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The National Horticultural Magazine

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Fig Trees for Ornamental Planting

IRA J. CONDIT

The genus *Ficus*, with its eighteen hundred species, shows a greater diversity of woody shrubs, vines, and trees than that of almost any other genus of plants. Scattered as they are throughout tropical and subtropical countries, the diverse forms have been utilized in many ways, the fruit for food, the bark for paper, the leaves for fodder, the latex for rubber and for medicine, the wood for timber, and many for ornamental planting.

It is not the province of this article to discuss such subjects as the botanical characters which distinguish members of the genus from other plants, the kinds or location of fig flowers, nor the relation of insects to pollination of the pistillate flowers. These are covered in detail by many other writers, among them being Lyon (1922), Williams (1928), Burkill (1935), Nehrling (1942), Corner (1952), and Barrett (1956). This article deals only with the species of *Ficus* which are planted for ornamental purposes, taking up first their hardiness and methods of propagation, then a discussion of those which grow as vines, as pot plants, as avenue or street trees, and as individual specimens.

Hardiness

Most species of the genus *Ficus* are native to tropical or subtropical climates and are not hardy in the ordinary sense of the term. Some are deciduous or partly so and may thus escape seasonal frost damage. The following species have been sufficiently tested in California to prove their resistance to moderate cold weather, with tempera-

tures down to about 25° Fahrenheit: *F. macrophylla*, *F. columnaris*, *F. rubiginosa*, *F. ovata*, *F. platypoda petiolaris*, *F. watkinsiana*, and *F. mysorensis*. *F. retusa* needs protection if temperatures drop to 25°. *F. pumila* on walls is hardy except for tender tips, at considerably lower temperatures. On the other hand, *F. benjamina* and *F. elastica* are likely to be injured by three or four degrees of frost.

As Mary Barrett reports, some species may be killed to the ground by a heavy frost but trees are renewed from the base. This has occurred at the Huntington Botanical Garden in California with *F. capensis* and *F. thonningii*. *F. lyrata* growing in a canyon near Los Angeles was frozen almost to the ground by a temperature down to 27°. At the same place *F. elastica* suffered injury at 27° while another tree on a higher location was not injured. Trees of *F. racemosa* and of *F. gnaphalocarpa* on a hillside at Riverside, California, were frozen to the ground at about 25° but suckers soon sprouted from the base. Banking soil around the trunk early in the season will serve as protection and prevent the total loss of specimen trees.

Methods of Propagation

Most species of *Ficus* can be readily grown from soft-wood cuttings if these are secured from plants under lath or glass cover. Cuttings from outdoor trees on the other hand are often difficult to root. This is true with *F. macrophylla* in California. It has been found in Florida that *F. auriculata* is difficult to grow from cuttings and that layering is more successful. Florida nurserymen found that cuttings of *F. aurea* struck root readily and young trees grew faster than those of *F. elastica*.

Patterns of the Fig Leaves

The palmately-lobed leaves of *Ficus hirta* (top, left) resemble those of the common fig, *F. carica*. *Ficus quercifolia* has leaves resembling those of an oak and fruits which look like small acorns (top, right). The leaves of *F. eriotrotyoides* (bottom, left) might be mistaken for those of a loquat. The palm-like fig, *F. pseudopalma*, with its long, drooping leaves (bottom, right), somewhat resembles certain palms.

Plants of the Common Rubber Tree may be grown from leafy cuttings twelve to eighteen inches long. Such a method is successful and fine plants may be secured within a few weeks' time, but too much wood is required for use on a large scale. Leaf-bud cuttings may also be utilized. A bud with a single leaf attached is cut exactly as though it were to be used in shield budding. The best results, however, are secured by using tips with four or five leaves attached. These cuttings should be rooted in a propagating frame with high humidity, such as is maintained by a fine spray of water.

A standard method of propagating many tropical plants is by marcottage, popularly called "mossing." This consists simply in making a cut into a twig and wrapping moss around the wound. The method has been greatly facilitated by the use of a polyethylene cover which is wrapped tightly around the moss to prevent drying out.

The budding or grafting of fig trees is seldom practiced, but can be successfully done in spite of exudation of the milky latex. Thus at least two species, *F. racemosa* and *F. gnaphalocarpa*, have been used experimentally as nematode-resistant stocks for the Common Fig. Further work on the compatibility of the different species might show interesting if not profitable results.

Figs as Vines

Ficus pumila, the Climbing Fig, outranks the Boston Ivy as an evergreen vine in California and Florida. Its twigs cling tightly to brick, cement, or wood and, if allowed to spread, will eventually cover buildings several stories in height with dark green foliage. The branches which grow out from the wall must be sheared off occasionally to control the straggly appearance of the vine. In this country, the large figs of *F. pumila* drop, but in South China, where the plant is native, the flowers are pollinated by an insect which causes the fruit to mature and become edible. This species belongs to the same group of the genus as the Common Fig *F. carica*. A few years ago the writer produced a hybrid by pollinating the flowers of this evergreen-vine fig with pollen of the deciduous-tree fig. The resulting

plants are intermediate between the two, but so far none has been selected which has either ornamental or fruiting value. *F. pumila minima* is a small-leaved form of the above which in some respects is more graceful and ornamental than the species itself.

