repair of the building are borne by income from rentals, membership fees, a gift shop, donations from various garden clubs and their projects, the spring plant sale and the fall rummage sale, travel tours and interested individuals. A circulating library of 3,200 horticultural books is kept open five days a

week. By arrangement with the county agent's office a horticulturist-landscape architect is on duty mornings.

In 1964 the use of five acres of the grounds east of the Garden Center building was pledged by the city to the Garden Center for the establishment of a small arboretum. A sprinkling system has been installed and trees and shrubs are being acquired from donations. The planting was designed and the varieties to be grown were selected by the Garden Center horticulturist with the aid of a committee of competent growers. The original cost of a tree or shrub covers cost of perpetual care. Each is marked with the botanical name and the name of the donor or honoree. Uncommon trees which will grow without coddling that are included in the planting are:—Bald Cypress, Dawn Redwood, Atlantic Cedar, Cedar of Lebanon, *Cunninghamia*, California Incense Cedar, four varieties of Flowering Dogwood, White Redbud, *Ginoko* and the pyramidal variety, Fringe Tree, Shagbark Hickory, ten varieties of oaks including the Southern Live Oak, Japanese Pagoda Tree, Oriental Persimmon, five varieties of pine, Black Hills, Morheim and Colorado Blue Spruce, Sour and Sweet Gum, American Linden, a selection of magnolias including *M. seiboldii* and *M. virginiana*, ten varieties of maple including Weir's cut leaf, common Witch Hazel, *Zelkova*, Tulip Tree, and eight varieties of flowering crabapples.

Among the better shrubs and small trees planted are:—*Camellia sasanqua* 'Dawn', red and white Crepe Myrtle, *Callicarpa*, Winged Euonymus and *Euonymus elata* 'Compacta', 16 varieties of evergreen hollies including Wilson's holly, two deciduous hollies and two Yaupon, three varieties of *Pyracantha*, seven viburnums including the High Bush Cranberry, Harry Lauder' Walkingstick, upright yew, the witch hazel 'Orange Glow' and Japanese Fantail Willow. This area has been designated as a songbird sanctuary and the area contains many bird feeders and martin houses.

A projection for the future is the beautification of the river and the con-

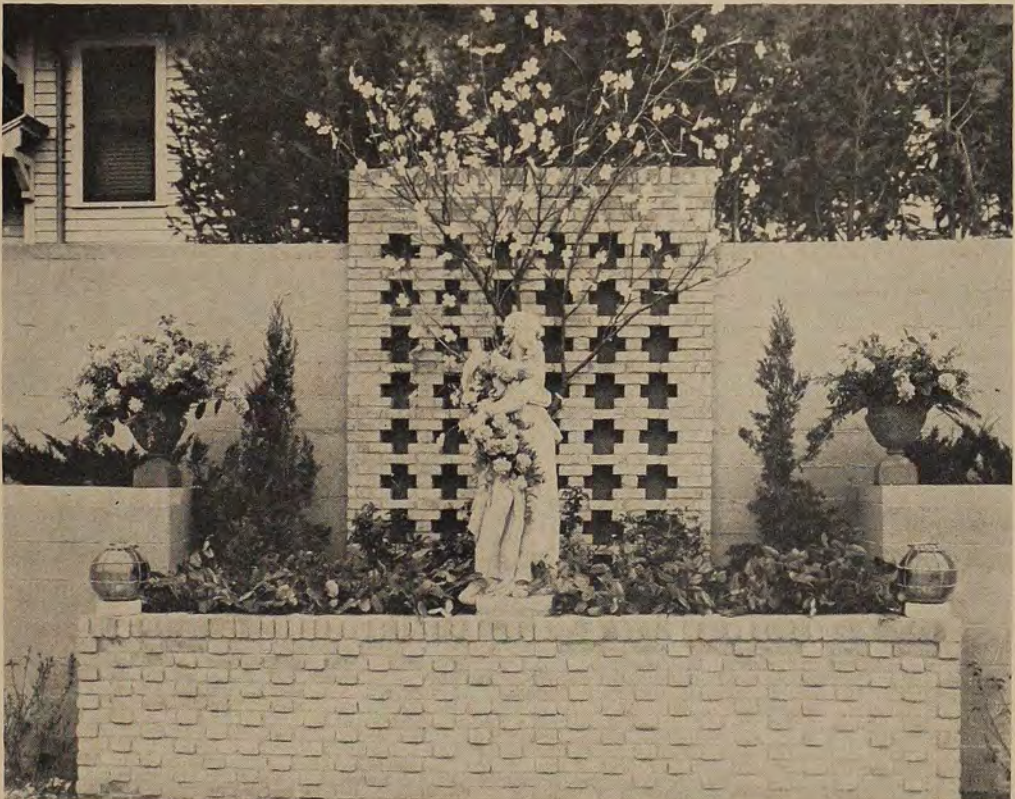
trol of the pollution problem where refineries dump waste into the river. There will be a series of 10-foot dams over a distance of about 12 miles that will back up the water into a series of shallow lakes. The banks of the lakes will be landscaped creating a River Park.

There are two museums both with large landscaped grounds. Philbrook Museum is set in a natural grove with many fine old trees, including some Chestnut Oak which are not common here. The Italian style building which is landscaped in an appropriate manner was the gift of the oilman, Waite Phillips. It is supported by memberships and by the income from a downtown office building also a gift of the donor. The Thomas A. Gilcrease Museum of American Art was a private museum before being acquired by the city through a bond issue. The 23-acre grounds contain

Magnolia stellata, a Golden Chain tree, Chinese Witchhazel, azaleas, the crab-apple 'Red Jade', double flowering cherry, white and pink dogwoods including a large specimen of the double flowered 'Pluribracteata', 'Schwedleri' maple and a holly planting including a large female American holly with a 21-foot spread.

For twenty years the Chamber of Commerce has maintained an active interest in commercial beautification. Whenever the permit for a new building is issued the owner receives a letter asking that sufficient money be allowed to provide for adequate landscaping. During the spring and summer they award their Industrial Beautification Plaque monthly for improvement in three categories:— industrial, commercial, and church beautification.

An outstanding winner of this award



LEROY RANDALL

Background of a flower shop parking lot. This facility won the Chamber of Commerce Industrial Beautification Plaque.

for improvement in the commercial division is Mrs. DeHavens Flower Shop. The building formerly of red brick with a spotty design and trim of limestone was painted gray and two porches of hand hewn timbers with shake roofs were added. On one side an outmoded filling station was wrecked to provide parking space and on the other a long shack used as a vegetable stand and a six by ten foot sectional building used as a liquor store were raised so that there might be additional parking. A wall and grape stake fence with a nice figurine as the center of interest screen off the neighboring houses. The planting is simple and no unusual plants have been used.

The trend in commercial landscaping is to have small landscaped plots in front of buildings which are set back from the

street. In the downtown areas the setbacks and the upper stories of the buildings themselves may have shrub and small tree plantings. A number of banks with drive-in facilities have good basic plantings which are supplemented by potted bulbs, azaleas, annuals, and chrysanthemums in season.

Many new shopping centers are well-landscaped, with a few grassy areas and benches for weary shoppers. Trees provide pleasant parking, relief from heat as well as beauty and make the skeleton for a veritable fairyland when lighted at Christmas. "Have you seen——, have you seen——, have you seen——?" So people go to see and stay to buy and merchants realize that 'beauty is good business.' Thus the seed for more beauty is planted.

Floriculture—With Honor to the Past

By JOHN H. WALKER

*Executive Director, Society of American Florists
and
President, American Horticultural Society*

Commercial floriculture has long been a leading industry in European countries, although the United States has made much rapid progress in the production and distribution of flowers and ornamentals during the past half century.

Like horticulture, floriculture was practiced almost exclusively in private homes before the nineteenth century. New England colonists brought flower and plant seeds with them and exchanged them with the Indians for corn, potatoes, tobacco, and grapes. In turn, the seeds were distributed inland to tribes in remote sections of our country even before the white settlers arrived here.

Commercial floriculturists, previous to the organization of the Society of American Florists, had representation in the American Association of Nurserymen, Florists and Seedsmen—the forefather of the present American Association of Nurserymen. It was found, however, that the diverse interests of the three branches could not be properly cared for under one organization. Therefore, during a meeting of the Association of 1883, John Thorpe and E. G. Hill took initiatory steps to form a separate organization. Their preliminary work and a little quiet canvassing resulted in a meeting in Chicago during June, 1884.

Twenty-one florists attended this meeting to form an association of florists. The name Society of American Florists was suggested by Frank Pierson and was finally adopted.

The first convention was held in Cincinnati, Ohio, in August of 1885. At this time there were almost 400 members on the rolls. The heating and ventilating of greenhouses were a main subject for discussion and the relative ad-

vantages of hot water and steam were brought out in discussions which sometimes waxed hot enough to heat many a greenhouse.

In 1894 a bill providing for SAF's charter was passed by both houses of Congress. A charter had been sought to give the Society a status, a position, and a legal existence as a national body. However, when this bill went to President Cleveland, he vetoed it on the grounds that it failed to carry out the purpose and objects of those interested in its passage. He felt the interests of florists would be badly served by a corporation confined to the furtherance of garden culture. This veto was actually the cause for the addition of "Ornamental Horticulturists" to the title of the Society in 1897. The Society was finally successful in 1901 and President McKinley signed the bill on March 3, 1901.

By 1900 there were between 9,000 and 10,000 establishments engaged in growing and selling plants and flowers in a commercial way. The SAF membership had grown to 553. Many more wholesale establishments were appearing, to add to the 31 which were in existence in 1890.

In 1910 commercial floriculture was given real assistance in the formation of a retailers section of the Society. The plan in general contemplated a trade arrangement by which business in distant towns could be exchanged on a safe basis as to quality of stock and credit. A temporary organization of the Florists' Telegraph Delivery was effected at Pittsburgh on January 27, 1910. In August of that year a meeting was held during SAF's Rochester convention and a constitution and bylaws were adopted. Thus the Florists' Telegraph Delivery,

now known as Florists' Transworld Delivery Association, came into being.

Commercial floriculture expanded greatly in America during this period. SAF's first publicity attempts were made back in 1912, when a resolution was passed calling for the appointment of a standing committee on publicity. Coincidentally, these steps were taken at the same time as those which established the first U.S. income tax, which was levied in 1913.

Then came the entry of the United States into the first World War. War-time conditions put a check on formal entertainment and efficiency was emphasized as the aim and keynote of the 1917 convention in New York. It was decided to place the advertising contract with P. F. O'Keefe Advertising Agency of Boston. It was Major O'Keefe and the National Publicity Committee Chairman William Penn of Boston who originated one of the greatest contributions to the floral industry—the "Say it with Flowers" slogan—which has spread the word of flowers from one end of the world to the other.

There were jubilant years in floriculture from 1919 to 1928 as there was a renewal of increased business activity. A new \$2,000,000 publicity campaign was begun in 1927 and was regarded as the second largest advertising fund in the country at that time.

By 1929, local tie-in had been increased and there were about 4,000 members in the publicity campaign organization. This was the year of the stock market crash and the year before prohibition became effective. Competition became more keen to attract the consumer dollar. A valiant effort was made to keep the campaign alive, however, the depression finally caused the Society to forego its plans and in 1933 the campaign had to be abandoned.

It must be pointed out that during the depths of the depression the flower business fell off only to the level of all business generally throughout the country, while the nonessential and luxury lines went almost to the bottom or out of business entirely. Business failures of florists were less than the average of the

country and the expansion of new greenhouse construction continued at a healthy rate. Obviously, this proves that flowers are even more of a necessity to express sentiment during times of stress and strain.

The past twenty-seven years have seen a sharp growth and industry-wide influence on the part of the national trade association. SAF has moved forward to offer an increasingly large number of services to the growers, wholesalers, retailers and allied tradesmen it represents. Great impact has been made through the National Product Promotion Program, the "please omit" program of the Florist Information Committee, the youth education program and other Society programs. Actually, every florist in America has an opportunity to cooperate in one of the industry's most successful promotion programs, the National Product Promotion Program, which is currently carrying on an outdoor advertising, public relations, and education campaign across the country.

The Society's continuous watch on legislation has protected florists' interests; opposition to rate increases has saved thousands of dollars in transportation costs; cooperation with the U.S. Department of Agriculture has stimulated production and marketing research and has provided funds to carry out these projects; and furtherance of grades and standards has helped pave the way for a common language for buyer and seller.

According to a U.S. Department of Agriculture report, conducted under a cooperative agreement between USDA and Florists' Transworld Delivery Assn. approximately 22,000 retail florists in the U.S. account for more than a billion dollars in annual sales. The study was undertaken to provide information about current marketing practices in the floral industry and to develop techniques to expand markets for floral products.

The study noted that the industry is comprised mainly of small businesses with two-thirds having annual sales of less than \$50,000; a fourth having an-

nual sales of \$50,000—\$100,000; and one-ninth having annual sales of \$100,000 or more (but accounting for nearly 40% of industry sales.)

The report noted that U.S. florists conduct about three-fourths of their business by telephone. Flowers-by-wire service is offered by 84%; credit by 95%; and free delivery by 97%. Credit policies are probably the most liberal of all U.S. businesses. Only 12% add a service charge to past due accounts.

To further commercial floriculture, nearly three-fourths of the florists advertise in paid media one or more times a year. More than a third who advertise feature specific floral products. Newspapers are the most popular advertising medium. Eighty-six percent use floral displays in shop windows as a sales stimulant. Less than 40% display prepared arrangements in their shops.

Nearly 40% charge the same price for arranged as for unarranged flowers. About 80% price-mark most items displayed for sale. The majority encourage customers to buy accessories and many give purchasers some accessories free.

Sales registered by the nation's 1,065 flowers, plants, florists' supplies wholesalers were 46.9 percent higher in 1963 than in 1958, according to figures compiled by the U.S. Department of Commerce Bureau of the Census. Total sales reported by these businesses in the 1963 Census of Business was \$297 million. In 1958, the previous census year, 903 establishment reported sales of \$202 million.

An analysis of sales of floral products showed that in 1963, New York led all states with sales of \$48.6 million; followed by California with \$33.7 million; Texas \$17.3 million; and Illinois \$16.3 million. These five states accounted for 44.7 percent of the total for the United States.

The U.S. Census figures show that from 1929 through 1963, the number of retail flower shops almost tripled. Another important shift noted in the floral industry by the Department of Commerce is that the wholesale value of potted plants increased by 100 percent

from 1949 to 1959, compared to 27 percent for the best known varieties of cut flowers.

Amazing strides have been made in floriculture in plant breeding since the beginning of the twentieth century. Research in floriculture in the Crops Research Division of the U.S. Department of Agriculture is concentrated in the fields of physiology, diseases, genetics, and entomology. Much of the research at Beltsville, Maryland is carried on by teamwork attacks in which the staff, well trained in the various scientific disciplines, pool their knowledge, training and efforts.

The problems facing the flower industry are becoming more and more complex because of the advent of so many new chemicals, pesticides, and laboratory equipment. Basic research on such problems as use of artificial lighting, temperature control, both pre and post planting, controlled atmosphere storage, and many other recent developments have introduced many new problems.

Floricultural research in the United States has now reached a stage of maturity where it is essential to understand what happens to plants when they are exposed to the various controlled environments now available to us. One of the most recent and valuable accomplishments at Beltsville is the discovery that some growth regulators induce early flowering. Studies are now in progress to determine the best time of application, proper concentration of the growth regulator, and number of applications necessary.

Research in our country is now planned to investigate the germination of a wide range of flower seeds, since research at Beltsville has shown that light is an extremely important factor in inducing germination of many seeds.

The entomologists have cooperated very closely at Beltsville in determining the insect vectors of virus diseases affecting lilies, gladiolus, dahlias, narcissus, and their control to prevent spread of the diseases. Soil systems have been investigated to control several virus diseases. An interesting new development

in the use of aluminum mulches between rows of plants that have been shown to repel winged aphid vectors of gladiolus viruses.

A constant search continues for improved and more effective insecticides and improved methods of increasing their penetration into leaves and stems by use of surfactants. Unfortunately, insects do develop resistance to insecticides and this requires a constant diligent search for new pesticides as resistant insects appear. Chemosterilants and predators are constantly being investigated for control of mites and other insects that have become resistant to the pesticide in common use. For instance, an efficient predaceous mite from West Germany has been tested against highly resistant mites and is being held in readiness for release in greenhouses when available acaricides should fail.

During the past five years the Society has sponsored two All-Industry Floricultural Congresses at which leaders from all segments of the industry came together to distill the discussion of the participants into provocative ideas, suggestions, and recommendations for consideration of the SAF Board of Directors. The seminars zeroed in on future

problem areas and focused on solutions to major industry problems.

Prior to the Congresses, through an SAF questionnaire, industry men identified the major problem areas they wished to discuss: education, finance, grades and standards, labor (employer-employee relations), marketing (advertising, public relations, retail merchandising, and grower-wholesaler-retailer cooperation), and transportation. Congress participants stressed several urgent requirements which underlie all six areas: the need for better communication among retailers, wholesalers, growers and suppliers; enlightenment and education of industry men and prospective employees in specific means for achieving a healthier industry and greater consumer sales; and a more competitive spirit among those engaged in floriculture in order to meet competition from other industries.

Both Congresses were hailed as outstanding successes and drew the best thinking from participants across the country, capitalized on open discussion, and provided a wealth of material for the Society to utilize in guiding the course of floriculture in the years ahead.

Some Contributions by Nurserymen to Ornamental Horticulture

BY RICHARD P. WHITE

Director, Horticultural Research Institute, Inc.
Washington, D. C.

Nurserymen the world around are alert in recognizing variations in plants with potential commercial value. Closely associated with plants every day of their lives, nurserymen become expert in detecting seedling variants, sports and mutations that may occur in the thousands of plants of a single variety produced.

Large quantity production of plants in the commercial nurseries of the United States to supply our mass markets, offers unlimited opportunity for such observations by those wholesale plant growers who have the inclination to search out and introduce variations from the normal of any species that they may detect. These become horticultural varieties or cultivars in the trade.

This desire on the part of the commercial grower is due to competitive reasons. To offer an "improved" variety of a well known plant has always been advantageous. At times, we must candidly admit, this competitive situation has undoubtedly resulted in the introduction of horticultural varieties not sufficiently different from those already in the trade to be of real superior value.