Ficus megacarpa grows in the Philippines into an immense vine which produces quantities of fuzzy, red fruits as large as billiard balls. The leaves are small, resembling those of *F. pumila minima*. It was introduced into Florida as P. I. No. 134991 but has not been widely distributed. In California, young plants grew luxuriantly in a humid propagating frame but failed to thrive when exposed to dry air outside. It deserves further trial.

Ficus villosa, the Shaggy Fig, has leaves and fruits conspicuously decorated with a reddish-brown pubescence. A native of the Malayan countries, it has been introduced into Florida where it is reported to be growing but its identity is questionable.

Ficus quercifolia, the Oakleaf Fig, is not a true vine but grows more as a trailing shrub in the Malayan archipelago. The leaves are extremely variable but commonly resemble those of certain oaks. In the United States, it is being grown in conservatories as a trailer or used in hanging baskets. Figs appear in axils of leaves even on small plants.

Two other vine-like or trailing figs may also be included here. *F. radicans* is useful as a ground cover in Florida. A variegated form of it has long been grown in Europe and more recently in the United States for use in hanging baskets. The identity of a fig grown in Cuba and in California as *F. scandens* is in doubt. The branches trail on the ground and take root at the nodes.

Figs as Pot Plants

No other species of *Ficus* has been so long propagated or so widely distributed for culture in pots as the India Rubber Fig, *Ficus elastica*. Hundreds of thousands of plants are grown and sold each year and the species has therefore become widely known outside of its native environment. This Rubber Plant is so well known that it needs no detailed description here. Like many of its close relatives, *F. elastica* is variable and several varieties have been distrib-

uted. Probably the oldest and least popular for pot culture is *variegata* which may fail to produce enough chlorophyll in the leaves to keep the plant healthy. Another is *rubra* which, as the name indicates, has red coloration in terminal buds, petiole and midrib of leaf. The latest and most ornamental variety of the India Rubber is *belgica* (also called *decora*) which has unusually large and broad leaves tinged with scarlet when young. Recent correspondence shows that this variety originated in Belgium about thirty years ago as a seedling of *F. elastica*.

A writer in the *Saturday Evening Post* for July 19, 1941, quoted a statement that the Fiddleleaf Fig, *Ficus lyrata*, is replacing the old rubber plant for pot culture. Certain it is that many are being propagated and sold but they are certainly far behind the rubber plant in total number grown. The large, glossy leaves produce a striking effect in a vestibule or patio, but may not be so resistant to dry air and dust as are leaves of *F. elastica*.

The two species just described practically monopolize the market for figs in pots. Some others, however, are being grown. *F. macrophylla* and *F. columnaris* are sometimes found and may easily be mistaken for the common rubber plant. A California nurseryman has recently introduced young plants of *F. altissima* which bear bright scarlet figs in profusion on young twigs. Both *F. retusa* and *F. benjamina* may be grown to a considerable size in large pots or tubs and kept in shape by judicious pruning. The variegated leaves and fruits of *F. parcelli* are striking in appearance but the plants have little if any place other than in a warm conservatory. *F. diversifolia*, the Mistletoe Fig, is grown more as an object lesson for botany classes than as an ornamental plant. A very recent candidate for popularity as a pot plant is *F. hillii* introduced from Australia by Willard Hagen, Arcadia, California. It has a weeping habit and somewhat resembles *F. benjamina*.

Figs as Avenue or Street Trees

Few if any ornamental figs are suitable for planting in the narrow strip between sidewalk and curb of the ordinary city street. Experience in Cali-

fornia and elsewhere has shown that shallow, spreading roots heave up pavements, crack cement curbs and generally cause trouble. In Mexico, some species are thus planted but the tops are controlled by heavy pruning. Even along broad avenues or highways, the branches of certain fig trees spread too widely for traffic or have prop roots which must be controlled. However, attention may be called to the following which are planted and used for decorating avenue borders in climates more tropical than that of California.

Ficus retusa (*nitida*), the Indian Laurel, is probably more widely planted for shade and ornament than any other member of the genus. Most cities in Mexico, Central America, and South America show trees of various ages and sizes up to those with trunks five and six feet in diameter. In North Africa its shade has long been a welcome feature of boulevards. Magnificent trees of the Indian Laurel line great stretches of the main highway of the Island of Cuba. The companion tree, *F. benjamina*, is equally pleasing, the arching branches meeting over the pavement and forming a shady tunnel or canopy for the traffic below.

Ficus altissima, the Lofty Fig, has been widely used as a highway tree in southern Florida, but the spreading branches must be kept in bounds and the foliage treated to control various pests. *F. religiosa* has an upright habit of growth and presents a very ornamental appearance in central parkway strips at Coral Gables. This species, like some other fruiting trees, is somewhat objectionable on account of the litter produced on the ground or sidewalk by the profusion of fallen figs.

Ficus lyrata, according to Nehrling, is the finest and most beautiful of all rubber trees for street planting. Nehrling also states that *F. aurea* is a feature as an avenue and shade tree at Naples, Florida. The same author gives *F. brevifolia* (*populnea*) as more open in growth than *F. aurea* and "is excellent for planting along highways, and even as an avenue tree in cities." Nehrling recommends *F. infectoria* as a "most valuable tree for gardens, avenues and highways, being attractive in form and foliage, and showing a drooping habit of growth." An unidentified species with

weeping branches was introduced by David Fairchild from the Celebes and has been propagated in Dade County for street planting.

Figs as Specimen Trees

Specimen fig trees may be discussed under three more or less distinct headings: Banyan Types, Cauliflorous Trees, and Miscellaneous Specimens.

Banyan Types. Many species of *Ficus* show the banyan habit, *i.e.*, the development of aerial roots from horizontal branches, the attachment of the root tips to the ground, and eventual formation of multiple trunks. Seldom do trees in California grow into real banyans for the tips of hanging roots usually dry out before they reach the ground. But in more tropical countries the spreading tops and numerous trunks make the planting of such trees impractical except on spacious grounds. *F. bengalensis* is probably the best known and most celebrated of the banyans, reaching enormous size in India. One near Poona is reported to be over two thousand feet in circumference of top. A large specimen has long been growing in the public square at Lahaina, Honolulu. In Florida, there are many fine trees of this species but they are not so common as are trees of *F. altissima*. Few good specimens are found in California. A bud sport of *F. bengalensis* with peculiar, cup-shaped leaves has been described as *F. krishnae*. It is more curious than ornamental.

Those who are familiar with *F. elastica* only as a plant in a pot or as a small dooryard tree can hardly visualize the tree as growing like a banyan, but Mary Barrett says that the Common Rubber Tree develops into one of the largest species of *Ficus* in Florida with the spreading branches supported by many prop roots. The main objection to its general use in yards or along streets is the surface root system which spreads in all directions. A fine specimen at Whittier, California, had to be removed on account of this objectionable feature.

A third banyan type is *F. altissima* sometimes called the False Banyan because of the relative paucity of prop roots. Trees of this species are common in Florida, the largest and oldest being in the vicinity of Punta Gorda. On ac-

count of variability in leaves and fruit, parent stock with desirable characters should be selected for propagation. Although introduced long years ago by Dr. Franceschi, there seem to be no good specimens of *F. altissima* now growing in California. A few years ago one fine tree did thrive and produce its bright red fruits at the University Botany Garden in Los Angeles but had to be removed to make way for roads.

Variety *nitida* of the Indian Laurel often develops prop roots like those of the true banyans and in this respect differs from the typical *F. retusa*. *F. nekbudu (utilis)* is very similar to *F. vogelii* and the two are sometimes regarded as identical. The leaves of both species are large and leathery and in Florida the tree has multiple trunks. There are good specimens growing at San Marino, Montebello, and San Diego in California, but without prop roots.

Cauliflorous Trees. Cauliflory, the production of flowers and fruits from trunk or large branches, is found in a few species of *Ficus*. A good example is *F. sycomorus*, the true sycomore which is sometimes included in collections of Biblical plants. However, trees of this species have little to recommend themselves for ornamental planting. The litter of fallen fruit is one objectionable feature of the sycomore. At Coconut Grove in Florida, Dr. Fairchild planted three sycomore trees in his garden in 1917. They grew so fast and made so much shade that two of them had to be removed. A large tree growing in Lincoln Park, Los Angeles, had to be taken out, but young plants propagated from it are now growing in a few localities.

Ficus racemosa (glomerata) is known as the Cluster Fig on account of the large clusters of fruit borne on the trunk. This again is a species which can be recommended only for parks or large estates. On the Isle of Pines young trees are said to grow rapidly and to be used as low windbreaks for gardens.

Ficus capensis, the Cape Fig, has become well established in Botanical Gardens in California, Florida, and Cuba. Two California nurseries brought in fertile seeds from Africa, grew numerous plants, but discarded them on ac-



The dense bunches of small figs borne by *Ficus caudatifolia* (left) have a strong resemblance to the red lady beetles in a resting condition. The clusters of fruit on the trunk and large branches show that *F. racemosa* is well named the cluster fig (right).

count of lack of interest in the ornamental value of the seedlings.

Ficus roxburghii (*auriculata*), Roxburgh's Fig, does have pronounced ornamental value as shown by specimens found both in California and Florida. It forms a low-spreading tree or large shrub with leaves a foot or more in diameter. The most ornamental period for the plant is in the spring when it is decorated by the maroon or mahogany colors of the new foliage. A good description and illustration of the plant with its large fruit clusters at base of trunk is given by David Fairchild in the *Journal of Heredity* for December, 1927.

The clusters of fruit borne by a species grown in Florida as *F. caudatifolia* (P. I. No. 137962) are here illustrated. The figs greatly resemble bunches of red lady beetles in a resting condition.

Miscellaneous Specimens. In addition to those already described above, there are some specimen trees especially suited to parks and large estates. One is the

Loquat-leaved Fig, *F. afzellei* (*eriobotryoides*). It is well named for its leaves do have a strong resemblance to those of the loquat. Trees of this species growing in South Florida and in Cuba have a striking appearance and are distinctly ornamental.

Ficus eximia glabra, introduced from Paraguay, is making a vigorous growth in California. The tree has a distinctive appearance because of the dark green leaves which droop on the petioles so that the upper surfaces face outward. A Mexican species, *F. bonplandiana*, deserves more attention as an ornamental, judging from the behavior of specimen trees growing near Orange, California, and at Orlando, Florida.