However, the keen observation of nurserymen in the early days has brought to the public via commercial channels such outstanding introductions as Stark's Delicious apple, Kelsey's Weeping hemlock, and a number of other weeping, prostrate, spreading, fastigate and dense forms of the Canadian hemlock; many varieties in *Taxus* again covering every conceivable type of growth habit and color variation from deep green to variegated.

Among the shade trees, numerous clones of the Japanese Maple (*Acer palmatum*), Norway Maple (*Acer platanoides*), and Red Maple (*Acer rubrum*)

will be found listed in nursery catalogues—all resulting from observations of nurserymen in detecting variations from the species, followed by vegetative propagation and introduction as horticultural varieties to the public.

The American elm (*Ulmus americana*) has produced such variants as the 'Moline', 'Princeton', 'Golden Column', and others. These have all been discovered by nurserymen and introduced as clones.

In shrubs the same situation exists. In almost any popular shrub, horticultural varieties are found to exist and commercial nurserymen have detected these and have introduced many as clones of superior value. The privets are noteworthy in this regard.

Similar comments could be made about almost any ornamental plant species grown in the United States in great quantities by wholesale nursery growers who supply a high percentage of our large mass markets. This is due to:

- 1) the opportunity to detect variants in the production of large numbers of a seedling population and
- 2) the competitive advantage of having something "new" with desirable qualities to offer the public.

Up to 1930 commercial nurserymen were motivated largely by the competitive advantage of having temporarily a new horticultural variety which other nurserymen could not offer to the public. It did not take long, however, for the competition to produce a suitable stock of this horticultural variety since plants could be purchased on the open market and be reproduced vegetatively. The competitive advantage soon disappeared.

In 1930 this was changed. In May of

that year the Plant Patent Act was signed into law by President Hoover, providing protection to the nurserymen who discovered or produced by hybridization and selection these new plants. Nurserymen and others from that time forward were able to patent new horticultural varieties, provided they were different from related kinds as determined by the United States Patent Office with the advice of the United States Department of Agriculture. The Patent laws of the United States provide seventeen years exclusive control of the new discovery, which means in the horticultural field, a prohibition against vegetative reproduction of the patented plant for that period of time without a license from the patent holder.

With this incentive, the search for better varieties by commercial horticulture was greatly stimulated. The first plant patent was granted in August 1931 to an everblooming, climbing Van Fleet rose named 'The New Dawn' which it truly was. Since then over 2,600 plant patents have been granted to nurserymen, florists, plant hybridizers, horticulturists, and others. Over 500 patents have run their span of seventeen years and are now public property.

The variety of plants that have been granted patents is wide. The American Association of Nurserymen, Inc., has published a listing of all plant patents with common names from 1931 to 1962, with supplements for 1963, 1964, and 1965, covering every plant patent from #1 to #2584.*

Those with the most numerous patented varieties are:

Apple (66)	Gladiolus (75)
Azalea (113)	Nectarine (66)
Camellia (39)	Peach (173)
Carnation (53)	Rose (1192)
Chrysanthemum (160)	Strawberry (34)
Fuchsia (28)	

Patented varieties are recorded in 155 species from *Abelia* to *Zelkova*, covering shade, flowering, fruit and nut trees,

shrubs, ground covers, turf grasses, perennials, small fruits, florist crops, and vines.

The rose has received by far the largest number of plant patents since passage of the Plant Patent Act. This is almost entirely due to the cooperative efforts of All America Rose Selections, an organization of 24 rose growers of the United States, devoted to the breeding, selection, testing and introduction of new and better roses for American gardens.

The organization fosters the establishment and maintenance of rose test and demonstration gardens in the United States. Currently there are 24 such test gardens, where new roses are grown, tested, evaluated and rated by experts before being offered to the public. These 24 test gardens are scattered over the United States from New England to southern California and from Georgia to Seattle, covering all climatic conditions of the United States.

Testing of any "new" rose is carried on in these varying climatic areas and under ordinary field conditions for two growing seasons. The judges are rose experts, including leaders in the commercial rose industry, professors of ornamental horticulture in leading state Universities, park directors and amateur rosarians of proven knowledge and ability.

After two years of field trials, the judges select only the top-rated rose varieties for All America Award. Some years no selections are made when in the opinion of the judges no variety could be ranked high enough for the Award. In this way the public gets the benefit of a two year testing of new roses before they are offered for sale by the producers.

All America Rose Selections was organized in 1938, with the first selections made in 1940. Since 1940 sixty-eight varieties have been selected as All America Rose award winners. It is estimated that 50 to 60 per cent of all roses produced and bought by the gardening public today are award winners, showing general acceptance of the winners as the better modern roses for American gardens.

*Plant patents with Common Names. American Association of Nurserymen, Inc., 835 Southern Bldg., Washington D. C. 20005. \$2.00. Supplements, 50¢ each.

Commercial nurserymen continue their individual observation and selection for "new and improved" varieties in a highly competitive market with all its stimulating rewards. Many new introductions are not patented. Since the rose leads in popularity as America's first flower, it holds the greatest promise for offsetting the great costs of maintaining a breeding program by any commercial nurseryman. Without some hope of recovering a part of the heavy expenses involved, through protection of propagating rights by the introducer, commercial concerns could hardly afford to return to the old method of chance finds or limited breeding and selection programs. Progress in ornamental horticulture would be greatly retarded and the gardening public of America would become the ultimate loser.

Selections of improved varieties of ornamental plants have contributed to improved home gardens, to municipal shade tree programs and to all facets of gardening, on account of making available to the gardening public better ornamental plants: either more hardy, better adapted to the unfavorable climatic growing conditions of the modern city, with growth habits more suitable for specific situations, or with other improved specific characteristics.

To illustrate this fact, over 40 improved horticultural varieties of deciduous broad-leaved shade trees have been developed over the past several years, most of which are generally available in the nursery trade for public use. Some, such as certain varieties of thornless honey locust, have been developed to replace the American elms lost by the Dutch elm disease. Three new varieties of ash, linden, and magnolia and at least five of maple can be purchased, as substantial contributions from commercial nurserymen, all with some desirable

new qualities for street planting. Nurserymen will continue to make such contributions to the improvement of horticultural plants for ornamental use.

Finally, the nurserymen's contributions toward a more beautiful America have not been confined to the introduction of improved horticultural varieties of ornamental plants. From 1928 to 1932, commercial nurserymen through their national organization, the American Association of Nurserymen, sponsored a nationwide program of beautification, three objectives of which were:

- 1) to encourage and assist home owners to beautify their grounds with trees and flowers, thus adding to the joy and happiness of family life,
- 2) to preserve and enhance our heritage of national beauty along our roadsides, and
- 3) to make towns and cities more attractive and to stamp out ugliness wherever found.

This program resulted in the establishment of a large number of garden departments in newspapers and home magazines, which continue to print editorial matter on gardening today. It also changed the concept of the "back yard" to the new concept still being used, of the "outdoor living room." The program also raised gardening to America's greatest hobby.

In 1950 the commercial nurserymen sponsored the "Plant America" program stressing roadside landscaping for beauty and safety, the landscaping of industrial establishments for community improvement, as well as planting of school, church, community and home grounds. This program is still developing under commercial sponsorship and its effects are visible throughout the nation.

All-America Selections

By W. RAY HASTINGS

*Executive Secretary-Treasurer
All America Selections, Harrisburg, Pa.*

Founded in 1932 at Atlanta Georgia by the Southern Seedmen's Association, All-America Selections established twenty trial grounds for the pre-introductory testing and evaluating of proposed new seed cultivars.

Ten trial grounds for vegetables and ten for flowers were established under resident judges in whom the seed industry had the greatest confidence. They already had trials for their own firms and with most cultivated varieties in commerce for comparison ratings.

The American Seed Trade Association co-sponsored the organization the following year and the other sectional, Canadian and some state seedsmen's associations voluntarily gave their endorsements or sponsorships soon afterwards.

New creations and discoveries were

solicited from all known plant breeders from around the world. All were invited to enter their new varieties in the AAS trials. Entries came from seed firms, private, amateur and government breeders. In the second year of trials, there were 101 vegetable and 149 flower entries, many of them from overseas. At first no entry or other fees were charged.

It was soon found that some entries were not new varieties but evidently believed by their entrants to be improved strain selection sufficiently different to be given new names. Such perhaps accounted for many new names given to existing varieties, confusing to seedsmen as well as to the public. The trials were first started for the knowledge of the seedsmen, so they would know of the



ALL-AMERICA SELECTIONS

Harry A. Joy, AAS Flower Judge, and W. Ray Hastings, Chairman, AAS, checking All-America trials and comparative varieties, at Rochester, Mich. Oakview Farms, of Ferry-Morse Seed Co., July 1941.

really different and superior new varieties to offer their customers.

Before All-America trials, commercial breeders and their firms usually kept their new varieties secret, away from the sight of rival firms until introduction. Under that system the introducing firm first offered seed when it had a very small quantity because that was all it could expect to sell. Even if an especially good variety, there would be several years before other seedsmen could test it under their soil and climatic conditions and feel safe in obtaining seeds to recommend and offer to their customers. Also, expense of promotion was usually more than received from seed sales.

Every gardener and planter should want the best varieties of their kinds or types and colors and for their purposes. Even with their own trials under purely local conditions seedsmen could hardly widely recommend a fairly new variety. Some good varieties were lost entirely because the originators could not afford to promote them and there was little inducement to support a breeding program.

With an outstanding new variety, believed best for its purpose to date, cooperative promotion does provide a profit to all concerned, assures a successful introduction and is a distinct service to the public.

Before AAS was started, some home magazine editors were in a dilemma for newsworthy garden articles of dependable nature. They knew little about new varieties and frequently published writers' articles on unknown subjects, sometimes misleading, not tested and unobtainable by the public. "Where can I get authentic information on worthy new things and a writer for them?", I was asked.

There were no newspaper garden editors or columns in 1932 although several magazines published gardening articles. The Garden Club movement was in its infancy and it needed subject material of new interest.

Leading home and farm magazines featured the first year's All-America Selections in 1933, as did seed and florist

trade magazines. All seedsmen had the opportunity of purchasing seeds of the award winners and helping with cooperative promotion of these introductions. The gardening public could purchase seeds from usual sources of seed supply and have these most worthy flowers and vegetables in their gardens as soon as the originators' next door neighbors. AAS was a success from the start.

Needing more climatic regions represented, as well as more judges for averaged all-season judgment, new judges and trial locations were gradually added until we now have 28 flower and 26 vegetable trial locations to better represent the gardening areas of North America, Canada to Mexico. New judges are provisional until their reports and trials are approved by the nine AAS directors who are elected by the Council of judges.

All-America Selections is self-perpetuating by its judges. It is incorporated as a non-profit educational institution, separate from any other organization and self-sustaining at the present time. It works closely with the seed industry and, until in recent years, was supported by voluntary subscriptions from seed trade associations and seed firms. Only the Southern Seedsmen's Association continues a nominal subscription.

No judges, directors or elected officers receive any remuneration for their services or expenses. Only the Executive Secretary and helper receive compensation for full time service and providing headquarters offices.

Seeds of all entries are sent to the Executive Secretary, where they are enclosed in AAS packets and sent to the judges under priority code number only for source identification. Source is not revealed even to the directors.

On the entry application form, the entrant is asked to name the nearest, most competitive, variety or varieties to his entry. He also gives a description as to type, height, color of flower or fruit, recommended use, claims of distinction, etc. This information, except for parentage or breeding information, is sent to the judges along with seeds of nearest comparison varieties for planting along

side the entry. If more competitive comparisons are known they also are sent. If voted award requirements and other more competitive comparisons should have been used, such an entrant may be asked to repeat his entry the following year when the more competitive comparison would accompany it, for re-evaluation.

After judges' reports are received and award points tabulated, this information is sent to entrants and judges alike. The tabulations show how each judge voted on each entry but still without the names of the entrants. Comments of the judges are also sent to the entrants on their own entries, often helpful in their breeding programs.

There are minimum award point requirements, as voted by the judges, before an entry is considered for award by the directors. While usually familiar with the entries from their own trials, descriptions, comments and award recommendations of the judges are considered by the directors at a Board meeting in January. At an open Council meeting to follow, the judges then vote on recommendations of the Board of Directors for designation of actual awards.

If a judge fails to obtain a fair and indicative trial of any entry the first season, he so reports and is sent a repeat trial sample for the next season. Each judge has two years in which to get a fair trial and judgment. Perennials may need a third year. However, on annuals, we usually know whether an entry has a chance for award from first year trials. If so, the entrant is promptly notified so he can plan for greatest possible seed increase towards release for introduction.

Demand for any new winner is multiplied, at wholesale and retail, so it is necessary to provide for enough seed to supply at least all wholesale contract orders before a variety may be released for AAS cooperative introduction.

All introductions are dated January 1, of the first spring season for retail distribution. All publicity to the public has this January 1 release date. Sets of releases, with full descriptions of the new

and recent award varieties are sent to all garden, home and farm magazines, all sizable newspapers and syndicates, all other known garden writers. Radio and television broadcasters help in bringing this most interesting and newsworthy garden information to the public.

While monthly magazines may use the publicity in only one or possibly two issues, for flowers and vegetables, newspaper garden editors frequently use several to all of the release articles during the spring months. Publications with over a hundred million circulation use this publicity material because AAS is the only generally accepted authority on new garden varieties.

We also supply publications, according to their preference, illustration mats or photographs of the current winners. We supply color transparencies to many magazines and newspapers which show the varieties in color. Large heavy dull finish photographs are furnished to television networks and individual stations. Original color slides, in numbers desired, are loaned to lecturers for projection use and some color television stations use them for tape recordings.

Further, to call public attention to the new award varieties and to popularize them, AAS has established some 25 flower demonstration gardens. These are located at famous and heavily visited gardens in Canada and the United States, including a number of state universities with important horticultural departments and the central Canadian Experiment Station at Ottawa. They are also in some large city municipal park gardens and botanical gardens. The number of demonstration gardens is to be greatly enlarged.

Seeds of the current and past two years' winners and the designated winners for the next year are grown and displayed at these demonstration gardens. There has been hesitation in showing the next year's winners because no publicity is to be given to them as All-America Selections until the next January first release and introduction date. No seeds are yet available to the public. By the time they are in bloom in these gardens it would be too late to

plant them anyway. They are simply labeled by variety names.

Being instrumental in starting the Garden Writers Association of America, we try to work closely with these editors, authors and other writers. They receive AAS publicity releases in advance. We would like for them to preview the varieties themselves, take their own notes, photograph them if they will, and to prepare their own articles on these new winners.

The next year's designated winners are repeated for final check at each of the regular trial grounds, to be sure that new crop seeds are at least as true and worthy as those sent for entry. The garden writers may preview them there as well as at the demonstration gardens. At least one of these locations should be near for a convenient visit. Some trial

gardens feature their flower field days when most varieties are at peak of bloom. The garden writers have regional meetings at a few of these locations.

The AAS Board of Directors has four regular meetings a year. One is before the annual Council of Judges open meeting in January in Chicago. The second, with the three new Directors elected for 3-year terms, follows the annual Council meeting to elect officers and adopt a budget for the new year. The third meeting precedes the second Council meeting in June at the time and place of the American Seed Trade Association convention. At the fourth meeting in mid-August at Pennsylvania State University the AAS has both flower and vegetable trials. The flower trials, including AAS entries, are considered the most comprehensive in the world. This



ALL-AMERICA SELECTIONS

All-America Selection—1966
Cosmos 'Sunset'.

is the annual meeting place for flower seed breeders, growers and leading distributors of North America, attended by some seedsmen from overseas.

Beginning with dinner, Monday evening is devoted to the annual International Flower Seed Conference, usually concerned with new varieties, their breeding, handling and promotion. Discussion of AAS rules and regulations, for clarification and full understanding and valued recommendations to its Directors come from this conference. More AAS flower judges and entrants attend this conference than the regular Council meetings in January or June. However, all AAS Council meetings are open for all interested in taking an active part in the deliberations. Only voting is legally confined to the judges and their proxies. There is nothing secretive in AAS.

Handling of entries for protection of ownership and so-called breeders' rights are important in AAS. Seeds sent for trial remain the property of the entrant. Each judge is accountable for seeds of all entries sent to him. He is responsible for growing or having them properly grown under his direction and attention throughout the growing season. No seeds, pollen, or any other reproductive material may be saved, used or transported from the trials.

Breeders of first generation (F_1) hybrids have the knowledge of their inbred parentage and may keep that information to themselves for variety ownership protection. On open pollinated lines or varieties, breeders have had no such protection.

We have what is termed the AAS Gentlemen's Agreement. It has no legal status whatever, but seed growers have

agreed not to grow any seeds of other AAS award varieties to sell or otherwise distribute for the first three years from introduction. Furthermore, seed distributors agree to purchase seeds of these award varieties grown by their original growers only for the first three years from introduction. Thus, the originator, his firm or agent, as award variety owner retains control of all wholesale sales for the first three years from introduction. No other varieties have this protection.

On AAS award varieties both the seed distributors and their customers, gardeners and planters, are assured of original strains from breeders' stock seeds only for these first three years. It is presumed that other seed growers will develop comparable strains from open pollinated AAS varieties after three years.

We try to reach all established and prospective gardeners through the various media, either for economic and beautification reasons or for those who make gardening the greatest hobby on Earth. People want and need the best seeds and varieties.

AAS provides authentic new variety guidance to the garden seed industry and to the public, and is anxious to encourage plant breeders of all countries in the creation of superior vegetables and more beautiful flowers. To the most worthy creations it is our privilege to honor them with awards, and through the seedsmen of North America to have them conveniently obtainable on this continent. Through confidence in our most helpful media articles and advertising, public demand assures successful introduction for the new All-America Selections. They are believed to be the best of their kinds and for their purposes to date.