A species introduced by David Fairchild and named after him is *F. fairchildii*. A tree at Coconut Grove, Florida, has a buttressed trunk over four feet in diameter, with medium-sized leaves somewhat pubescent when young. An introduction from Java under P. I. No. 73995 has been grown in Florida



Growth Habits are Also Diversified

- Top left: The deciduous Roxburgh's fig, Ficus roxburghii has large leaves of a beautiful mahogany red when they first unfold.*
- Top, right: This stately tree of F. padifolia in a Mexican cemetery shows that it does have ornamental possibilities.*
- Bottom, left: The multiple trunks of this Florida specimen of F. elastica emphasize the need of such trees for plenty of room to spread.*
- Bottom, right: This tree of the Moreton Bay fig, F. macrophylla, had a massive buttressed trunk and a branch spread of 124 feet in 1935.*

as *F. fulva* but is probably better identified as *F. hirta*. The plant grows as a bush with palmately-lobed leaves somewhat resembling those of *F. carica*.

F. goldmanii, Goldman's Fig, is a native of Mexico where the tree reaches magnificent proportions of trunk and spread of branches. It has been introduced into California where it makes vigorous growth but may not prove to be winter hardy. Another Mexican species, *F. padifolia*, shown in illustration, is well worthy of trial as an ornamental.

Of all the fig trees introduced into California, none reaches the regal size of *F. macrophylla*, the Moreton-Bay Fig of Australia. Recent measurement of a tree in Orange County shows a girth of twenty-two feet with two large framework branches up to three feet in diameter. Other specimens as large if not larger are common. Because of the immense size of the tree with its buttressed trunk, it does need abundant room in which to spread.

Another specimen which reaches large size is *F. rubiginosa*, the Rusty-leaf Fig. Trees of this Australian species are variable in habit of growth and pubescence of leaves. One form with very little pubescence is commonly known as *F. australis*. Trees of two distinct types have recently been selected to ornament the campus of the University of California at Los Angeles. A third Australian fig which has long been established both in California and Florida is *F. watkinsiana* (*bellengeri*). Fine specimen trees are to be seen at Los Angeles, Santa Barbara, and San Marino, California.

The following species are not commonly grown but deserve consideration for further trial. *F. monckii* from Argentina is deciduous for a short period in winter and is growing well at Los Angeles and Arcadia. *F. mysorensis*, the Mysore Fig of India, has proved its value as an ornamental both in California and in Florida. The large figs are orange red in color and add to the attractiveness of the plant. The fruitful

twigs without leaves are reported to keep for several days with or without water and are therefore useful for table decoration.

Ficus nymphaeifolia, the Waterlily-leaved Fig, is represented in Florida by several trees, conspicuous on account of the large heart-shaped leaves, green above, whitish on lower surface. Trees of *F. ovata* have long been growing at Oxnard and at Santa Barbara, California, and should be tested as ornamentals elsewhere. The white-barked *F. petiolaris* of Mexico has been introduced and trees are growing in both Florida and California. The young cordate leaves are especially ornamental on account of scarlet petioles and veins.

Ficus pseudopalma, as the name indicates, has palm-like leaves a yard or so in length. A few fine specimens are found both in Hawaii and in Florida and numerous seedlings have recently been grown by a California nurseryman. Introduced as seed in 1936 from East Africa where it is a common shade tree, *F. thonningii* has become established at San Marino and San Diego, California.

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Magnolia acuminata

Around the eighteenth century Peirce homestead (left foreground) may be seen some of the old trees of Peirce's Park. This giant cucumber tree, Magnolia acuminata, planted by the Peirces, is one of Longwood's oldest trees.

Longwood Gardens¹

W. H. HODGE²

Few realize that the horticultural plantings built up by the late Pierre S. du Pont, forming what is now known as Longwood Gardens, had informal beginnings two and a half centuries previously when William Penn, in 1701, deeded a parcel of some 500 acres of land to a fellow Quaker, one George Peirce.

In a land where forests were being cleared many Quakers still liked to plant trees as ornamentals and the Peirce family was no exception. Even though a homestead had to be built (1730) and land cleared, the Peirces still found pleasure in what was by some of their neighbors considered a useless thing, the starting of an arboretum. This was the special hobby of the Peirce brothers, Joshua and Samuel, descendants of the original George. By 1800 they had laid out plantings which, until the first years of the twentieth century, were to become locally famed in Chester County under the name, "Peirce's Park." On the slopes surrounding the brick family manse, they established what was for them an unusual assemblage of trees both native and exotic. Among them were fine pines and hemlocks, European horsechestnuts and American buckeyes, several species of magnolia, handsome hollies, old world yew, swamp cypress (*Taxodium*), and one of the first Ginkgo trees said to have been planted in this country.

Certain of their plants may have been obtained through exchange with some

fellow Quaker garden enthusiasts who had also started plantings in the Philadelphia area, for not so far distant was Bartram's Garden, Humphrey Marshall's place in nearby Marshallton, and the collections of trees at the Tyler Arboretum at Chester. But many a treelet came through the Peirce's own hard labor and travels. Some of the plants were brought in as "frail little withes . . . carried in the saddlebags on a favorite horse of Mr. Peirce, who from time to time would have to dismount and by means of sprinkling their roots with water kept them alive until they reached their destination." Thanks to the guardian care of a tree-loving family and to the bounty of the fertile Chester County soil, the trees prospered. By the end of the nineteenth century, they had in many cases formed magnificent mature specimens which were admired by the numerous visitors whom the Peirces freely admitted to their "Park." Thus it was that in 1906, when Pierre S. du Pont acquired the old Peirce property, the nucleus of an arboretum was already in being.

"Peirce's Park" was a fortunate purchase, for the new owner was by avocation as much a lover of trees as were the original Peirce brothers, Joshua and Samuel. As a matter of fact, although he may have been intrigued by the arboretum, it was a sawmill's ominous threat to one of the "Park's" fine old woodlots that inspired Mr. du Pont to buy the place. On that day when the property became his own even he probably had no exact idea of what was to be accomplished during the next half century when Longwood, as Peirce's Park soon became known, blossomed under his enthusiastic direction. What it has become is easily noted by more than 300,000 persons who annually—and as with the Peirces, without charge—visit the place, for the estate, now

¹Located at Kennett Square, Chester County, Pennsylvania. This account is limited to a description of the Gardens as a horticultural center. Other Longwood attractions of a non-horticultural nature include electric fountain displays, special Sunday organ recitals, and sponsored benefit events in the main conservatory or in the Open Air Theatre. Longwood Gardens is open to the public every day of the year without charge. Outdoor gardens may be visited from sunup to sundown, while the conservatories are open from 11:00 a.m. to 5:00 p.m.

²Head, Department of Education and Research, Longwood Gardens.



The main conservatory and fountain garden (foreground) as seen from the rectangular fountain basin.

known as Longwood Gardens, has grown to the point where it is considered one of America's most distinguished horticultural showplaces. Around the core of the tree collection at "Peirce's Park" were added several new developments including a new and larger arboretum, extensive flower gardens, a unique open-air theatre, unusual formal gardens incorporating spectacular fountain displays, and a large conservatory building which, with its companion greenhouses, contains over three acres under glass.

Taken as a whole, the Garden developed by Pierre S. du Pont is unlike any other in America. The emphasis on formality, the use of such decorative elements as fountains and classical porticos, and the presence of a great greenhouse all show the influence of the eighteenth and nineteenth century gardens of Britain and the Continent—gardens

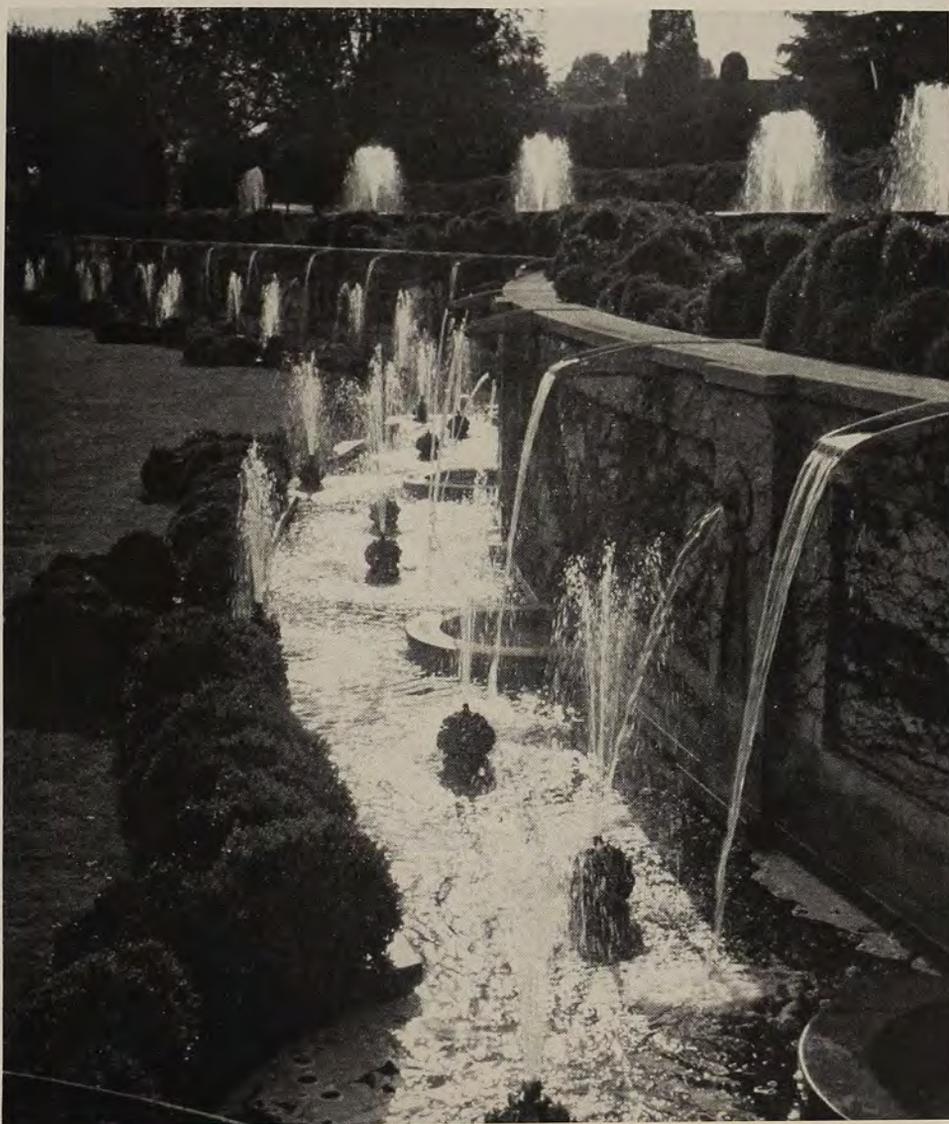
such as Kew and Hempstead in Britain, Versailles and Fontainebleau in France, or those in Italy such as at the Villa d'Este at Tivoli and of the Borghesi in Rome. That this should be is natural for Pierre S. du Pont, American descendant of an old and distinguished French family, who was a frequent traveler to the Continent and was familiar with all the outstanding gardens abroad.