ALL-AMERICA SELECTIONS—TRIAL LOCATIONS AND JUDGES—1966

VEGETABLES

California, El Centro	Archibald M. Dessert	Dessert Seed Co.
California, Gridley	Dr. Oscar Pearson	Seed Research Specialists
California, Hollister	Fred W. Rohnert	Rohnert Seed Co.
California, San Juan Bautista	John J. McCabe	Ferry-Morse Seed Co.
Connecticut, Storrs	Prof. Joseph M. Lent	Univ. of Connecticut

Florida, Bradenton	Paul E. Helsel	Asgrow Seed Co.
Florida, Gainesville	Dr. Victor F. Nettles	Univ. of Florida
Georgia, Pine Mountain	Donald M. Hastings	H. G. Hastings Co.
Idaho, Twin Falls	James L. Musser	Charter Seed Co.
Illinois, Wheaton	Carl Dietz	Vaughn's Seed Co.
Iowa, Shenandoah	John R. Topham	Earl May Seed & Nursery Co.
Louisiana, Lafayette	Prof. Harland P. Riley	Southwestern La. Univ.
Maryland, Beltsville	Dr. Raymon E. Webb	USDA Plant Industry Station
	Dr. Eduardo Alvarez Luna	Productora Nacional de Semillas
Mexico, Chapingo)	a n d	a n d
Mexico, El Roque)	Dr. Guillermo Hernandez Bravo	Horticultural Institutions
Mexico, Toluca)	Lawrence W. Corbett	Northrup, King & Co.
Minnesota, Minneapolis	Joseph Steinke	Asgrow Seed Co.
New Jersey, Bridgeton	Joseph Harris, Jr.	Joseph Harris Co.
New York, Rochester	Prof. Robert Schmidt	N. C. State University
North Carolina, Raleigh	W. Harry Gale	Stokes Seeds, Ltd.
Ontario, St. Catharines	Theodore C. Torrey	W. Atlee Burpee Co.
Pennsylvania, Doylestown	Dr. Martin L. Odland	Pennsylvania State Univ.
Pennsylvania, University Park		
Quebec, Montreal	Gerard de Maisonneuve	Superior Seed Co.
Texas, Lubbock	Prof. Robert R. Reed	Texas Tech. Institute
Washington, Mt. Vernon	Robert MacDonald	Alf Christianson Co.

FLOWERS

British Columbia, North Surrey	Thomas Barber	Retired Editor
California, El Centro	Donald Dodds	Dessert Seed Co.
California, El Monte	John Mondry	Bodger Seeds, Ltd.
California, Guadalupe	John Waller	Waller Flowerseed Co.
California, Lompoc	David Denholm	Denholm Seed Co.
California, San Juan Bautista	Elmer G. Twedt	Ferry-Morse Seed Co.
Colorado, Paonia	Charles L. Weddle	Pan-American Seeds Inc.
Georgia, Pine Mountain	Donald M. Hastings	H. G. Hastings Co.
Illinois, Urbana	Prof. G. M. Fosler	Univ. of Illinois
Illinois, West Chicago	G. Carl Ball	Geo. J. Ball, Inc.
Illinois, Wheaton	Edward H. Vaughn	Vaughn's Seed Co.
Iowa, Shenandoah	John R. Topham	Earl May Seed & Nursery Co.
Louisiana, Lafayette	Prof. James A. Foret	Southwestern La. Univ.
Massachusetts, Waltham	Prof. Franklin J. Campbell	Univ. of Mass.-Field Station
Minnesota, Minneapolis	Bruce Johnstone	Northrup, King & Co.
New York, Cambridge	Lyman N. White	Asgrow Seed Co.
New York, Farmingdale, L. I.	Prof. Daniel Dowd	N. Y. Agricultural Institute
New York, Rochester	Fred J. Statt	Joseph Harris Co.
Ontario, Hamilton	James Redman	Royal Botanical Gardens
Ontario, St. Catharines	W. Harry Gale	Stokes Seeds, Ltd.

Pennsylvania, Doylestown	David Burpee	W. Atlee Burpee Co.
Pennsylvania, King of Prussia	Henry F. Michell III	Henry F. Michell Co.
Pennsylvania, Smethport	Ronnie T. German	H. G. German Co.
Pennsylvania, University Park	Prof. Robert P. Meahl	Pennsylvania State Univ.
Quebec, Montreal	Henri Perron	W. H. Perron Co.
South Carolina, Greenwood	George B. Park	George W. Park Seed Co.
Texas, Lubbock	Prof. Edward W. Zukauckas, Jr.	Texas Tech. Institute
Virginia, Blacksburg	Dr. Paul L. Smeal	Va. Polytechnic Institute
At Large-Guest Judge	Holmes Bloomer	Mandeville & King Co.

ALL-AMERICA SELECTIONS—FLOWER DEMONSTRATION GARDENS—1966

(Not Official Trial Grounds but Additional Display Locations for 1964-67 Award Winners)

California, Arcadia	George H. Spalding, Supt.	Los Angeles State & Co. Arboretum
Colorado, Colorado Springs	Mrs. Marion Black Williams	Horticultural Arts Society
Colorado, Fort Collins	Jerry Nelson, Show Mgr.	Colorado State Univ.
Connecticut, Storrs	Prof. Joseph M. Lent	Univ. of Connecticut
District of Columbia	Dr. Henry T. Skinner	U. S. National Arboretum
Georgia, Pine Mountain	Dr. Fred C. Galle	Callaway Gardens
Iowa, Ames	Prof. Ben F. Vance	Iowa State Univ.
Iowa, Eldora	Prof. John Matusch	Iowa Training School for Boys
Kentucky, Lexington	Prof. Jan W. Abernathie	Univ. of Kentucky
Louisiana, Many	Miss Kitty M. Simpson	Hodges Gardens
Maryland, Beltsville	Dr. Victor R. Boswell	USDA Plant Ind. Station
Maryland, College Park	Dr. Conrad Link	Univ. of Maryland
Michigan, East Lansing	Prof. Richard F. Stinson	Michigan State Univ.
Michigan, Tipton	Prof. Milton Baron	Hidden Lake Gardens
Minnesota, Minneapolis	Carl Holst, Supt.	Minneapolis Park Board
Missouri, Kansas City	Miss Rachel Snyder	Flower & Garden Test Garden
New Jersey, New Brunswick	Prof. Malcolm R. Harrison	Rutgers University
New York, Tuxedo	Charles Lewis, Hort.	Sterling Forest Gardens
Ohio, Mansfield	Dr. Ray C. Allen, Dir.	Kingwood Center
Ontario, Ottawa	Dr. A. R. Buckley	Canada Central Exp. Farm
Ontario, Toronto	Thomas W. Thompson, Dir.	Edwards Gardens
Pennsylvania, Hershey	James Bobb, V.P.	Hershey Estates
Pennsylvania, Kennett Square	Dr. Russell J. Seibert, Dir.	Longwood Gardens
Virginia, Norfolk	Frederic Heutte, Dir.	Norfolk Botanical Gardens
Wisconsin, Milwaukee	John E. Voight, Dir.	Whitnall Park

Progress in the Flower Seed Industry

BY CHARLES L. WEDDLE

Pan American Seeds Inc., Paonia, Colorado

The efforts of man to develop new and better ornamental plants has perhaps been less intense through the ages but it certainly has been no less consistent than his efforts to develop better plants for food and fiber. It is quite probable, in fact, that ornamental plants were domesticated by primitive man even before he found it necessary to cultivate plants for food. The instinctive desire of man to embellish his surroundings and his person and to modify his environment for the better led him naturally into sylvan surroundings. When such were not available, he soon learned to create them himself by cultivating plants for shade and, in general, to make his surroundings beautiful and more pleasant. The cultivation of plants for ornamentation has been closely associated throughout history with the more advanced islands of civilization. Mesopotamia was the cradle of civilization and gave us not only the wheat plant but also the first hanging gardens, built by Nebuchadnezzar's son in Babylon.

Early horticulturists were quick to note that individual plants of the same species differed greatly in quality, color, vigor and other characteristics. Man has always attempted to achieve uniformity of perfection, in the plants that he grows. Naturally he chose the better specimens for propagation, and just as naturally he discovered asexual propagation as the easiest means of achieving perfect uniformity. He was just as quick to learn that propagation by seeds was far simpler and easier than asexual propagation. Furthermore, not all species were adapted to asexual propagation. There was, however, the problem of variability from seeds. Seedlings were noted to produce stronger, healthier plants and for many species there was no other

method of propagation. Nevertheless, we floundered for centuries before we finally learned even partially to control the uniformity of seed propagated plants. At best, we could produce populations with a relatively high percentage of plants with desired characteristics.

Plant breeding is the story of man's attempts to control the heredity of plants grown by putting into each and every one as many as possible the desired traits sought. A seed industry is the natural outgrowth of plant breeding efforts. Creative plant breeding, in which we are able to produce uniform varieties with new combinations of characters or even new characteristics is a relatively infant art, less than a generation old in its application to ornamentals.

Propagating materials (bulbs, corms, rhizomes and so forth) became commercial commodities in Europe during the Renaissance and probably flower seeds were found in trade not long before. Flower seeds were produced in New York State by the middle of the nineteenth century and by the early 1900's production had become established in California. It was not until the beginning of World War I that the production of flower seeds in this country began to be capable of supplying domestic needs and some for export. From the beginning, American flower seed buyers were interested in quality. Almost without exception American flower seed growing firms were founded by individuals interested in breeding and in improving the quality of flower seed strains.

The evolution of annual flowers under domestication has taken place very rapidly and American seedsmen can take the credit for the development of many species, some of which probably would

not have attracted the attention of European breeders had it not been for American interest and work. Although the sweet pea was important in England, where the early work was done, the name of Burpee is tightly linked with the development of the sweet pea. The first double forms of zinnias were introduced by the French seedsman, Vilmorin, in 1860 and a few separate colors were available from Peter Henderson, the American seedsman, in the early 1900's; but it was not until 1919 when Bodger, one of the early California seed growers, marked the first big step in the development of the modern zinnia by introducing the dahlia flowered strain in several colors. The marigold was an early interest of the Burpee company and that firm has contributed immeasurably to the development of both types of marigold: the so-called French and the American types.

Although separate color varieties of annual flowers began to be fairly common after the turn of the century, high standards of quality had not been attained in those days and variability was great. Varieties which were fairly true for color were usually quite variable for other characteristics such as height, habit, and time of bloom. Early flower breeders depended upon mass selection for "fixing" the desired characters in a variety. Individual plants or groups of individuals, chosen were isolated from the less desirable ones and allowed to set seed. The breeder paid little attention to controlling pollination and the rate of improvement was slow. The naturally self-pollinated species, of course, were the first to yield true uniform varieties but all continually had to be "rogued." The process of selection had to be repeated every year and the desired uniformity of quality was seldom attained. Varieties had a tendency to "run-out" or revert to the old undesirable types when recessive traits, hidden in the population, segregated out.

Demands of gardeners for uniformity and better varieties, however, increased and as knowledge of the infant science of genetics became more widespread, the older empirical methods were found to

be inadequate to meet the new demands for quality. In mass selection only the female or seed parent was chosen and pollination left to chance. American seedsmen, however, soon became wise to the fact that many species could be self-pollinated and the practice of caging individual selections for the purpose of insuring self-pollination became common. In-breeding was soon found to be the only sure method of producing varieties which could be counted upon to remain stable from generation to generation.

At this stage in the development of the flower seed industry new types and potentially new varieties were plentiful. The natural variability of the species (many of which were newly domesticated), chance cross-pollination in the seed fields, together with planned crossings resulted in many new varieties and, after the first World War, separate color varieties of annual flowers became relatively abundant. In-breeding, however, is not fool proof. Pioneer flower breeders found that there was a loss of vigor and fertility with each succeeding generation. Noting this, many breeders discarded the method and reverted to mass selection. Furthermore, it was difficult to incorporate all the good characters desired into one strain. Uniformity was gained at the expense of vigor and productivity. Hence, earlier seedsmen used in-breeding very cautiously and often stopped before complete uniformity was attained and soon the progress in flower breeding leveled off. Early breeders often depended upon chance hybrids or variations as the source of new varieties. Early seed company flower breeders, such as Ian Sinclair and Frank Cuthbertson, were European trained by the apprenticeship method. What they lacked in science they more than compensated for by dedication and keen perceptive eyes and long experience with plants. They were astute in distinguishing small differences which are hereditary from those which are environmental. Furthermore, they knew what was wanted by the gardener. Hybridization for the purpose of re-combination followed by carefully controlled in-breeding and rigid selection in subsequent

generations, eventually became the primary tool of the modern flower breeder.

F₁ Hybrids

Increasing demands for uniformity forced breeders to resort more and more to in-breeding until many varieties introduced were too lacking in vigor and difficult to grow for the average gardener. *Petunia* 'Twinkles' was a good example; *Zinnia* 'Rosie O'Grady' and 'Blaze' were others. Having heard of the work with hybrid corn, a few flower breeders began experimenting with F₁ hybrids. As early as 1940 Burpee sold seed of an F₁ hybrid marigold, using a genetic male sterile as the female parent. Experimental results with hybrid varieties were very encouraging but few seed growers were optimistic enough to think that the cost of hybrid seed production, especially if hand pollination were involved, could be recovered in the selling price of the seed. In F₁ hybrids, however, it was realized that for the first time both uniformity and vigor could be achieved in a single variety! Also groups of new characters could be added, which had not been seen in combination before. It was realized that some varieties and types, for example the double petunia, would be impossible to produce any other way. Cut flower growers were the first to take advantage of the F₁ hybrid technique and F₁ hybrid snapdragon seeds were available as early as 1935. F₁ hybrid double petunias were offered by a Japanese breeder about the same year. During the early years of the second World War a Canadian grower, Mr. R. Simonet of Edmonton, Alberta, began offering some F₁ hybrid double petunias and by 1946 Burpees were offering two varieties of small flowered doubles. In 1946 Pan American Seed Company was founded for the purpose of breeding and growing specialty F₁ hybrid flower seeds, primarily petunias and snapdragons.

The petunia was well adapted to hybrid seed production, first because of the economic importance of the crop to the bedding plant industry and secondly, although hand emasculation and pollina-

tion was required, the returns were fairly good because of the large number of seeds produced by one pollination. Hybrid petunias were a phenomenal success and by 1960 several growers were involved and the great majority of petunia seeds sold were of the hybrid varieties.

Unfortunately, hybrid seed of not all species and classes of flowers can be mass produced. The main obstacle is the lack of either functional male steriles or some quick easy method of emasculation. Petunia flowers are readily emasculated by hand because the flower parts are not closely associated and the anthers can readily be lifted out with fingers or forceps before the flowers open and the pollen sheds, effecting undesirable self-pollination. Snapdragons also are quickly and easily emasculated just prior to anthesis by simply slipping the corolla from its attachment at the base of the ovary. Garden snapdragons also were converted to F₁ hybrids by Pan American and, as of now, practically all of the forcing snapdragons grown are hybrid varieties and several companies offer F₁ hybrid garden varieties in several types. In other species, however, such as pansies, sweet peas, and larkspur the pistils and anthers are closely associated and emasculation is either costly, time consuming, or else practically impossible. Several growers have attempted to offer F₁ hybrid pansies but so far have been unable to deliver quantities of seed. Burpee has led the way in the production of F₁ hybrid marigolds and zinnias and are offering several varieties. Seed supplies as yet, however, are insufficient to meet the demand.

The possibilities for greatly improved and new varieties by F₁ hybrid technique, nevertheless, are so great that considerable effort is being expended by the seed companies to add other crops to those being produced as hybrids. In the zinnia many new colors can be produced as hybrids that would never be seen otherwise except in field grown mixtures. In pansies an infinite variety of separate colors, with large flowers and much freer blooming, longer standing plants are the promise of F₁ hybrids. No

doubt the seed production problems will be solved.

American seedsmen are realizing that the F_1 hybrid technique, in spite of the above implications, is more than a separate technique. It is the embodiment, and hence the most effective approach, of all the separate techniques of science as applied to flower improvement, combining the best cultural skills, hybridization for planned recombination, careful selection for incorporating large numbers of desirable traits, and finally the crossing of proven in-breds into commercially reproducible hybrids. Despite all the tremendous advantages that F_1 hybrid varieties have for the gardener or the commercial grower, for the seed grower it still adds up to more work in breeding, maintenance of strains and in seed production.

For the seedsman, however, hybrids do have one big advantage: namely the built-in protection for the breeder-grower firm's investment in research and development. Since F_1 hybrids, for their production each year, depend upon crossing the original parent in-breds owned by the breeder seedsman, the latter can exercise ownership and control just as though he had a patent on the process. In-bred varieties, however, since they can be reproduced from seed of the variety itself, are lost to the breeder who has no chance to re-coup even the cost of the breeding, much less a profit. For this simple reason the great majority of research efforts by seed companies is being spent on those crops which can be produced as hybrids. It is to be feared that other worthy crops which greatly need improvement will be neglected. By modern standards flower seed growing is not big business. However, with a maturing economy and culture in the United States and with more emphasis on national beautification, one can as-

sume that it will grow. Much is being done by the horticulture press, the All America Selections and government agencies to encourage higher standards of quality in flower seed breeding and production. Great things, therefore, may be expected from flower breeding firms and seed producing firms in the future. Many seed companies have dedicated, experienced, and trained men capable of directing well organized programs, aware of existing bottlenecks and challenged by the vision of what can be done when they are eliminated. America has taken a position of leadership in flower seed production and research and may well be expected to maintain it. Climatic advantages are an important factor, but not to be discounted is American ingenuity and daring, sufficient to expend large sums of money on breeding and other types of research even when there is no assurance that it will prove profitable. American seedsmen have set their own high standards of quality and ethics and are seldom happy unless they can constantly improve them. Home gardeners, as seed buyers, are more often than not surprised at the high quality of flower seeds and the excellence and quality of new varieties offered.

Variety improvement and new variety production as shown by the number of entries in the All-America Selections trials, has steadily increased since 1950. In 1966, forty-three varieties have been entered in the AAS trials: 5 snapdragons, 6 China asters, 8 geraniums, 3 impatiens, 2 marigolds, 4 zinnias, and 2 petunias, with one entry each of *Salvia*, *Statice*, *Begonia*, *Dianthus*, *Celosia*, and flowering cabbage.

The gardeners of the world can rest assured that there will be a continuing supply of good new varieties of annuals from American seedsmen.

Some Current Research On Ornamental Plants in USA

By HENRY M. CATHEY

Horticulturist, Crops Research Division¹

The methods of growing and handling ornamental plants are constantly changing in the United States of America. Two sources contribute to the change in the practices now used by ornamental plant growers. First, some changes occur due to new equipment or new material. The first obvious combinations of equipment and plant material thus produce a new and effective way of handling the plants. A good example of this type of development is the widespread use of pad-and-fan cooling to reduce the air temperature in greenhouses. Even though the equipment was developed for use in arid regions, the usefulness of pad-and-fan cooling is generally accepted throughout the USA.

Second, many of the changes result from research on the genetics, physiology, pathology, entomology, and engineering of ornamental plants. This article relates some of the areas of research which are of current interest and suggests their usefulness in the future handling of ornamental plants.