Europe's contribution to outdoor garden design at Longwood appeared first in 1925 with the construction of a formal water garden on the site of an old swamp. During the previous decade horticultural activity had been devoted to the enlarging of the old Peirce arboretum, to establishing complementary flower gardens near by following the form of early American gardens, and to constructing the large conservatory described below. The building of the Water Garden followed a trip Mr. du

Pont made to Italy where he visited the garden of the Villa Gamberaia near Florence. In design, the Longwood Water Garden duplicates that to be found at the Italian Villa except that certain of the plant materials differ. For example, at the far end of the Water Garden at Longwood is a hemlock hedge rather than the clipped cypress trees characteristic of the original. The form of the garden and the blue-tiled pools follow in size and shape their Italian counterparts except that fountains have been added at Longwood.

Formal though it is, the compact size of the Water Garden gives it a more intimate charm not found in Longwood's most familiar display, the great Fountain Garden. This was built during the period 1929 to 1931. Matching in size a full city block, this garden in Old World style was developed to display properly, during night or day, the splendors of Longwood's outstanding fountains. Viewed from the vantage point of a special observation terrace, one sees at the lower level below a great rectangular green lawn with hidden

Detail of a fountain basin in the main fountain garden.



All illustrations accompanying this article were made from photographs taken by G. Hampfer, Longwood Gardens.

fountain basins bordered with plantings of old box. Around the peripheral walks are twin rows of Norway maples carefully trimmed to cubical form to keep both the feeling of formality as well as not to obstruct the view of the main fountain basin. The latter occupies a terrace at a higher level so that colored light displays may be readily seen. A low rolling hill, the site of the new arboretum, serves as a backdrop to this massive formal garden.

Some visitors consider that Longwood's superb outdoor gardens are secondary attractions compared to the floral displays to be seen year round in the great conservatories. The largest of these, dating from 1920, is a building some 650 feet long and up to 40 feet tall, a size ample enough for any kind of horticultural show. Pierre S. du Pont insisted that familiar flowers be superlatively grown and displayed the year round in this great greenhouse, which has been open to the public ever since it was built. That his desires are still carried out is apparent to even the casual visitor, for whether the plants be amaryllis or chrysanthemums, tulips, stock, Schizanthus, primroses or begonias, they have one thing in common—all are outstanding display specimens and would take top awards in any competition.

The principal conservatory includes a spacious interior with inviting green lawns hemmed in by permanent beds used for artful display of flowering materials. The great supporting pillars of this glasshouse give an illusion of tree trunks covered as they are almost completely by the branches and foliage of the climbing fig (*Ficus pumila*). Most materials are grown in pots in adjacent production greenhouses and at maturity are brought into the large conservatory where they are planted out temporarily for display. To assure a top floral display, specimens are replaced regularly before they have a chance to pass their prime. Anyone who has had experience in growing on plant material for one of our great national flower shows will realize the great deal of effort required to set up exhibits for only a few days' duration. Multiply this to cover a year-round show and some realization can be gained of the intricate

time table that must be followed by Longwood's horticulturists, who have a first-class flower show to maintain every day of the year. From this one can readily understand why Longwood Gardens must refuse to exhibit elsewhere. All her efforts are needed to put on her own continuous show.

Naturally, the conservatory display varies continually through the year. Because of the vicissitudes of the seasons, it has low and high points, one of the latter being the weeks immediately prior to Easter during which an unusual wealth of material, especially spring-flowering bulbs, is on display. The person who is lucky enough to visit Longwood periodically through the year will find among the more familiar plants some species not so frequently met with in indoor collections. In this category fall Javanese rhododendrons (*Rhododendron javanicum*), the handsome pink vine, *Mandevilla splendens*, Mallow trees (*Lavatera*), *Pittosporum*, the blue-flowered *Pyncostachys dawei*, *Medinilla magnifica*, *Veltheimia viridifolia*, blue amaryllis (*Hippeastrum procerum*), and certain of the blood lilies (*Haemanthus*).

There are also other specialties perhaps not so rare but generally associated with the Longwood conservatories. One such is the Scurvy acacia (*Acacia leprosa*) whose scented foliage is trained to form feathery arches over one of the main corridors. Shortly after the first of the year multitudes of ball-like flower clusters suffuse the corridor seemingly with golden mist. A month later other Australian acacias become so striking that they are often displayed along with spring flowers in a temporary indoor garden with pebbled walks.

About the same time, during late February and March, and in the same greenhouse, an outstanding indoor planting of camellias (some 106 varieties, certain of which are trees ranging up to twenty feet tall) is in full bloom. Concurrently in an adjacent range, one can see the rare spectacle of great pink fans of meticulously espaliered nectarines. These represent choice greenhouse varieties imported from England in 1919. A favorite fruit of Mr. du Pont, they produce regularly year after year. April brings on the peak of



In the main conservatory at Longwood Gardens, fine specimens of tree ferns are to be seen; *Al-sophila australis* (left, tall ferns) and *Cibotium schiedeii* (left, low growing). *Acacia leprosa* may be seen in another section of the conservatory (right)

conservatory displays for, besides the superb planting of spring-bedding flowers, there is a fine showing of cymbidium orchids, a collection of outstanding amaryllis (one of the few plant groups that has been hybridized at Longwood), and a large conservatory ablaze with tender azaleas, mostly *indica* types.

With the coming of May, there is a gradual shift of interest from the conservatory to flowering materials in the outdoor plantings. Yet there are still choice plants to be seen indoors, for example this month finds exotic Orchid Cactus (*Epiphyllum* hybrids) in the Succulent House. In June, bougainvillea may be found high overhead in the main conservatory, while for an unbelievable length of time throughout the summer and fall, the rare apocynaceous

vine, *Mandevilla splendens*, is full of gorgeous pink blooms. Late fall completes the season indoors with a chrysanthemum show in which all horticultural types—represented by over 250 different clones—of these favorite plants are featured.

Elsewhere in this country plants trained as standards are no longer as commonly grown as in past years. Longwood still maintains an outstanding collection which may be seen throughout the year indoors, including roses, fuchsias, bougainvilleas, lantana, tibouchina, jasmine and wisteria. Other favorites in the conservatory, of which examples may be seen at any season, are the orchids. Longwood is particularly rich in display types with over five thousand plants in over a hundred genera. The orchid collection owes its quality to the fact that in it are

incorporated the plants of the late Mrs. William K. du Pont, a noted orchid fancier. Last but definitely not least—if only because of their size—one should mention the fine specimens of Australian tree ferns which for over thirty years have graced the indoor conservatory auditorium.

All that has been described both indoors and outdoors has long been associated with the Longwood Gardens of Pierre S. du Pont. Had it not been for his vision all this might well have been lost after his death in 1954. Fortunately, as early as 1937, Mr. du Pont had already taken the necessary steps to assure the permanence of Longwood Gardens. In that year he incorporated the Longwood Foundation, established as a non-profit philanthropic organization, charged by the stipulation of his will to the care and improvement of the Gardens, as well as other charitable activities designed to promote the public welfare.

Longwood Gardens has been operated since 1954 by the trustees of Longwood Foundation, Inc. One of their first duties was the appointment of an executive director to reorganize Longwood following the stipulations laid down by Pierre S. du Pont. Dr. R. J. Seibert, appointed director in 1955, has had broad scientific training in botany and much practical experience in horticulture, having come to Kennett Square from a stimulating job as administrator in charge of developing the young Los Angeles State and County Arboretum. Among the first things to be done by him was the initiation of activities that would help give better balance to Longwood and enable it to be not solely an outstanding show garden but also an organization which might rank creditably in the horticultural world, because of new educational and research programs, with such institutions as the Arnold Arboretum and the Brooklyn Botanic Garden.

One necessarily basic activity begun in 1955 was the making of an inventory of all Longwood plants. As a private garden, such a program was hardly necessary, but, in anticipation of such new activities as plant exchange with sister institutions, the planning of new display gardens, the upgrading of the old collections, the over-all task of mapping the grounds, and the like, a plant inventory

was now absolutely necessary. No inventory is possible without proper identification of the plant collections, often a difficult thing when ornamental cultivars are involved. An early addition to the new scientific staff thus included a trained plant taxonomist. A cooperative arrangement with the Bailey Hortorium of Cornell University, permitting free use of the extensive herbarium and library facilities of that institution, has made it unnecessary at present to plan either a large research herbarium or an extensive botanical or horticultural library. However, a small herbarium of voucher specimens of all plants represented in the living collections will be made. To augment the herbarium, complete photographic files of Longwood Gardens' plants, both in color and in black and white, are being assembled for use not only as scientific records but also as aids to the new educational program. Likewise, books needed as work tools or references will be required to form a suitable working library.

One immediate result of the work of plant identification and inventory is the initiation of a program of labeling the living plant collections. More favorable comment has come as a result of this work than any other new activity at Longwood, for labeling has increased immeasurably the usefulness of Longwood's plant collection to the visitor.

The program of identification and inventory is also serving to point up the gaps that exist in the plant collections at the Gardens. Wherever possible and when they fit into the over-all objectives, attempts will be made to have all important horticultural and botanical groups of plants represented either in the conservatories or in the outdoor plantings. An active program of introduction of new plant material has already been started. For example, during 1956, over 2,500 new species, varieties, or clones were brought into the Gardens.

In the past, outstanding new ornamentals or better selections of well-known species or varieties have usually found their way into the Longwood collections. This phase of the old introduction program will continue, but, in addition, many other kinds of plants are now being introduced for eventual display which, because of lack of outstanding



The camellia collection, with over a hundred varieties, is the largest growing indoors in this country.