I. Light. Evidence is accumulating that phytochrome, the blue, photoreversible pigment, is present in all green plants. Phytochrome controls photomorphogenesis in plants. Visible radiant energy triggers the action of phytochrome in processes such as seed germination, stem elongation, leaf expansion, flowering, fruiting, and coloration.

Since phytochrome is a photoreversible pigment, intermittent light is as effective as continuous light in obtaining long day responses on plants. Artificial light given 5% to 20% of the time in cycles of 30 minutes or less is as effective on plants lighted continuously for a similar number of hours, such as 4, 8, or 16.

Current research is concerned with the control of the growth of seedlings and stock plants through the manipulation of day length and light quality. Artificial light sources are also being studied to enhance photosynthesis. In recent years very high output fluorescent, mercury vapor, and sodium lamps have become available for research in this area. For the maximum utilization of added levels of carbon dioxide during the seedling and stock plant stages of growth, the effect of high levels of artificial light are being investigated. Growth rooms are being designed in the United States to provide not only control of temperature, light quality, and light duration, but also control of humidity, gaseous composition, air velocity, and partial pressure of the atmosphere. The very complex interactions of light with the other environmental factors will be studied in great detail.

II. Carbon dioxide and gas exchange. Enhancement of the levels of carbon dioxide in greenhouses is now almost routine in the culture of carnations, lettuce, roses, and tomatoes. The quality of the flowers produced is much superior to those produced on plants grown in con-

¹Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland.

ventional greenhouses. Many other plants are now being tested in their response to enhanced levels of carbon dioxide. Because carbon dioxide accelerates growth and promotes early flowering and fruiting, the time required to grow a particular plant is greatly reduced. Current research deals with the problem of applying carbon dioxide from various sources, the duration of treatment, the interactions of carbon dioxide with light, temperature, and nutrition. As bonuses, air movement is also being controlled. Air is intentionally introduced from the outside, and the plants are grown at higher temperatures and nutritional levels than formerly used. Use of carbon dioxide is thus promoting a re-examination of the growing techniques for plants and eventually will be an aid in the growing of any plant in the greenhouse. Many of the old baselines as to the time required to produce a salable plant are being re-evaluated.

III. Temperature. A re-appraisal is also being made of the optimum temperatures for starting and maturing ornamental plants. Along with nutrition, light and carbon dioxide, the optimum temperature for net accumulation of dry weight is higher during the time the plant is a seedling than when it is a mature plant. Current research is concerned with relating the optimum temperature for the growth of large plants in a minimum time.

IV. Growing media and nutrition. Composted soils as a growing media for ornamental plants are disappearing from U.S. horticulture. Research programs at several State experiment stations have developed media which are disease-free for near-sterile growing. The artificial mixes are composted of peat, fine sand, perlite, and vermiculite of various sizes and proportions. Lime and dry fertilizers are added to the mixes to provide the desired acidity, buffering capacity, and nutrient balance. The artificial mixes are now available for use by growers and homeowners in standardized bags prepared at central assembly points. Liquid

fertilizers supplement the nutrients provided by the dry fertilizers. Control of nutrient supply and release is also obtained by mixing in the media particles of water-soluble fertilizers coated with resins or particles of relatively insoluble fertilizers. The nutrients are made available to the plant on a slow-release basis. The optimum dosages of the slow-release fertilizers are difficult to standardize; they vary with the time of year and with the frequency of watering. They are used primarily as a supplementary source of nutrients. Soil testing of water-soluble nutrients has been used for many years as an index of the optimum nutritional regimens for growing ornamental plants. Current research is concerned with relating the plant responses to the content of the leaf tissue for nitrogen, phosphorus, potassium, calcium, and magnesium. Standard curves of the leaf composition values suggests the optimum nutritional levels and balance for crop production, keeping quality of the harvested flowers, and disease tolerance of the harvested plants.

V. Watering methods. Techniques for automating the watering of plants have been a constant area of interest in the USA. The most common method studied today consists of plastic pipe fitted with fine plastic tubes running to the individual pots or plants. The plants are placed on mesh benches without staging. They are watered and fertilized automatically by a time clock controlling a solenoid valve. The frequency of watering may also be regulated by growing one pot plant on scales as an indicator of water loss. A predetermined amount of water is applied when the pot plant becomes dry.

Intermittent mist is commonly used to to apply water and carbon dioxide automated mist is now being studied as a way to apply water and carbon dioxide automatically to cuttings, seedlings, and transplanted plants.

VI. Growth regulators. Regulation of the growth characteristics of plants through the use of chemical growth retardants is

Dr. Neil W. Stuart with azaleas induced to flower in the summer by use of growth retarding chemicals.

USDA



now widely studied and used on many ornamental plants entering the U.S. market. Growth retardants such as phosfon, Cyocel and B-Nine retard internode elongation of many ornamental plants. At maturity, the treated and untreated plants have a similar number of nodes. In proportion to the dosage of the growth retardant the internode is reduced in length. Growth retardants, through the restriction of growth, promote prompt initiation of flower buds on azalea, apple, gardenia, holly, and rhododendron. Plants properly treated with growth retardants become resistant to smog, tolerant of salt in the soil, and less susceptible to drying winds.

Current research is concerned with implementing the effects of the growth retardants into techniques for the year-round flowering of rhododendrons and azaleas and the histological and biochemical changes in the treated plants.

Other growth regulators used in the culture of ornamental plants are auxins or gibberellins. The auxins are used to promote the rooting of cuttings and the

parthenocarpic setting of fruits. Auxin-like compounds are used as herbicides in the production of woody plants. Current research is concerned with identifying the selectivity of the plants to the chemicals and techniques for formulating and applying the herbicides. The gibberellins are used to substitute for low temperature on camellia and rhododendron plants. The treated flowers open much sooner, develop into larger flowers, and persist longer than flowers on untreated plants. Each individual flower is treated by placing a drop of a concentrated solution of gibberellin at the base of the flower bud.

VII. Propagation. With the advent of mist propagation, inert, well-drained rooting media, and proper use of root-promoting chemicals, the emphasis in studying propagation of ornamental plants has shifted to other areas. One area of current research is concerned with the naturally occurring co-factors involved in the rooting of plants. Several non-specific chemicals are being found

which enhance the root-promoting activity of the naturally occurring auxins. Also, differences are being found in the composition of easy-to-root and hard-to-root plants. Second, the losses of nutrients and other metabolites from cuttings rooting under intermittent mist are being studied. A third area of study is the handling of plants during the first year after propagation as container-grown stock. Many nursery plants in the USA are now container-grown. The problems in the culture of these plants are very different from those of plants grown in the ground and sold as balled and burlapped plants. The fourth area is the propagation of plants from excised apical meristems or from single cells grown in solution culture. These techniques allow escalation of the propagation of outstanding disease free cultivars.

Dr. Robert N. Stewart investigates inheritance patterns of foliage variegation in geraniums and other ornamental plants.

USDA



VIII. Post harvest physiology. Extending the useful life of ornamental plants is being studied through the modification of the atmosphere and by the application of chemicals. Senescence is delayed by the use of lower than normal oxygen, and the maintenance of required levels of carbon dioxide to oxygen in gas tight, refrigerated rooms. Daffodils, as an example, may be stored in an atmosphere of nitrogen for 6 weeks at 31°F; the flowers, on removal from storage, have a display time similar to fresh cut flowers. Other ornamental plants are now being studied under the conditions of controlled atmospheric storage. The actions of ethylene and ethylene oxide in regulating senescences are also being examined.

Mixtures of phytochemicals, 8-hydroxy-quinoline citrate, sucrose, and n-dimethylamino succinamic acid (B-Nine) modify senescence of cut flowers and promote expansion of immature flowers. The biochemical and histological changes associated with maturation and senescence of plants are being investigated.

IX. Plant protection. Many kinds of chemicals are used to control pests on ornamental plants. Current research is concerned with regulating pests through means other than chemical. Aluminum sheeting placed on the ground or level with the top of the plants prevents the landing of certain insects. Chemicals are being studied which immobilize insects. They literally stick the insects to the plants. Also predatory insects are being introduced to limit the number of harmful insects. Females in the natural population of insects are rendered infertile when they mate with males released in large numbers after they have been sterilized by gamma radiation or by chemicals. Female sex attractants are being used to lure males to their death or to contact with a sterilizing chemical. Insecticides are now being atomized into the atmosphere through the use of mechanical or thermal fogging machines. The fogging machines have features which combine the speed of application of aerosols and the localized treatment



USDA

Dr. Curtis May examining inoculated American elms being tested for resistance to Dutch elm disease.

of liquid sprays. The carriers and the surfactants used to prepare the concentrates determine the effectiveness of the insecticides.

X. Plant breeding. Ornamental plants are grown from seed or clonal material. The seed of many ornamental plants are now F_1 hybrids. They are produced by crossing two or more inbred lines. Current research is concerned with the production of F_1 hybrids in the field through the use of male or cytoplasmic sterility.

The genetics of many ornamental plants are too complex to produce inbred lines which are necessary to produce F_1 hybrid plants from seed. The ornamental plant breeders are currently studying many aspects of the barriers-to-breeding to produce new cultivars. They are treating the plants with colchicine to double the chromosome number. The size and texture of the flowers of lily, daylily, and rose are greatly enhanced. They are also treating the flowers with growth substances to overcome incom-

patibilities of the pollen and seed parents or they are excising the embryos prior to the maturity of the seed. The plant explorer is also contributing to the creation of new types of ornamental plants by introducing different forms of the cultivated plants. The most notable change has been the introduction of a salmon pink species of poinsettia from Mexico and the creation of commercial poinsettia cultivars in the new color.

XI. Plant pathology. The development of disease-free stock plants is a major research area with ornamental plants. Techniques are being developed to diagnose one or several viruses in a plant by serological methods and by biological indices on alternate hosts. Meristem culture and heat therapy are used to free the plants of the viruses. Current research is concerned with the identification and purification of the viruses in the plants, increasing the sensitivity and reliability of the biological indices, and developing techniques for the mainte-

nance of a nucleus of disease-free stock plants.

The following lines of research have only recently become of interest:

1. Protection of ornamental plants from urbanization—air, water, and soil pollutants.

2. Techniques to make plants tolerant of people and traffic.

3. Techniques for the automation of pruning, thinning, disbudding, and emasculating plants by mechanical, genetical, or applied chemical means.

4. Breeding ornamental plants which are disease resistant.

This brief review gives only a sampling of the current research activities

on ornamental plants in the USA. The names and the institutions involved in the various research projects may be found in the listings of abstracts and papers published in the Proceedings of the American Society for Horticultural Science, in *HortScience*, and in the publications of the Federal and State Experiment Stations.

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Horticultural and Gardening Organizations

BY ERNESTA D. BALLARD

Executive Secretary, Penn. Horticultural Society

This article is concerned with horticultural and gardening organizations as distinguished from educational and scientific institutions, such as agricultural colleges, technological institutes, botanical gardens and arboretums. However, it is not always possible to draw a clear line between the two groups. Many botanical gardens offer the same kind of services and programs provided by horticultural societies. Some horticultural societies have sponsored and supported a local botanical garden or arboretum.

In general the groups discussed here are membership societies run for the benefit of their members and (in some cases) for the public at large. The larger ones are often organized as non-profit corporations. Others are unincorporated associations operating under constitutions and by-laws resembling those of a social club.

Horticultural Societies

Organized horticulture in America began in the first half of the nineteenth century in the prosperous and stable communities along the eastern seaboard. Men of affairs, steeped in the tradition of Franklin and Jefferson, had a wide-ranging interest in the natural sciences. Not the least among these was horticulture, for it combined the fascination of the exotic with hard-headed practicality. The great merchants of Boston and Philadelphia had many contacts abroad from which to obtain new and interesting species. And most of them owned large tracts of land in the country (in addition to their city houses) where they could grow their importations. Perhaps most important of all,

they were confident that their children and grandchildren would continue to live on the family holdings and enjoy the trees their grandfathers had planted.

The Pennsylvania and the Massachusetts Horticultural Societies were organized in 1827 and 1829, respectively. The Pennsylvania Society's charter states that it was formed "*for the purpose of promoting and encouraging horticulture by improving the growth of vegetables, plants, trees, fruits and flowers, and of introducing into our country new varieties and species.*" The minutes of the first meeting tell us that its object was "*to inspire a taste for one of the most rational and pleasing amusements of man, and to facilitate the means of cultivating that taste.*"

At the outset, horticultural societies were learned institutions. Their membership included the leading scholars and practitioners in the field, and their debates and proceedings were in the forefront of the scientific knowledge of the day. However, with the passage of time and the enlargement of agricultural and botanical knowledge, academic leadership passed to the U.S. Department of Agriculture and the land grant colleges and universities. The horticultural societies were relegated to their secondary objective—the cultivation of a taste for horticulture among the public at large and a source of information for both amateurs and professionals. They became service, rather than scientific, organizations. The popularity of their services is shown by the growth of the societies. Today there are at least 25 state and regional groups across the country, with a combined membership exceeding 50,000.

In keeping with their tradition as institutions of learning, most of the older horticultural societies have substantial libraries which are used by writers and by scientific and professional researchers as well as by amateur horticulturists and gardeners. The library of the Massachusetts Horticultural Society numbers 30,000 volumes and is the most comprehensive collection of horticultural works in the English speaking world. The Horticultural Society of New York has 15,000 books in its circulating library; the Pennsylvania Horticultural Society has 9,000. These and some of the other large societies have professional librarians whose services include circulation of books and reference work for members.

Another service that most of the horticultural societies offer is the publication of newsletters and bulletins consisting in some cases of detailed horticultural information and original articles and in others listings of activities. In addition, these societies often publish handbooks and yearbooks. The Massachusetts Horticultural Society publishes *Horticulture*, an outstanding monthly magazine, which several of the other societies buy for distribution to their members.

From their earliest days, horticultural societies have been associated with shows and exhibitions. Originally these emphasized greenhouse plants, fruits and vegetables. More recently they have concentrated on flowers, ornamental plants, gardens and gardening designs. The larger shows also include commercial displays of gardening tools, accessories, fertilizers, chemicals and plant material; and they are apt to have remarkably elaborate educational exhibits demonstrating improved techniques in lawn care, plant propagation, city gardening, indoor gardening, mulching, and other specialized activities.

The Massachusetts Horticultural Society runs the New England Spring Flower Show. The Horticultural Society of New York takes half the responsibility for the International Flower Show in New York City. The Pennsylvania Horticultural Society originally and again recently has been running the Spring Flower Show

in Philadelphia. The Chicago Horticultural Society sponsors and organizes a large part of the Chicago Spring Flower Show. In addition, all the Societies work with garden clubs and plant societies in staging special and seasonal shows.

Tours, field trips, demonstrations, exhibits, lectures, instructional clinics, garden visits and seed and plant exchanges are included in the varied programs these organizations offer their members. They serve as clearing houses for the latest and best information at a time when gardeners are overcome with widely advertised new developments. In some instances they are taking an important part in civic beautification programs, giving advice and frequently on-the-spot assistance in the selection of plant materials for housing projects, public parks, schools, and shopping malls. No matter where its efforts are directed, the primary functions of a horticultural society is to maintain standards of taste and excellence in a field which will be of increasing importance in an affluent society.

Horticultural societies generally have a professional staff and a substantial budget financed through membership dues, activities, fees, and in some cases flower show admissions. Several of the older societies have considerable endowments dating back to the days when they were among the foremost organizations of learning and science.

Serving all the regional and state horticultural organizations, plant societies and garden clubs is the recently reorganized American Horticultural Society, with headquarters in Washington, D.C. One hundred and seventy organizations and businesses make up its affiliate membership. There are also 4,500 individual supporting members. The American Horticultural Society publishes *Gardeners Forum* eight times a year and the *American Horticultural Magazine* quarterly. It sponsors the annual Garden Symposium at Colonial Williamsburg and holds an annual Congress at which 300 to 400 delegates and members gather to hear talks on horticultural developments and to exchange ideas.

The potential of the American Horticultural Society for further growth in membership and prestige is immense. The collective membership of all American Horticultural Society affiliates now numbers nearly 800,000 people. The affiliates publish nearly 200 publications. As the national body increases in stature and size, it can expect as many as 200 additional local and regional groups to join. An organization with such a membership could play a leading part in the national effort for natural beauty.

Garden Clubs

The development of garden clubs began after the turn of the century reflecting the migration of the well-to-do from the city to the suburbs. Today there are about 15,500 women's garden clubs in the United States with a total membership of nearly 500,000. Some are affiliated with similar groups in other countries, and practically all are affiliated with one of three national federations. The National Council of State Garden Clubs, Inc., is made up of 50 state federations with a total of about 15,000 clubs. The Garden Club of America is less cosmopolitan and considerably smaller. Its 170 member clubs spread across the continent into Hawaii. Its projects and influence are impressive in relation to its size. The Women's National Farm and Garden Association, Inc. is the smallest of the three federations with total membership of 8,000.

From the beginning, garden clubs have taken pride in their service to the community at large. While their programs have always included many activities to improve the gardening skills and knowledge of their members, they have devoted at least as much time and effort to civic beautification and the conservation of natural resources. Their projects have included general and specialized flower shows, the establishment and landscaping of parks, preservation of natural areas of horticultural interest, highway beautification and the development of horticultural therapy. They also support education in horticulture, landscape design, and conservation.

Work with children and youth is also

important in garden club programs. Classes in nature study, plant identification and gardening are included in their efforts to instill a love of growing things and an awareness of natural beauty. Both the national and regional organizations make annual awards to individuals and organizations for horticultural achievements and for outstanding work in conservation.

Garden clubs are organized, run, directed and joined by volunteers, without professional staff. They operate on limited budgets, supported entirely by modest membership dues. While garden club leaders tend to remain active for many years, actual terms in office are usually limited to two or three years. Hence, there is a constantly changing roster of individuals in the key positions of the state and national clubs.

Beginning in the 1930's, garden clubs and their members began to organize garden centers to provide facilities and services for their meetings and programs. Such centers typically include auditoriums, workshops, meeting rooms and grounds with test plots and demonstration gardens. The larger ones have libraries, professional staffs and community programs of their own in addition to the activities of the sponsoring clubs.

While the garden club movement has been mostly by and for women, the Men's Garden Club of America is growing rapidly. At present it consists of 200 member clubs in eight regions, with a total membership of some 10,000. Plant testing, seed and plant exchanges, and the giving of awards are among the activities of these clubs which, like their female counterparts, are intensely civic minded.

Plant Societies

The days when the "many-sided Franklin" could grasp the whole of horticultural knowledge are long since past. The opening up of tropical plant life and the proliferation of technological developments have made it impossible for anyone, least of all the amateur, to claim all horticulture as his province.

Man likes to be an expert, even if it

is only in the production of dahlias or chrysanthemums, or the growing of plants under artificial light. To satisfy this desire, a large number of specialized organizations have been formed over the last fifty years. Some of these devote their attention to particular kinds of plants such as orchids or roses; others are concerned with particular activities such as rock gardening. They afford their members access to detailed and comprehensive knowledge in rather narrow fields of concentration. Those which specialize in particular plants are generally recognized as official national or international registrars for new cultivars.

All of the societies issue bulletins or journals, some monthly and others bi-monthly or quarterly. These publications are authoritative references for students, hobbyists, and researchers. Their articles, while not always in the most polished literary style, are generally based on the writer's actual experience and as such are highly valued by amateurs and professionals alike. In addition, each national plant society usually has at least one convention and show a year, to which members of the regional and local branches send delegates as well as plants and cut specimens.

The leadership and majority membership in plant societies is apt to be composed of men, rather than women, but often participation in the group's activities becomes a family enterprise.

There are 40 plant societies and spe-

cialty groups in the country. Their combined membership totals over 80,000 individuals. Most have local or regional units in addition to the national organizations. Some of the larger societies have professional staff in their national headquarters. These executive directors are responsible for the society's publication and for keeping in touch with the chapters and branches.

While the membership figures quoted in the foregoing discussion are impressive, it is plain that the organizations described are reaching only a small proportion of their natural constituency. There are, by rough estimate, 35 million home-owners in this country. An ever growing proportion of their homes are in a suburban setting which virtually requires them to take some interests in lawns, trees, shrubs, and gardens. They spend \$4½ billion dollars a year on garden supplies, and their income and leisure time are growing.

The challenge for all horticultural and gardening groups is to find ways to interest and enlist the participation of these multitudes of potential horticulturists—to make them aware of the beauty and fascination of the world of plants—to help them cultivate the "*rational and pleasing amusement*" of horticulture—and in the long run to contribute to the preservation of natural beauty and the transformation of our blighted cities into pleasant places for people to live.

How the Newspapers Help the Home Gardener

By JOAN FAUST
Garden Editor, New York Times

A young bride telephoned the garden news office of a large metropolitan daily and asked, "What shall I do about all the bulbs and leaves pushing up through the soil? My husband says to give them vitamin pills, water or something, but I don't know what to do?"

Telephone calls such as these are probably made to many garden news offices in newspapers all over the United States. If the questions do not come over the telephone, they come by mail.

As it turned out, the bewildered bride had grown up in a city apartment and had never confronted a real garden until she and her husband signed a lease on a ground-floor apartment with a "postage-stamp" sized yard. (Her husband was not much closer to the soil, except his wife said that he did spend one week on a farm.)

The bride's first step was a wise one. She turned to a reliable source for her information. She was off to a good start as a gardener.

Many new gardeners, such as the young couple, sprout each year as newlyweds buy homes or city-bound families move to greener pastures in the suburbs. A great majority of these newcomers to the trowel and hoe fraternity rely on the garden information provided by their local newspapers.

Four hundred eighty five newspapers in the United States print garden news features. Some of the larger publications have extensive weekly supplements with large color spreads. Others print separate garden supplements on a regular schedule several times a year in addition to featuring weekly garden pages. The smaller papers may have space for only a weekly column or partial page of news. News space is dependent upon

the circulation and size of the paper and the equivalent balance of advertising space.

Garden news is published in all 50 states. Even Alaska, with its permafrost and few outdoor growing months, has garden news in the Anchorage Daily Times. California, with its sunny weather, boasts the most garden-minded newspapers: 47. Texas follows with 34. In addition to the newspapers, there are 14 syndicated columnists who write on gardening.

Size, however, is no criterion on the value that every garden-minded newspaper plays in the proper upbringing of the well-hoed gardener. Because the United States embraces such a wide diversity in climates, the local focus of the newspaper is ideal for disseminating accurate information. The garden columns can be specific on planting dates, when to plan protective measures for particular pests and diseases, hints for vegetable and fruit harvesting and so many other gardening activities which depend on accurate timing.

The garden news writers can also assess local soil, exposure and weather conditions and make particular recommendations. They can also report on local emergencies and guide the gardener through them. A case in point, is the current drought in the Northeast of several years standing. The garden press is keeping on the alert to inform their readers of new regulations on watering restrictions, to report measures which can be taken to control soil moisture, to suggest which plants can be grown, and to explain how to rescue plants that have been damaged by drought.

In addition, garden editors also have

the opportunity to correct misinformation which is, at times, widespread. It appears in flagrant promotion efforts of opportunists who would take advantage of an uninformed public. These wares are marketed by door-to-door salesmen, through the mails, and through advertising.

Gardeners' interests are not confined to their own back yards. They like to be informed of the events taking place in their world and newspapers can tell them about them. In an indirect way, these news features help gardener education. The columns announce courses, lectures and demonstrations that are conducted by garden clubs, extension services, nature organizations, or in larger cities by botanic gardens and plant societies. The news columns also encourage garden club and civic activities by reporting of good deeds done, or by pointing out deeds that might be done. Published reports of accomplishments in civic beautification, garden therapy programs, conservation and planning, urban renewal and planning often encourage other good works.

There are times when gardeners prefer to just sit back and "be inspired," rather than review all the things they should be doing outdoors. They are interested in gardens that they might someday visit, in the trends of landscape architecture, and how they may redesign parts of their own yard. Of special interest are in-depth articles on "how to grow" particular plants.

Many gardeners are clippers. They cut articles from the paper and save them for future reference. Sometimes they become so worn from wear, they have to write to the publications for new copies.

Seed and nursery catalogues appear in January and February. To coincide with this, the garden press is serviced by the nurseries, seed houses and manufacturers with news reports of their introductions for the year. Organizations such as the All-America Selections and All-

America Roses test the new introductions and honor the best of them by choosing them for a selections award. Announcements are made in January for seed introductions and in June for roses. In addition, many editors visit the various seed houses and nurseries to see the new plants for themselves. Or, they test the new introductions in the garden, prior to public announcement, so that they may tell their readers how the roses, annuals or vegetables perform in their own locale.

Reader interest in this type of news often stirs high response. Recently, two news articles which appeared on The New York Times Garden Pages reported on a new type of cucumber and some hardy bamboo. Both the news office and the nurserymen, who supplied the particular plants, were swamped with letters and phone calls.

The New York Times Sunday edition, in which the garden news appears, has a circulation of over 1,400,000, and publishes more garden advertising than any other publication. It is read in 10,698 cities and towns of the United States. Readers' letters, therefore, come from all over the country—California, Texas, Illinois, the New England States or, upon occasion, from as far away as Alaska or Europe.

Readers' letters usually fall into two categories: requests for plant-buying sources, or questions on growing a particular plant. Each letter is answered personally by mail. The Times news office maintains a current catalogue file of nursery and seed houses from all over the country, and it has a garden reference library available to the staff.

According to a recent survey, there are 42 million home gardeners in the United States. They grow all kinds of plants and garden in all kinds of soils and climates. It can easily be wagered that a good number of them have their initial garden upbringing by reading the weekly features of their local newspapers.

How Garden Writers Can Increase Their Contributions to Horticulture

BY ELSA UPPMAN KNOLL
Senior Editor, Sunset Magazine

By request of the editor of the American Horticultural Magazine, this article was to have been a report on the contribution of garden magazines to American horticulture—an assessment of what they now offer. In a sense, it still is such a report. But there also is a strong emphasis on how garden writers, in league with botanists, horticulturists, and landscape architects, and their various organizations, might enhance their contribution and increase their help to the gardeners of America.

Garden writing in the United States is almost as diverse as the country itself. This is a natural and healthy sign, reflecting the many kinds of people interested in gardening: people of different tastes, needs, and income levels. There seems to be a garden magazine or specialists' journal on almost any plant or phase of gardening imaginable. Each must satisfy a need, contribute something worthwhile, or it would soon disappear.

Certain criteria should apply to all garden writing: it should be accurate, timely, and clearly presented. Of course, editorial policy, style, format, art work, and photography all play important parts in making a publication elegant and sophisticated, friendly and chatty, or serious and scholarly. But to make a significant contribution to horticulture, it must first of all present the facts straight.

The simple definition of horticulture as "the art or science of growing fruits, vegetables, flowers, or ornamental plants" gives scarcely a hint of the actual complexities of horticulture as we know it today. For example, look at what has happened since World War II in that part of the chemical industry given over to the production of insecticides, fungicides, herbicides, soil sterilants, and growth stimulants and regu-

lators. There have been similar drastic new developments in fertilizers and soil amendments, and also in plant breeding (hybrid lilies and induced tetraploidy are examples).

No garden writer is on safe ground unless he is informed on the latest horticultural developments. Fortunately, there is no dearth of authorities to help him. A writer has access to the specialists in universities, colleges, agricultural experiment stations, and various state and federal agencies. County agents and local farm advisors are further invaluable sources of technical and practical information. The jobs of checking and re-checking data are time consuming, but they are indispensable to writing that makes any real contribution to horticulture.

Of course, the majority of articles in garden magazines simply have to do with growing and using plants. But here, again, the writer who wants to be sure of his facts checks and re-checks. Suppose that you are writing about a plant that you have grown for years. Your neighbor also grows it. Your local nursery sells it. Your favorite catalog lists it. Out of this tight little package of research you describe the plant, tell how to grow it, and where to put it in the garden. But is the article really complete? By talking to a horticulturist nurseryman, landscape architect, or experienced gardener (preferably all four, and more) living in another part of the county or state, you might add something new to horticultural literature. You might report how the same plant performs under several different conditions, in different soils, varying exposures, and even in different climates.

An often overlooked but vitally important prerequisite to useful garden writing is making sure that the plants you write about are actually available.

When writers don't do this, garden editors must spend considerable time answering letters from frustrated gardeners and disgruntled nurserymen.

Some readers may be interested in the way this matter of availability is checked by *Sunset Magazine*. After years of depending, unsuccessfully, on a few nurseries and catalogs as possible sources of supply for plants mentioned in articles, *Sunset's* garden department has finally worked out a nearly foolproof system. Briefly, here is how it works: Six weeks before publication of a given issue, approximately 500 wholesale growers in the eight Western states covered by *Sunset's* circulation receive a list of plants to be mentioned in that issue. Each grower writes down the quantity of each plant he has available, and then mails the list back to *Sunset*. (Incidentally, if returns indicate an inadequate supply of certain plants, those plants are dropped from the article; or the article is postponed until the plants become available in sufficient supply.)

Approximately two weeks before publication of the issue, *Sunset's* garden department sends about 4,000 copies of a Garden Preview to retail nurserymen and garden suppliers. This preview contains brief résumés of all garden articles and lists of plants mentioned. In parentheses after each plant name are numbers keyed to a list of wholesale growers on the back page. Thus, retail nurserymen can place orders with growers in time to have plants on hand when readers of the magazine ask for them.

No one would insist that all magazines be patterned along common lines, but there is one point in garden writing in which uniformity and editorial consistency would be a blessing. That is the matter of plant nomenclature. By keeping in touch with the latest name changes writers can eliminate much of the inconsistency and inaccuracy that mar otherwise excellent garden writing. In due time, such a policy would no doubt be reflected in greater accuracy and consistency in plant labeling in catalogs and nurseries.

In the state of California, the agricultural code requires woody ornamen-

tal plants to be labeled with the botanical name. But there is still much to be done in educating the gardening public. Garden writers can and should lead the way as part of their contribution to horticulture.

Contributions to horticultural knowledge could be greatly enriched if there were closer communication between the three key people in the horticultural complex: the botanist, the horticulturist, and the landscape architect or designer. Too rarely do these three people join forces.

In this vast country it's impossible to have the tight centralization one finds in England, where the Royal Horticultural Society serves as a clearing house for horticultural information. In that small country, there is no problem in establishing close communication. Writers, horticulturists, botanists, nurserymen, growers, botanic garden superintendents, and gardeners of all types—from a de Rothschild to a cottage gardener—get together in meetings, attend the monthly shows in London, visit the trial grounds at Wisley. The horticultural message is spread from one end of the country to the other; every one in the field knows what the other person or organization is doing.

Here, garden organizations and plant hobby groups tend to pay little attention to other garden organizations or plant groups. Ornamental horticulture in this country would gain tremendously if such groups could join in some way.

Several broadly based organizations in this country could serve to bridge the gaps between splinter groups, and draw together various horticultural skills. Of these groups, probably the best equipped to set up a central clearing house for horticultural information is the American Horticultural Society. To a degree, it already serves this function. The job of reaching into the far corners of this country, and establishing lines of communication among hundreds of different organizations would be costly and time-consuming. But it is something that could and should be done before too many years if we are serious about the advancement of horticulture.

The Small Community Garden Club

BY GRACE P. WILSON

Secretary-Treasurer, American Horticultural Society

The small community garden club—what is its role in American Horticulture? Is it a group seriously interested in horticulture, or is its primary function social—a ladies “tea party” with perhaps some interest in “tortured” flowers in “way-out” arrangements. Perhaps there are some such groups, but here I will tell you of another kind, the type that I believe to be in the majority.

The group was formed in a small residential community where most of the people were in the middle income bracket. They lived in custom built houses and practically all of them were interested in their home grounds. Many realized that they lacked the knowledge necessary for the selection, proper placement, and care of plant materials for their own homes or for the grounds of the community buildings, streets, and parks. Although most of the organizers, myself among them, were women, we decided on open membership and encouraged couples and interested men to join. From the very beginning we planned educational programs, most of them on some phase of horticulture. We had programs on conservation and plant preservation, beautification of streets, parks, and roadsides, and a few general programs on flower arranging. We soon found that it was better to confine most of the flower arranging to small workshops or demonstrations scheduled just prior to flower shows that we sponsored or shows of other clubs that we participated in.

At this point in the life of any fledgling club, the programs planned to highlight meetings assume prime importance. These will depend, of course, upon just what kind of an organization has evolved, but whatever it is, member

participation in programs as well as outside speakers are necessary to keep club enthusiasm high so that goals can be reached and projects accomplished. Guest speakers who use audio-visual aids or who bring “give-aways” such as seeds or cuttings are very popular. Knowledgeable speakers are located by consulting plant societies, county agricultural extension agents and services, colleges, arboreta, and Park Boards in the area. Garden and nature writers from the local newspaper and hobby gardeners may also consent to speak for the group. Many communities fail to realize that there is an unlimited reservoir of horticultural knowledge in their own back yards among rose, dahlia, azalea, box, chrysanthemums, hemerocallis, and holly hobbyists.

After organizing in the Spring, we were brave enough to schedule our first show for that Fall. We felt that it would stimulate interest in horticulture, develop an aesthetic sense, and be educational both to our members and to other residents of the community. We stressed horticultural and educational exhibits and have followed this rule in every show since that first one without the lapse of a single year.

By the time the group had been organized for about a year, we felt we had progressed enough so that we could divide our programs into two parts; first a fifteen minute member-participation section which drew on the reservoir mentioned above, and second, an outside speaker. This system proved effective and we could now share what knowledge we had or had gained with all the other members.

Now we were ready to undertake some civic projects. One of our earliest efforts

was to landscape the grounds of the local Church that had been generous enough to allow us space to hold our meetings. A landscape architect friend drew up the plans and suggested plant materials to be used. The Church purchased the plants as the Club finances were limited, and our men in the club provided the labor to get the plants in the ground. From this initial project we progressed to street planting, beautifying the community entrance, and planting the school grounds.

When we were well organized and running smoothly, we began to think of affiliating with other groups, first the county, then the state, regional, and national organizations, among them the American Horticultural Society. This we did and are participating in the many activities, such as community projects outside our own area, conservation, horticultural, and educational programs. We sponsor a Junior Gardening group, take part in the annual Christmas Greens Show at the U. S. Botanic Garden, help with the Fern Valley project and Guide Service at the U. S. National Arboretum. We have taken advantage of the Flower Show Judging Schools and Landscape Design Study Courses and now provide many accredited judges and landscape critics from our members.

Some of our most rewarding projects are the works we do with the retarded and disturbed children in the area. One such project involved a school for disturbed boys which was located at an old Nike site. The grounds were just as bleak and uninviting as you probably imagine them, but now with the help of "people power" and plants from our own gardens, the grounds are rapidly changing and becoming beautified. This "people power" includes the young residents at the school and their participa-

tion in the actual work of improving their surroundings is a wonderful morale booster.

An enthusiastic horticulturist working with another group of retarded boys, decided that there were many kinds of work in the horticultural field these young people could be trained to perform, and thus become useful, productive citizens. How many of us have stopped to think how the boring task of washing flower pots, for example, appears to a retarded boy. This simple, but necessary task can be taught and the boy who masters it soon takes great pride in doing it exceptionally well and is gratified that he is not only performing a useful work but is also able to earn money.

Flower arranging has a part in Garden Therapy, too. Many of our members go to mental hospitals and teach the women patients this art and many patients have progressed to the point they are willing to participate in demonstrations.

Another project that gave our group much satisfaction was the "Garden of Meditation." A friendly landscape architect donated plans for a low maintenance garden. Plant material was also donated. We followed the plan and as the garden took shape, there were further gifts of plants from Church members who wanted to donate a plant in memory of a loved one. Now the garden is finished. What a lovely, restful spot it is, serene and peaceful.

We feel that our garden club has found its place and that our plans and projects are taking shape. We are proud and gratified that we are adding interest and enthusiasm to the ever increasing task of making and keeping our land truly "America the Beautiful."

The Plantsman's Library*

GEORGE H. M. LAWRENCE

Director

The Rachel McMasters Miller Hunt Botanical Library

Liberty Hyde Bailey once told me, "a gardener grows plants, but a plantsman knows plants." Every gardener worth his salt aspires to become a plantsman, a goal to be reached through the study, reading, and consulting of books, as well as knowing the plants themselves. Every leading country has its own galaxy of gardening literature, and America is no exception. In the belief that the metamorphosis of many a gardener into a plantsman is suppressed through ignorance of the pertinent literature, a selection of books to be sought in the personal library of a plantsman follows. The gardener and the plantsman are concerned with plants. So also are botanists, and the true plantsman must know of and have recourse to some books that are more botanical than horticultural. There is no hard line between the two disciplines or their respective literatures.

The American plantsman's library is of wide scope, for he may garden in summer in the northern states and in winter in warmer subtropical climates; or he may garden outdoors and in his own greenhouse-conservatory. His library includes works in many categories, particularly those of (1) reference, including botanical aids to better knowing plant structures, functions, and identification, (2) plant culture, propagation, and the control of pests and diseases, (3) plants of other lands deserving of trial in the garden, (4) accounts of plant exploration

and introduction—the fireside books for enrichment and depth of knowledge, and (5) the monographs of the plants themselves, or of groups (e.g., trees and shrubs, perennials, wildflowers, herbs, etc.).

To avoid long lists of books, the literature for each area is presented separately, each with personal notes and commentaries—admittedly subjective, and sometimes contestable. Omitted are most of the older "classical" works since often they are difficult to obtain, are costly when available, and represent items of greater interest to the collector than to the working plantsman. The titles given in any one subject area are selections from among many. They reflect no attempt to include the "best," and there is no attempt to make any list complete. The attempt is made, however, to show the scope and depth of our literature in these areas as produced by American authors, but for the use and enlightenment of all.

Reference Works

To the plantsman, a reference work may be broadly encyclopedic, or it may be more technical than his daily needs require but which he consults from time to time to understand better the plants he would grow.

I. Encyclopedic works and dictionaries. These are the one- to multivolume works that embrace all aspects of horticulture and its practices. Every plantsman will count one or more of these a must. No one is truly better than another. Each has its place. Many are the persons who regularly consult two or more.

* Majority of these books, *if in print*, may be obtained by members, at substantial savings. Contact Secretary, AHS, 1600 Bladensburg Rd., NE, Wash., D. C. 20002.

Bailey, L. H.—*Manual of Cultivated Plants*. Ed. 2. New York, The Macmillan Co., 1949.

More accurate in its nomenclature than *Hortus Second*, this manual is designed for the use of the serious and more advanced amateur, and for the professional. It is a botanical treatise on the identification and nomenclature of the more commonly cultivated plants of this country and of all cultural groups.

Bailey, L. H. & E. Z.—*Hortus Second. A Concise Dictionary of Gardening, General Horticulture and Cultivated Plants in North America*. New York, The Macmillan Co., 1941.

———*The Standard Cyclopedia of Horticulture*. 6 vols. New York, The Macmillan Co. 1914-17. Ed. 2. 6 vols. 1922.

The 2nd edition differs only in the correction of typographical errors, plus a supplement composed of a finding-list harmonizing horticultural with botanical names. A "new edition," differing in no respects from the 2nd, was published on india paper in 3 volumes in 1925. This, and every printing since that date, are only reprints of the 1922 edition. No matter what date may appear on a title-page of a copy of this encyclopedia, the textual content is that of the 1914-17 edition. Taking into consideration the age of its contents, it remains the best buy for the money.

Everett, T. H.—*The New Illustrated Encyclopedia of Gardening*. 6 vols. New York, Greystone Press, 1960.

Farrington, E. I.—*The Gardener's Almanac*. Ed. 11. [Boston], Massachusetts Horticultural Society, 1954.

Faust, J. L.—*The New York Times Garden Book*. New York, Alfred Knopf, 1960.

Fernald, M. L. & Kinsey, A. C. —*Edible Wild Plants of Eastern North America*. Rev. by R. C. Rollins. New York, Harper & Bros., 1958.—Includes uses in prepared foods, beverages, and condiments, together with section on poisonous plants likely to be mistaken for edible ones.

Graf, A. B.—*Exotica* 3. Rutherford, N.J., Roehrs Co., 1963.

This is surely the most complete and fully illustrated work of its kind in any language. The 1,828-page tome, available also in a 2-vol. format, provides text in telegraphic form and 12,025 photographic figures 231 in color—of all the genera and species of conservatory and related plants known to be cultivated in America.

Hoyt, R. S.—*Check Lists of Ornamental Plants of Subtropical Regions. A Handbook for Reference*. San Diego, Calif., Livingston Press, 1958.—Includes lists and descriptions of species.

Neal, M.C.—*In Gardens of Hawaii*. Rev. Ed. [Honolulu], Bishop Museum Press, 1965.

This is basically a manual for the identification and nomenclature of the cultivated ferns and flowering plants of the tropics—including many of California and Florida. It is a cornerstone reference for all seriously concerned with tropical and subtropical gardening.

Nickerson Color Fan. Washington, D.C., Amer. Horticultural Society, 1957.

A color-fan of 40 hues of maximum chroma, displaying 262 named color samples.

Rehder, A.—*Manual of Cultivated Trees and Shrubs Hardy in North America, Exclusive of the Subtropical and Warmer Temperate Regions*. Ed. 2. New York, The Macmillan Co. 1940.

The publisher's disconcerting practice of placing later printing dates on the title-page is considered an unethical suggestion of currency of content. All printings later than 1940 are identical with the original. Like Bailey's *Manual*, this is a "must" for the serious plantsman concerned with any appreciable variety of woody plants. For its age, it has no peer.

Snyder, R.—*The Complete Book for Gardeners*. Princeton, N.J., Van Nostrand Co., 1964.

A comprehensive reference, recommended especially for the beginner seeking a non-technical relatively inexpensive work.

Taylor, N.—*The Guide to Garden Flowers*. Boston, Houghton-Mifflin Co., 1958.

———. *Taylor's Encyclopedia of Gardening, Horticulture, and Landscape Design*. Boston, Houghton-Mifflin Co., 1961.

II. *General references—botanical and horticultural*. These include the backup books, to be consulted for technical information and to provide botanical explanations to horticultural functions or procedures; it includes selected floras to better enable one to identify plants of a particular area, or to learn their correct name.

Bailey, L. H.—*How Plants Get Their Names*. New York, The Macmillan Co., 1933. Reprinted by Dover Publications, New York, 1963.

Although the rules of botanical nomenclature have undergone revisions since 1933, this remains the only lucid readable account on the subject.

Dickinson, A.—*The First Book of Plants*. New York, Franklin Watts, 1953.

This book is written at a very elementary level, is lavishly and beautifully illustrated, but is strictly for the novice.

Rickett, H. W.—*Botany for Gardeners*. New York, The Macmillan Co., 1957.

An excellent, readable survey of plant structures and classification, of physiological functions and their horticultural applications. Written and illustrated by a botanist for the horticulturist.

Lawrence, G. H. M.—*An Introduction to Plant Taxonomy*. New York, The Macmillan Co., 1955.

An elemental text, including also an illustrated glossary of most of the terms encountered in botanical descriptions of plants.

Gleason, H. A. & Cronquist, A.—*The Natural Geography of Plants*. New York, Columbia Univ. Press, 1964.

A background book, useful to the travelling horticulturist, and to he who introduces to his garden plants native of other parts of this country. It is a fine account of vegetation

groups, habitat characteristics, plant behavior in the wild. In addition, it is a beautiful book.

Platt, R.—*Our Flowering World*. New York, Dodd Mead & Co., 1947.

A scholarly survey in non-technical language of factors and hypotheses purported to account for the distribution of plants throughout the world, now and during the geological past. Includes a bibliography.

The Yearbook of Agriculture. U. S. Department of Agriculture. Washington, D.C., U.S. Govt. Printing Office. 1948 *et seq.*

Commencing with that for 1948, at least 7 of these Yearbooks are works to be studied and consulted by the plantsman. Authoritative and complete, each is a monograph on its subject, and each contains abundant references to supporting literature. Those recommended, with year of publication, are:

Grass, 1948	Seeds, 1961
Insects, 1952	Trees, 1949
Land, 1958	Water, 1955
Plant Diseases, 1953	

Krutch, J. W.—*The Gardeners World*. New York, G. P. Putnam's Sons, 1959.

A sumptuous and fascinating background book, presenting with commentaries selected quotations *in extenso*, in chronological sequence, from the world's great contributors to our plant literature. The essence of a substantial library is here brilliantly compressed in a single volume.

Moldenke, H. N. & A. L.—*Plants of the Bible*. Waltham, Mass., Chronica Botanica Co., 1952. Includes a copious bibliography.

Stephenson, J. W.—*The Gardener's Directory*. Garden City, N. Y., Hanover House, 1960.

A valuable reference providing data on all leading American horticultural organizations, educational centers, and research institutions, on places throughout U.S.A. of horticultural interest, and a short bibliography of current gardening literature.

Hill, A. W.—*Economic Botany. A Textbook of Useful Plants and Plant Prod-*

ucts. Ed. 2. New York, McGraw-Hill, 1952.—A standard work, unsurpassed for its comprehensiveness.

Kingsbury, J. M.—*Poisonous Plants of the United States and Canada*. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1964.

Treats the poisonous properties of some cultivated ornamentals, and of other plants important to many horticulturists.

Muenschler, W. C.—*Weeds*. Ed. 2. New York, The Macmillan Co., 1955.

The most authoritative book on the identification and distribution of weeds in the U.S.A. Its recommended control measures have been superseded in most instances, but no one volume, more up to date than this, has displaced it for the horticulturist.

III. *Selected floras*. Every horticulturist, and especially the traveller-collector, requires botanical works about the native plants of the country. No single title accounts for all plants and for some areas no work is of recent vintage. For books about wildflowers for garden use, see below under *Monographs*. The books comprising these floras are arranged geographically: north to south, and east to west.

Fernald, M. L.—*Gray's Manual of Botany. A Handbook of the Flowering Plants and Ferns of the Central and Northeastern United States and Adjacent Canada*. Ed. 8. New York, American Book Co., 1950.

Gleason, H. A.—*The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada*. 3 vols. [New York], The New York Botanical Garden, 1952.

——— & Cronquist, A.—*Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. Princeton, N.J., D. Van Nostrand Co., 1963.

Petrides, G. A.—*A Field Guide to Trees and Shrubs . . . Wild in the Northeastern and North-central United States and in Southeastern and South-central Canada*. The Peterson Field Guide Series. Boston, Houghton Mifflin Co., 1958.

Rickett, H. W.—*The New Field Book of American Wild Flowers*. New York, G. P. Putnam's Sons, 1963.

Cobb, B.—*A Field Guide to the Ferns and Their Related Families of Northeastern and Central North America*, . . . Boston. Houghton Mifflin, 1956.—Beautifully illustrated.

Wherry, E. T.—*The Fern Guide. Northeastern and Midland U.S. and Adjacent Canada*. Garden City, N.Y., Doubleday & Co., 1961.

Small, J. K.—*Manual of the Southeastern Flora; giving Descriptions of the Seed Plants Growing Naturally in Florida, Alabama, Mississippi, Eastern Louisiana, Tennessee, North Carolina, South Carolina, and Georgia*. New York, Privately Published, 1933.

Dorman, C.—*Flowers Native to the Deep South*. Baton Rouge, La., Claiborne's Book Store, 1958.

Wherry, E. T.—*The Southern Fern Guide*, Garden City, N.Y., Doubleday & Co., 1964.

Steyermark, J. A.—*Flora of Missouri*. Ames, Ia., Iowa State Univ. Press, 1962.

Lundell, C. L.—*Flora of Texas*. Vols. 1-3 [incomplete]. Renner, Tex., Texas Research Foundation, 1955-61.

Rydberg, P. A.—*Flora of the Prairies and Plains of Central North America*. New York, N.Y. Botanical Garden, 1932.

———. *Flora of the Rocky Mountains and Adjacent Plains, . . . Colorado . . . and British Columbia*. Ed. 2. New York, N.Y. Botanical Garden, 1922.

Kearney, T. H. & Peebles, R. H. *et al.*—*Arizona Flora*. Ed. 2. Berkeley, Univ. of California Press, 1960.

Abrams, L. R.—*Illustrated Flora of the Pacific States*. 3 vols. Stanford, Stanford Univ. Press, 1944-1960. [Vol. 4 by Roxanna Ferris.]

Munz, P. A. & Keck, D. D.—*A California Flora*. Berkeley, Univ. of California Press, 1959.

Sharples, A. W.—*Alaska Wild Flowers*. Stanford, Stanford Univ. Press, 1938. Reprinted 1960.

Plant Culture, Propagation, Pests & Diseases

I. Culture of plants and gardens (including design) is covered by a formidable literature and titles given here lead one to the very elementary and intermediate works. See also under Encyclopedias, above.

Aldrich, D. G. *et al.*—*The Care and Feeding of Garden Plants*. Washington, D.C., Amer. Society for Horticultural Science, 1954.

Ballard, E. D.—*The Art of Training Plants*. New York, Harper & Bros., [1962].

———. *Garden in Your House*. New York, Harper & Bros., 1958.

Christopher, E. P.—*The Pruning Manual*. New York, The Macmillan Co., 1954.

Church, T. D.—*Gardens are for People*. New York, Reinhold Press, 1955.

Greene, W. F. & Blomquist, H. L.—*Flowers of the South, Native and Exotic*. Chapel Hill, Univ. of North Carolina Press, 1953.

A treatment, by species (each illustrated) of showy plants suitable for gardens of the Gulf states, the Carolina, and some adjacent areas.

Hume, H. H.—*Gardening in the Lower South*. Rev. ed. New York, The Macmillan Co., 1954.

Kuck, L. E. & Tongg, R. C.—*The Modern Tropical Garden*. Honolulu, Tongg Publ. Co., 1955.

Lawrence, E.—*Gardens in Winter*. New York, Harper & Bros., [1961].—The emphasis is on gardens of the southeastern states.

Lees, C. B.—*Budget Landscaping*. New York, Henry Holt & Co., 1960.

Ochse, J. J., Soule, M. J. *et al.*—*Tropical and Subtropical Agriculture*. 2 vols. New York, The Macmillan Co., 1961.—Includes excellent accounts of fruit-producing species that may also be grown for ornament.

Parcher, E. S.—*Shady Gardens: How to Plan and Grow Them*. Englewood Cliffs, N.J., Prentice-Hall, 1955.

Stevenson, T.—*Pruning Guide for Trees, Shrubs and Vines*. Washington, D. C., Robert B. Luce, 1946.

Sunset Western Garden Book. Menlo Park, Calif., Lane Publ. Co., 1954.

Teuscher, H.—*Window-Box Gardening*. New York, The Macmillan Co., 1956.

Thomas, G. L., Jr.—*Garden Pools, Water-lilies and Goldfish*. Princeton, N.J., D. Van Nostrand Co., 1958.

Wyman, D.—*Ground Cover Plants*. New York, The Macmillan Co., 1956.

———. *The Saturday Morning Gardener. A Guide to Easy Maintenance*. New York, The Macmillan Co., 1961.

II. Plant propagation has received less attention in recent years than formerly. Of the two books cited, that by Wells is for the more advanced plantsman and that by Wright is more for the beginner.

Wells, J. J.—*Plant Propagation Practices*. New York, The Macmillan Co., 1955.

Wright, R. C. M.—*Plant Propagation and Garden Practice*. New York, Criterion Press, 1956.

III. Pests and diseases have received considerable impetus in recent decades, but most of the books on the subject are directed to the professional growers. Among those books that are useful to the ornamentalist are the following:

Chupp, C. & Sherf, A. F.—*Vegetable Diseases and Their Control*. N.Y., The Ronald Press Co., 1960.

Pirone, P. P. *et al.*—*Diseases and Pests of Ornamental Plants*. Ed. 3. New York The Ronald Press Co., 1960.

Shurtleff, M. C.—*How to Control Plant Disease in Home and Garden*. Ames, Ia., Iowa State Univ. Press, 1962.

Westcott, C.—*Plant Disease Handbook*. Ed. 2. Princeton, N.J., D. Van Nostrand Co., 1960.

Plants of Other Lands For American Gardens

Background books by American authors that recount the history of plants in our gardens, or of plants that deserve trial in our gardens, are reported here. In some instances, the author is the plant explorer who introduced an item, but more often the book is a compilation from earlier literature.

Fairchild, D.—*The World Grows Round My Door*. New York, Charles Scribner's Sons, 1947.

Li, H. L.—*The Garden Flowers of China*. New York, Ronald Press Co., 1959.

———. *The Origin and Cultivation of Shade and Ornamental Trees*. Philadelphia, Pa., Univ. of Pennsylvania Press, 1963.—Plants, largely, from the Orient.

Matschat, C. H.—*Mexican Plants for American Gardens*. Boston, Houghton Mifflin Co., 1935.

Menninger, E.—*Flowering Trees of the World for Tropics and Warm Climates*. New York, Hearstside Press, Inc., [1962].

Sirén, O.—*Gardens of China*. New York, Ronald Press Co., 1949.

Watkins, J. V.—*Gardens of the Antilles*. Gainesville, Fla., Univ. of Florida Press, 1952.

Wilson, E. H.—*Aristocrats of the Garden*. Boston, Mass., The Stratford Co., 1926.

———. *Aristocrats of the Trees*. Boston, Mass., The Stratford Co., 1930.

———. *China, Mother of Gardens*. Boston, Mass., The Stratford Co., [1929].

———. *The Romance of Our Trees*. Garden City, N.Y., Doubleday Page & Co., 1920.

Plant Explorers and their Introductions

These background books provide the source material from which the plantsman learns that there is a heritage for so much that is in our gardens. Space permits only a limited selection, and a bibliography of titles in this category numbers in excess of 400 items.

Dorrance, A.—*Green Cargoes*. Garden City, N.Y., Doubleday Doran & Co., 1945.—A popular account, includes a bibliography.

Douglas, D.—*Journal Kept by David Douglas During his Travels in North America, 1823-1827. . . . With Appendices . . .* New York, Antiquarian Press Ltd., 1959.

Fairchild, D.—*Exploring for Plants*. New York, The Macmillan Co., 1930.—Based on the Allison Armour expeditions of 1925-27.

———. *Garden Islands of the Great East*. New York, Charles Scribner's

Sons, 1943. Collecting experiences in the Philippines and Indonesia.

———. *The World was my Garden*. New York, Charles Scribner's Sons, 1948.—An autobiography.

Jewett, F. L. & McCausland, C. L.—*Plant Hunters*. Boston, Houghton Mifflin Co., 1958.

Peattie, D. C.—*Green Laurels*. New York, Simon & Schuster, 1936.

Steele, A. R.—*Flowers for the King*. Durham, N.C., Duke University Press, 1964.

von Hagen, V. W.—*The Green World of Naturalists. A Treasury of Five Centuries of Natural History in South America*. New York, Greenberg, 1948.

Monographs about Plants

This section includes horticultural and botanical books about particular groups of plants or plant genera, found to be useful to the more advanced plantsman interested in the group or particular plant.

1. *Herbs* for culinary and decorative uses are treated in many books for the plantsman. The following is a small selection, mostly from the more recent publications.

Clarkson, R. E.—*Herbs, Their Culture and Uses*. New York, The Macmillan Co., 1942.

———. *Magic Gardens. A Modern Chronicle of Herbs and Savory Seeds*. New York, The Macmillan Co., 1939.

De Sounin, L.—*Magic in Herbs*. New York, M. Barrows & Co., 1941.

Fox, H. M.—*The Years in My Herb Garden*. New York, The Macmillan Co., 1953.

Kamm, M. W.—*Old-time Herbs for Northern Gardens*. Boston, Mass., Little Brown & Co., 1938.

Miloradovich, M.—*The Home Garden Book of Herbs and Spices*. Garden City, N.Y., Doubleday & Co., 1952.

Muenschner, W. C. & Rice, M.—*Garden Spice and Wild Pot-Herbs*. Ithaca, N.Y., Cornell Univ. Press, 1955.—Illustrated from woodcuts by Elfriede Abbe.

Simmons, A. G.—*Herb Gardening in Five Seasons*. Princeton, N.J., D. Van Nostrand Co., 1964.

II. *Wildflowers* suitable for introduction into cultivation, and especially for woodland streamside planting, have prompted the study of several specialists.

Aiken, G. D.—*Pioneering with Wildflowers*. [n.p.], Stephen Daye Press, 1946.—Reissue of the 1933 edition.
Hershey, J.—*Wild Flowers to Know and Grow*. Princeton, N.J., D. Van Nostrand Co., 1964.
Hull, H. S.—*Wild Flowers for Your Garden*. New York, M. Barrows & Co., 1952.

Steffeck, E. F.—*Wild Flowers and How to Grow Them*. New York, Crown Publishers, 1954.

Taylor, K. S. & Hamblin, S. F.—*Handbook of Wild Flower Cultivation*. New York, The Macmillan Co., 1963.

III. *Woody plants* (trees, shrubs, vines) are the subject of many horticultural monographs. Some of the older works continue to serve as standard works of reference. For others, see above under References, items by Bailey, and Rehder.

Bailey, L. H.—*The Cultivated Conifers in North America, Comprising the Pine Family and the Taxads*. New York, The Macmillan Co., 1933.—The work is both botanical and horticultural.

Barrett, M. F.—*Common Exotic Trees of South Florida. (Dicotyledons)*. Gainesville, Fla., Univ. of Florida Press, 1956.

Cloud, K. M. P.—*Evergreen and Flowering Shrubs for Your Garden*. Philadelphia, Pa., Chilton Press, 1958.

Faust, J. L.—*The New York Times Book of Trees and Shrubs*. New York, Alfred A. Knopf, 1964.

Howard, F.—*Landscaping with Vines*. New York, The Macmillan Co., 1959.

Hull, G. F.—*Bonsai for Americans*. Garden City, N. Y., Doubleday & Co., 1965.

Lynn, R. P.—*Bonsai: Trees and Shrubs*. New York, The Ronald Press Co., 1964.

Menninger, E. A.—*What Flowering Tree is That?* Rev. Ed. Stuart, Fla., E. A. Menninger, 1958.—Deals with ornamental trees for the tropics and subtropics.

Perkins, H. O.—*Espaliers and Vines for the Home Gardener*. Princeton, N. J., D. Van Nostrand Co., 1964.

Symonds, G. W. D. & Merwin, A. W.—*The Shrub Identification Book*. New York, M. Barrows & Co., 1963.

Wigginton, B. E.—*Trees and Shrubs for the Southeast*. Athens, Ga., Univ. of Georgia Press, 1963.

Wyman, D.—*Shrubs and Vines for American Gardens*. New York, The Macmillan Co., 1949.

———. *Trees for American Gardens*. New York, The Macmillan Co., 1951.

IV. *Herbaceous plants* (annuals, biennials, perennials).

Cumming, R. W. & Lee, R. E.—*Contemporary Perennials*. New York, The Macmillan Co., 1960.

Green, L. M.—*Perennials in A Bishop's Garden*. Philadelphia, Pa., Dorrance Co., 1953.

Kelly, G. W.—*Short Guide to the Perennial Garden Flowers*. New York, Crown Publishers, 1964.

V. *Monographs of plant genera* by American authors and published during the last two decades number well over 100, not counting the substantial contributions that have appeared in our periodical literature. Presented below is a very small selection of titles for the more common genera.

African Violets

Moore, H. E., Jr.—*African Violets, Gloxinias and their Relatives*. New York, The Macmillan Co., 1957.

Wilson, H. V. P.—*The New Complete Book of African Violets*. New York, M. Barrows & Co., 1963.

Begonia

Brown, W.—*Tuberous Begonias: A Complete Guide for Amateur and Specialists*. New York, M. Barrows & Co., 1948.

Buxton, B.—*Check List of Begonias*. Los Angeles, Calif., Amer. Begonia Society, 1957.

Krauss, H.—*Begonias for the American Home and Garden*. New York, The Macmillan Co., 1947.

Camellia

Hertrich, W.—*Camellias in the Huntington Gardens*. 3 vols. San Marino, Calif., The Huntington Library. 1954-1959.

Hume, H. H.—*Camellias in America*. Ed. 2. Harrisburg, Pa. J. Horace McFarland, 1957.

Threkeld, J. L.—*The Camellia Book*. Princeton, N. J., D. Van Nostrand Co., [1962].

Tourjee C. C. (Ed.)—*Camellia Culture*. New York, The Macmillan Co., 1958.

Geraniums

Krauss, H. K.—*Geraniums for the Home and Garden*. New York, The Macmillan Co., 1955.

Wilson, H. V. P.—*Geraniums, Pelargoniums for Windows and Gardens*. Ed. 3. New York, M. Barrows & Co., 1957.

Holly

Dengler, H. W.—*Handbook of Hollies*. Washington, D. C., Amer. Horticultural Society, 1957.

Hume, H. H.—*Hollies*. New York, The Macmillan Co., 1953.

Iris

Mitchell, S. B.—*Iris for Every Garden*. New York, M. Barrows & Co. 1949.—Reprinted 1960.

Randolph, L. F.—*Garden Irises*. St. Louis, Mo., American Iris Society, 1959.—The most comprehensive and modern treatise on the genus.

Lilies

Rockwell, F. F., Grayson, E. C. & de Graff, J.—*The Complete Book of Lilies*. New York, Doubleday & Co.,

1961.—for critical review, see *Amer. Hort. Mag.* 41: 36. 1962.

Slate, G. L.—*Lilies for American Gardens*. New York, Charles Scribner's Sons, 1939.

Orchids

Fennell, T. A. Jr.—*Orchids for the Home and Garden*. Rev. Ed. New York, Rinehart, 1959.

Hawkes, A. D.—*Orchids, their Botany and Culture*. New York, Harper & Bros., 1961.

Northen, R. T.—*Home Orchid Growing*. Princeton, N. J., D. Van Nostrand Co., 1950.

Withner, C. L.—*The Orchids: A Scientific Survey*. New York, The Ronald Press Co., 1959.—A modern manual of orchidology.

**Rhododendrons
(including Azaleas)**

Leach, D. G.—*Rhododendrons of the World and How to Grow Them*. New York, Charles Scribner's Sons, 1961.

Lee, F. P.—*The Azalea Book*. Ed. 2. Princeton, N. J., D. Van Nostrand Co., 1965.

Roses

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A Book or Two

The Bamboos—A Fresh Perspective

By F. A. McClure. Harvard University Press, Cambridge, Massachusetts. 1966. 347 pages. Illustrated. \$10.00. (Library)

Books strictly about bamboos are rare and the appearance of this new work by the recognized world authority will immediately catch the eye of horticulturists who enjoy growing these plants. Bamboos occupy a unique place among plants of ornamental value as all who have grown them will agree. While many people object to the running bamboos, and they can become a problem, it is possible to control the rhizomes by the simple technique of sinking metal flashing into the ground on an angle away from the plants.

Perhaps many think of fishing poles in relation to bamboo, yet these plants are tremendously important in paper making and for building purposes in the Orient and some other areas. They are grown extensively for ornament wherever they can be cultivated successfully. Bamboos, for example, are widely grown in the more temperate parts of this country from Washington, D. C. south and along the Pacific coast to southern British Columbia, and are extensively grown in parts of Latin America for building. In western Europe bamboo is widely grown for ornamental purposes. In Africa, the mountain bamboo of Ethiopia, Kenya, and the Mountains of the Moon is used to build houses.

Botanically, bamboos are grasses, but they are unique among all the grasses in possessing woody culms (up to 12 inches in diameter) with a tendency to flower only at rare intervals. Spread of bamboos is mostly by vegetative means, usually by rhizomes or modifications thereof.

Dr. McClure began his studies on the bamboos during the period 1924 to 1927 under the U. S. Department of Agriculture, as an Agricultural explorer in China. A large bamboo garden was established at Lingnan University at Canton of over 600 accessions of living bamboos for observation and comparison. Later on, 250 numbers of living plants were introduced into this

country from collections made over 17 years the author lived in China.

Essentially, the book is an analytical treatise on the bamboo plant as a living organism covering the seedling, vegetative phase, and reproductive phase. Nothing about the bamboo plant has gone undiagnosed. Most of the information is based upon the personal observations of the author over a 40-year period, first in China and more recently in Bethesda, Maryland, where he grows bamboo in his garden. The chapter on propagation will be of special interest to all who grow bamboos.

The author's own drawings are included among the many excellent illustrations and photographs which form one of the most important and useful features of the book. Two appendices include a generic key to bamboos under cultivation in the United States and Puerto Rico and a most useful finding list of bamboos and nurseries offering them in the United States. A glossary of special terms applicable to bamboos is another most useful addition, and finally there is an index for scientific names and a separate subject index.

F. G. MEYER

Manual of Cultivated Conifers

By P. den Ouden in collaboration with B. K. Boom. Martinus Nijhoff, The Hague, Netherlands. 1965. 526 pages. Illustrated. \$15.00. (Library)

In scope, this book was designed to include all conifer species and cultivars grown in temperate regions and includes 303 species and hybrids, 208 botanical varieties, and 1935 cultivars. Aiming for completeness, the book includes descriptions of cultivars and varieties from the time of Linnaeus (1753), even though many cultivars have been lost and are no longer known in the trade. For this reason, the book will become a standard finding list of conifer

(Books available **for loan** to the membership are designated: (Library). Those not so designated are in private collections and are not available for loan. Books available **for sale** to the Membership are designated with the special reduced price and are subject to the usual change of price without notice. Orders must be sent through the American Horticultural Society accompanied by the proper payment. Please allow two to three weeks for delivery. Those not designated for sale to the Membership at reduced prices can be purchased through the Society, however, at the retail prices given. In these instances the full profit is received by the Society to be used for increased services and benefits of the Membership.)

names and an extremely useful reference work.

Mr. Pieter den Ouden, until a very short time before his death in 1964, continued an active interest in his favorite subject, the conifers, and the bulk of the data is his. But failing health and age prevented him from completing the book and for this reason the final preparation for publication was under the able direction of Dr. B. K. Boom, well known horticultural taxonomist of Wageningen in the Netherlands.

As a nurseryman in Boskoop, Mr. den Ouden gained a wealth of practical experience in growing and observing conifers over many years. His first major work "Coniferen—*Ephedra* en *Ginkgo*" published in 1949 was a standard reference long out of print. It is a pity the present work lacks *Ginkgo* and *Ephedra*. Unfortunately, works such as these go out of date the day they are printed because nurserymen and others are constantly flooding the trade with "new" names for plants often of questionable distinctness, leading only to further confusion. Nevertheless, the present volume will long remain a standard reference work.

The format clearly distinguishes between conifers now in cultivation and those no longer known which are printed in smaller type. The book is copiously illustrated with excellent black and white photographs of plants in the wild and in gardens; also, some detailed drawings are included of cones and branchlets. The book is arranged alphabetically by genera, therefore no index is needed, beginning with *Abies* and ending with *Tsuga*. Additional information of value at the end of the book covers seed density and germination, diseases and pests, an index of synonyms, and finally vernacular and trade names.

Technically, the book is beautifully produced and fully measures up to the high standards known for this publisher. The present volume is a milestone among specialized horticultural books.

F. G. MEYER

Natives Preferred

By Caroline Dorman. Claitor Book Store, P. O. Box 239, Baton Rouge, La. 70821. 1965. 218 pages. Illustrated. \$5.00.

As in all well planned and well written books, this volume starts with a preface that forcefully and clearly sets forth the urgencies the author felt in bringing special attention to the native materials she discusses, and definitely marks out the limitations she set for herself.

While Dr. Dorman, as artist, is possibly moved first of all by her passion for beauty, her love for and knowledge of native species that have never been fully appreciated and now stand in peril of extinction or extermination in many areas, give her book not only a value to any gardener but make a handbook of great value to all conservationists. The writing of the book, long in progress, and the fruit of years of study and gardening practice, comes from the press at a

time when long range planning is widespread in connection with the officially sanctioned programs of beautification, not only of homes and estates, but of highways and other public areas.

There have been enough examples in past experience of the use of plants, beautiful enough in themselves, but not natives, that failed because they could not survive with the minimum of maintenance they received, after the initial enthusiasms had faded.

The book will be of value to nurserymen as well, since they will find in it suggestions for species not now commonly grown, that will survive in areas now being considered for public plantings for which he has supplied materials. This one element may assure the success in plantings for which he has supplied materials. All nurserymen are aware of the balance that must be attained successfully in maintenance.

Dr. Dorman states clearly that her book does not contain all the plants that might well have been considered, but she presents her data, organized in sections, to stress the values of the plants by seasons, by color of flowers, fruit and foliage, and in relation to the specific types of areas to be planted, with due notice of shade, sun, soil types physical and chemical, and dares offer definite advice as related to causes of failure. This last is a rare offering.

The advice given is so sound that one can only regret that the national coverage is not even more complete than it is.

The book is largely illustrated by Dr. Dorman's drawings, which are fine as always. The half tones are less excellent. One finds a few errors, and one accident of caption. But one also finds a list of other books that may be consulted, a list of nursery addresses, covering many if not all of the plants discussed. If one wishes to be captious, the chief criticism will be that the book is not even longer, and the discussions even more detailed.

B. Y. MORRISON

Rose Growing Complete

By E. B. LeGrice. Faber & Faber Ltd., 24 Russell Sq., London. 1965. 265 pages. Illustrated. 15 in color. \$5.90. (Library)

A complete book on roses written for the English gardener. The first part deals with culture in all of its several phases. Part II is entitled "Showing Roses" but actually covers such topics as the different rose types and where they may be used in the garden, the exhibiting of roses, the use of roses as decorative materials and the growing of roses under glass by the amateur. Part III is devoted to the genetics and hybridizing of roses, the history of modern roses and the raising and evaluating of new seedlings. The chapter on the varieties to grow will interest the rose enthusiast with suggestions of important varieties and brief descriptions in all of the main species and hybrid groups.

CONRAD B. LINK

Anyone Can Grow Roses

By Cynthia Wescott. 4th Edition. D. Van Nostrand Co. Inc., Princeton, N. J. 1965. 220 pages. \$5.95. (Library) Members Price \$5.05.

A revised updated edition of a very practical and authoritative book on roses. It is written to be useful to the rose grower in any part of the United States. Dr. Westcott is a well known plant pathologist who has made roses a special interest. This book reflects her own experiences in growing roses, in supervising the care of rose gardens and in a particular way her studies of rose pests and their control. A book to start any gardener into rose growing.

CONRAD B. LINK

The Concise British Flora in Colour

By W. Keble Martin. Ebury Press and Michael Joseph, England. 1955. 231 pages, 100 color plates. \$5.00.

This is a volume of 100 color plates displaying 1480 British native wildflowers and occasionally an escaped alien. With an average of over 14 flowers for each 10 by 8 inch plate, the plates are filled to overflowing. However, each flower on a plate is carefully separated from the others, although the eye may take a few moments to find it in the crowd.

The drawings are scientifically accurate and give the impression of painstaking affection and skill. The color used in reproduction of the individual original drawings, despite the low price of the volume, is good on the whole, with the green of leaves suffering most.

On the page opposite a plate each flower is identified by botanical and common name and accompanied by a 4- or 5-line description of the plant. A glossary of botanical terms is included.

Prior to ordination, The Reverend Martin studied for a degree in botany at Oxford. He collected, painted and identified his specimens over a 60-year period. The volume represents a lifetime of recurrent effort persisted in despite heavy daily duties as a churchman. H.R.H. Prince Philip, Duke of Edinburgh, adds in a foreword his praise for the achievement.

FREDERIC P. LEE

The Rhododendron and Camellia Year Book, 1966

Edited by P. M. Synge and J. W. O. Platt, published by The Royal Horticultural Society, London, England. 1965. 248 pages. 68 plates, 9 in color. \$2.40.

This is the twentieth anniversary issue of *The Rhododendron Yearbook* and its successor, *The Rhododendron and Camellia Year Book* by The Royal Horticultural Society of Great Britain. Naturally over the period a rather fixed

design of content has evolved and is generally followed: Descriptions of large rhododendron gardens in the British Isles (this year Werrington Park and Arduaine); exploring and collecting trips (this year North East India and New Guinea); accounts of shows and exhibits and garden tours in Australia, England, Scotland, and United States; lists and descriptions of rhododendrons receiving awards as the result of Wisley trials or at Society exhibitions; descriptions of newly registered rhododendrons; and intermittent articles on breeding, propagation, and taxonomy (this year Hobbie hybrids from Germany, a new *Rhododendron succothii* and *R. metternichii* and its hybrids in Japan).

The newly registered rhododendrons include about 40 azaleas introduced by B. Y. Morrison of Pass Christian, Mississippi. These are Back Acres azalea hybrids, a continuation of Morrison's work with the Glenn Dale hybrid azaleas, but seeking flowers with white or very light throats and colored borders. These plants probably are Morrison's last introductions before his death in January of this year.

In addition to the rhododendron materials there are five articles on camellia gardens, exhibits, and meetings. Outstanding are the numerous black and white and color illustrations.

FREDERIC P. LEE

Fuchsias, a Complete Guide to Their Propagation and Cultivation for House and Garden

By Stanley J. Wilson. St. Martin's Press, Inc., 175 Fifth Ave., New York, N. Y. 10010. 1965. 293 pages. Illustrated. \$10.00 (Library) Members Price \$8.50.

Mr. Wilson's book is full of detail which every Fuchsia enthusiast will want to have at hand. For Britishers, it is a must because it is at once a source of complete cultural directions, exhibiting suggestions and a guide for the choice of varieties available in Great Britain. The Chapters, "The Fuchsia and its History" and "Hybridization" are alone worth the price of the book.

For Americans, especially those of us who live in the northeast, the book is a reference to be highly recommended. The cultural notes contain many references to the use of the British-venerated John Innes soil mixes. These were an early and valuable advance in simplifying potting soil mixes. Fortunately for us, we have the wonderful Peat-lite mixes developed by Cornell University, which produce as fine or better plants, more uniformly than many other soil mixes.

As is natural, and as Mr. Wilson points out, American and British uses of Fuchsias are somewhat different. We grow a greater proportion of Fuchsias in hanging baskets than are used in Britain. His clear directions for growing these

plants for exhibition may stimulate Americans to grow more bush and standard shaped Fuchsias.

There are 132 pages devoted to the names, history and descriptions of more than 750 species and cultivars of Fuchsia. Since some experts believe there are several thousand Fuchsia cultivars loose in the world, no list will likely contain all of one's favorites. As an example, I grow over 50 varieties of bush and trailing Fuchsias commercially, but found only 27 of them in Mr. Wilson's long list. He has included nine names and addresses of British growers. I wrote to all of them and have received several replies with interesting lists of varieties. There are 72 American growers listed with addresses. I wrote to 12 of them, picked at random. Five letters have been returned, "Moved—no forwarding address," but the rest sent lists and prices.

The colored illustrations in the book are all too few, but they do the lovely Fuchsia all the justice it deserves.

PAUL E. CASE

Guide to Plants of the Everglades National Park

By Alex D. Hawkes. Tropical Isle Publishers, Inc., P.O. Box 613, Coral Gables, Florida 33134. 1965. 51 pages. Illustrated. \$2.00.

This attractive little booklet of 51 pages is the only readily accessible literature concerning the plant life of the Everglades National Park, Florida, one of our larger national parks. The Park was established in 1947 to protect and to preserve for future generations the many fine plants, among the other natural features, that may be found in this area and nowhere else in the United States. The title, however, is somewhat misleading, as only the ferns and seed plants are included, leaving completely untreated all of the numerous "lower" plants.

Within the framework of the booklet the author has, in addition to a discussion of the various plants, included a general discussion of the physical features and botanical formations of the Park. To help the visitor better utilize the booklet, he has also cited a number of locations where each of these formations may be found. Therefore, one may not only be able to read about them, but also to see them as they really exist in nature, which of course makes the information much more meaningful.

To discuss the various plants, he has grouped them into their respective families that are arranged alphabetically according to their common names. Since there are so many species of plants represented in this area, only one or two of the more characteristic and common members of each family are discussed. This is somewhat unfortunate, but perhaps more may be added in a future edition.

Both the scientific and common family, generic, and specific names are given, making this book-

let appealing to both the amateur and professional botanists alike. Unfortunately, some of the nomenclature follows the old American Code that was replaced by the International Code in 1935.

The index of botanical names is quite helpful for the pronunciation of the scientific names; each Latin entry is followed by a phonetic pronunciation, with the accented syllables in italics and the others in Roman type.

Illustrations have also been used to make the booklet more meaningful. These include several scattered black and white photographs. Also, there are a few pages, as well as the front and back covers, with color photographs. Generally speaking, with one or two exceptions where the composition, color or focus could be improved, the quality of these photographs is quite good.

I feel that this booklet will be both useful and helpful to those persons interested in the more common ferns and seed plants of the Park. On the other hand, I would suggest that a future edition include an updating of the nomenclature, more individual plant descriptions and illustrations, and also some sort of a key to aid in the identification of the various groups of plants. As it now stands, if one is not familiar with the plant, he has no easy way of finding a name by using this booklet, except to read each family description until such a description fits the plant in question.

Nevertheless, for the first publication of its kind, it is a breakthrough the many years without such an item, and I would suggest it to anyone interested in the vascular flora of the Everglades National Park.

PETER M. MAZZEO

The Daffodil and Tulip Year Book, 1966

P. M. Synge, J. W. O. Platt, and Elspeth Napier, Editors, published by The Royal Horticultural Society, Vincent Square, S. W. 1, London. 1965. 200 pages. Illustrated (4 in color). \$2.40.

One of the interesting aspects of the Daffodil and Tulip Year Books which now number 31 since 1913—annually since the end of World War II—is their reflection of the rising interest in daffodils in the United States, a development which the editors have noted and faithfully reported as good editors would.

Twenty years ago the year book for 1946 contained only a single chapter of American origin: one by Jan de Graaff on "Factors in Hybrid Daffodil Selection." Two decades later the 1966 Year Book is dedicated to an American for the first time: John C. Wister, who, with the late B. Y. Morrison, had a great deal to do with the awakening appreciation of daffodils in this country. Two chapters report on American shows and favored varieties, Mrs. J. Lionel Richardson records her impressions of daffodils in Southern

California, and Jefferson-Brown pays tribute to the reversed bicolors created by Grant E. Mitsch of Canby, Oregon.

A less obvious but more significant penetration of the home of the exhibition daffodil is the frequency with which one who reads the fine-print reports of English shows finds varieties bred and introduced by Mitsch taking top honors. Classes for reversed bicolors are now completely dominated by his creations; 'Spellbinder' and 'Binkie' no longer are good enough.

While of necessity a year book must find space for the current news of home and overseas, lists of show winners, and newly registered varieties, nevertheless room is always found for papers of scholarship. The chapter on *Narcissus* \times *johnstonii* by Cyril F. Coleman tidies up a dusty corner of daffodil taxonomy and J. T. Hesling provides an absorbing account of how applied science has learned to control the stem and bulb eelworm which devastated the European bulb fields fifty years ago. C. R. Wootton and J. W. Blanchard write on their personal experiences with jonquil hybrids and miniatures and reveal that in these—and doubtless most other forms—the genetic possibilities of the daffodil are far from being fully explored.

Year by year the Daffodil and Tulip Year Books which now nearly fill a shelf have achieved a competence, possibly somewhat bland, which places them well beyond any but the most capacious criticism. This writer is not a tulip fancier and warms to the abundance of material on daffodils, but if he was an apostle of the tulip, he might well have reason to complain that the object of his horticultural affections scarcely receives its due share of attention.

GEO. S. LEE, JR.

Handbook of Plants of the Colorado Front Range

By William A. Weber. University of Colorado Press, Boulder. 1961. 232 pages (2nd ed). \$4.00. (Library)

The Front Range is the easternmost extension of the Colorado Rockies and includes some of the most spectacular mountain scenery on the North American continent. Rising dramatically a few miles west of Denver, this range introduces the easterner to one of the grand sights of the American Far West. The treeless Great Plains are replaced by snow-capped alpine peaks, some over 14,000 feet high, crystal clear streams, and verdant evergreen forests. In season the native flora of the Front Range ranks among the most colorful and varied in this country.

The present volume of 232 pages is the 2nd edition of a work that first appeared in 1953. Dr. Weber, as a professional botanist, has written a highly useful popular, semi-technical field handbook to nearly 1400 native plants of the area. This amounts to about half of the total flora of Colorado. The book is without illus-

trations, which is the major fault, especially for a work intended primarily for popular consumption. The volume does include, however, an illustrated glossary at the end, which is a most useful inclusion. Nevertheless, Dr. Weber's book will be most useful to travellers and to others who visit the Colorado Front Range.

Except for a few parts of this country, altogether too few books of this kind are available for local consumption and for schools. The technical floras are of little help to the uninformed and win too few friends to botany. More handbooks pitched to local use and to schools should be written for all parts of the country. County floras could be most useful in this respect.

F. G. MEYER

Piscataqua Papers: Gardening from the Merrimack to the Kennebec

Published by the Piscataqua Garden Club, York Harbor, Maine. 1965. viii + 148 pages. \$3.50 (postpaid mail orders should be addressed to Mrs. Herman Pike, York Harbor, Maine). (Library).

This is an interesting potpourri of gardening information for the "area from the Merrimack to the Kennebec, extending inland for about twenty-five miles." As such it discusses the very special horticultural problems of this bit of New England coast for both the summer visitor and the year-round resident. The contents cover six main topics: History and Early Gardens, Practical Horticulture (the major portion), Flower Arranging, Indoor Gardening, Natural History, and A Gardener's Calendar. The Piscataqua Garden Club has tapped a host of authors who include the gamut from university professors and professional horticulturists to plain dirt gardeners; the only serious omission appears to be the name of this journal from the list given (page 80) of "Useful Magazines." This reviewer hopes this was the result of an oversight!

W. H. HODGE

Descriptive Catalogue of West Australian Plants

Edited by J. S. Beard. Published by the Society for Growing Australian Plants. 1965. 122 pages. Illustrated. (Library).

West Australia is noted for its wealth of wildflowers. Many of these are found only in this State of the island continent. Unlike other States of the Australian Commonwealth, West Australia, unfortunately, lacks a descriptive manual of its spectacular flora. A simple systematic list prepared in 1931 by the then government botanist, Charles A. Gardner, is the sole source of our knowledge of the plants of West Australia. Thanks to the editorship of Dr. J. S. Beard, Di-

rector of the new developing Botanic Garden in King's Park, Perth, we now have a modification and amplification of Gardner's census in this paperback published by the Society for Growing Australian Plants. In much abbreviated telegraphic style (following Gardner's taxonomy) each species is listed together with data (where available) on kind of plant, general size, flower color, flowering months, localities of occurrence, and soil and/or vegetation type. Some 38 species are illustrated with color photographs which, unfortunately, are not too well reproduced. There is a brief introductory description of the vegetational provinces of West Australia and—for the gardener—concise suggestions on planning, making, and maintaining a garden of native West Australian species. Notes on specific recommended subject and propagation problems conclude this handy reference book. In the United States this volume will be especially welcome to gardeners in Southern California where plants of West Australia find conditions most suitable for successful growth.

W. H. HODGE

The American Camellia Yearbook, 1966

Edited by Joseph H. Pyron, Amer. Camellia Society, Tifton, Ga. 1965. 345 pages. Illustrated in color and black and white. (Library)

The 1966 Camellia Yearbook contains a very informative collection of articles which are separated into eight major sections: Camellia Personalities, Culture, Travels, Varieties, Hybrids, Gibberellic Acid, Research, and Miscellaneous.

In the first section tribute is made to Charles Puddle, Bodnant Gardens, England, and Ferol (Mrs. Sam M.) Zerkowsky, Tammia Nursery, Slidell, Louisiana, for their separate work with camellias.

As always, the yearbook's section on culture brings forth an array of techniques and experiences, some new, some old, but always of the utmost concern to the dedicated camellia grower and hobbyist. The use of gibberellic acid in promoting better blooms, which in the previous yearbook was the subject of one article under culture, has this year been elevated to an entire section of six articles. Although the topic of much controversy in the past, gibbing apparently is here to stay.

New varieties in substantial numbers each year are a good sign of an active, thriving industry—and so must the camellia industry therefore be. This year's variety section, composed of seven articles on the subject, helps keep the camellia fancier well posted about promising new camellias now being offered.

Intra- and interspecific hybridization are the foundations of successful breeding and development of new camellia varieties. This subject is handled separately under two sections: Hybrids and Research. In the first, backyard hybridizing

covers in detail many of the steps which are important to amateurs and professionals alike in developing a successful procedure. The list of known interspecific hybrids is a staggering one and certainly is indicative of the long way camellia breeding has come in its search for the "ideal" camellia. It also leads one to wonder if this trend toward mixing up our camellia species might not possibly go too far. Under the section—Research, two new methods of inducing cuttings to root are discussed—one involving a nurse seed grafting technique, the other the use of germinated seed extracts. Last, but by no means least, is the discussion of the genetics of camellias and the camellia breeding progress report of the Los Angeles State & County Arboretum—further proof of progress toward breeding better camellias for all of us.

WILLIAM L. ACKERMAN

Trees for New Jersey Streets

By the New Jersey Federation of Shade Tree Commissions, Blake Hall, Rutgers, College of Agriculture, New Brunswick, N. J. 1965. \$1.00.

A booklet intended to serve as a guide in the selecting and maintaining of street trees. Suggestions are given on the general planting and care of young trees planted as street trees. Lists of trees are given based on mature size, on general shape and those for specific locations as on plazas or paved malls, near the sea shore or for planting under extreme city conditions.

The New Book of Foliage Arrangements

By Emma Hodkinsom Cyphers. Hearthside Press, Inc., 381 Park Ave. South, New York, N. Y. 10016. 1965. 152 pages, cloth. Illustrated. \$4.95. (Library). Members Price \$4.21.

This is a delightful, comprehensive and instructive book, full of know-how on preparing, treating and arranging foliage all through the year. There are 85 black and white photographs which should encourage everyone, from gardener—with an abundance of plant material—to apartment dweller—who may have to resort to material found beside the highways and byways, to make attractive arrangements of long-lasting materials. The Chapter on the use of evergreens for Christmas arrangements with suggestions on highlighting the materials with glitter, snow and accessories that mean Christmas, will be of interest to many.

The author points out in her short Chapter on Modern Arrangements that we need to be aware of ever changing concepts and technical innovation, to be able to enjoy the products of the many variables. Many will enjoy the pictures of the modern arrangements that will fit so beautifully in the contemporary home.

MARIE W. LEE

Adventure in My Garden

By Helen M. Fox. Crown Publisher, N. Y. 1965. 168 pages. Illustrated in color and black and white. \$4.95 (Library) Members Price \$4.20

Not many gardeners have set down the record of their long lives as gardeners and that is one of the major attractions of Mrs. Fox's latest book.

In it are recollections of the gardens of three distinct places, and of many projects that have been reported on in special books already published.

Some of the story as presented here will seem familiar to readers of her books and of her many contributions to our Magazine but the story is worth telling again and again, and particularly now, as some of it seems almost like a new vision of past performance, not a "total recall" as the popular hackneyed phrase goes,

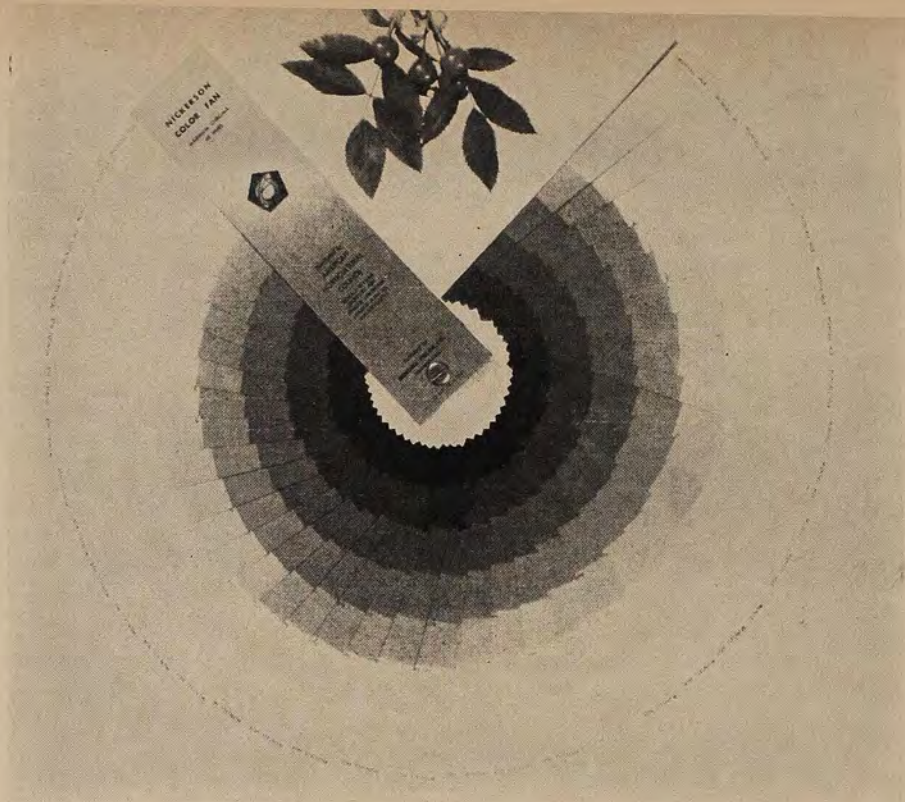
but a new evaluation of some of the things already supposedly finished and now seen in happy retrospect.

Needless to say, Herbs and Lilies come into their own special prominence, and yet, they do not overshadow any of the rest of the numerous and highly varied plant populations. These are all presented not only in relations of seasonal value, but in planting relations one to another. Enough is told of soil and climate as well as about cultural practices so that any intelligent reader can estimate precisely what is most pertinent for his attention and use.

The pictures are superb and the color plates, only twelve in number, are as distinct from the usual plate as any one might wish.

For the captious reader, there will be noted a few typographical errors, and there will be some differences of opinion about some of the plants chosen!

BYM



Nickerson Color Fan

The American Horticultural Society has been interested for many years in making available to the horticultural public a popularly priced color chart that could be used as a standard in all phases of horticulture. Accurate charts, in the past, have been too costly to publish at a moderate price.

No color chart, except those with a thousand colors or more, can contain all the colors needed by all the various horticultural

groups, but the Nickerson Color Fan, which has been approved by America's outstanding color foundation, can well become the standard everywhere.

Included with the color chart is a twelve-page booklet explaining the use of the fan in detail. Printed in small type, on each color, is the popular color name and its numerical designation in the Munsell System of Color Notations which is fast becoming accepted as standard by many

industries and societies dealing with color systems in America. The chart uses color names that have been selected as standard by the Inter-Society Color Council and the National Bureau of Standards.

Judges who have used the fan report that the color chips are so easy to handle, particularly when working with color classes, that they prefer it to any other color reference.

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A non profit organization for the benefit of the serious gardener.
All Officers and Directors serve without pay and the material used in the magazine and forum is donated by the authors. No paid advertising appears in these publications.
The nation's leading experts in many fields of horticulture give of their time and knowledge to AHS members.
Each year the Society holds a Congress. This is an opportunity to get to know other interested gardeners, and hear internationally known speakers discuss horticultural highlights.

AMERICAN HORTICULTURAL SOCIETY, INC.
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