An ample bulb cellar is required to assure a continuing conservatory show of spring-flowering bulbs during the first quarter of the year.



ornamental value, previously had not been considered. Examples include the numerous economic plants—sources of food and spices, drugs, fibers, wood, rubber, gums, resins, oils, waxes, or other industrial products; plants interesting because of unusual form or structure, for example, epiphytes, bizarre succulents, or the carnivorous plants; and also those more strictly considered as “botanicals” which, like the cycads and ferns, illustrate important groups of plants. It is felt that the careful addition of a wide variety of plant types such as these will serve not only to better balance the horticultural displays that Longwood has to offer but will also help to attract a greater sampling of the public, particularly those who may prefer a little more of the botanical garden flavor in horticulture.

As new materials have accumulated, it has been possible to plan new display gardens or to modify older ones. Outdoors, attention has been focused first on modifying pre-existent gardens so as to bring them within the plans of the new program. For example, the garden which formerly existed solely to supply vegetables for the estate dinner table has been changed to demonstrate as wide a range of edible garden plants as possible, along with methods of culture that are useful to the average home gardener. Also added is an herb garden, a garden of hardy economic plants, and a collection of dwarf fruit trees. The arboretum, at present relatively poor in species, is gradually being amplified. Newest ornamental garden is the series of thirteen outdoor pools in which may be seen an outstanding display of tropical waterlilies. Actually, the outdoors offers the greatest scope for future development at Longwood either for special gardens or for new mass, group, or generic plantings. Only about a tenth of the total acreage has been developed and not all of this fully; the remainder, at present in farm land, eventually will be developed.

Education, in the formal sense of the word, is a completely new activity on the Longwood Gardens scene. Although it ties in directly and indirectly with much that has been discussed above, it is more frequently associated in the public mind with such things as formal tours, demonstrations, lectures, courses, and publica-

tions. In 1957, the real initiation of a formal education program began with a programming of an annual series of public horticultural lectures as well as a series of demonstrations of common horticultural practices. Activities of this sort require certain physical facilities, such as lecture rooms, auditoriums, laboratory facilities, and the like, which are yet to be constructed. Consequently, this program has yet to expand dynamically.

Nevertheless, there have been measurable advances in this program and in the related field of public relations. A new Information Center is in operation at the west entrance to the Gardens. Besides dispensing both general and horticultural information, it acts as a welcoming center for visitors. It also serves as the coordinating point for a new program of guided tours offered to certain special groups, particularly school classes, garden clubs, or other more strictly horticultural groups. With its program expanding, regional and national horticultural societies are also finding Longwood Gardens an unusually attractive spot for scheduling annual or special meetings, and each year more and more of these organizations are taking advantage of our facilities.

Concomitant with the growing work in education is also a program of publication. At the start essential literature, such as guide maps and guide books for popular consumption, received primary attention, but a new series of popular booklets dealing with outstanding plant groups or attractions in the gardens has also been started.

A research program is yet to be developed at Longwood Gardens. Such research when it develops will follow more practical aspects of horticulture. For example, special problems related to the breeding of ornamentals of interest to the Gardens may well be considered. However, before that time arrives both trained researchers and research facilities will be needed. In the meantime, certain lines of research of interest to Longwood conducted elsewhere are receiving support through grants of the Longwood Foundation. Of special interest is the cooperative work with the Plant Introduction unit of the United States Department of Agriculture in which financial support is being given by the Long-



Moving a tree, Abies nordmanniana, at Longwood Gardens. Beyond is the fountain garden and, in the right background, a part of the new arboretum.

wood Foundation for the sustained exploration for and introduction of new ornamental materials from abroad. This phase of Federal plant exploration has never received sufficient attention from Congress in the form of funds. Financial support from the Longwood Foundation is aimed at trying to at least partly remedy this situation. In this program two explorations have already been completed, one in Japan and the other in the countries of southern Europe. As other worthwhile areas are shown to merit exploration, it is expected that proper support will be provided. This program is of special interest since it should benefit not only the cooperating parties but also all ornamental horticulture in America.

From the above it can be seen that Longwood Gardens, with a bright past,

is headed towards an even brighter future. At a time when most horticultural establishments both here and abroad are having to retrench because of diminishing investment returns these gardens, with an ample endowment, are able to progress in the opposite direction.

Longwood's growing interest in the more basic problems of horticultural practice, research, and education cannot fail to strengthen her position among her sister institutions of the horticultural world. Yet her primary objective will remain that of her founder—growing and displaying superlatively the finest ornamental materials available. With continued expansion along these lines assured, Longwood Gardens should easily remain one of this hemisphere's most outstanding horticultural show-places.

Hydrangeas

ELIZABETH McCLINTOCK

It has been said that during the years of exploration of the earth's surface after the discovery of America, men went out in search of gold, drugs, and spices. But not all who explored looked for these three commodities and the financial profit which they accrued. There were a few who sought new, interesting, and unusual plants in unknown regions. To these men we are indebted for many of our garden plants and much of our knowledge of the plants and vegetation of the world. Because of the ornamental nature of some of the species of *Hydrangea*, many early collections of these plants were made in North America and eastern Asia for introduction into European gardens. The present paper tells the story of some of these early introductions. A botanical key and some of the technical characters of the cultivated hydrangeas are given in an earlier paper (22)*.

The temperate regions of eastern Asia have yielded countless lovely ornamental plants for European and American gardens. Among these are rhododendrons, azaleas, lilies, viburnums, primulas, flowering cherries, and hydrangeas, to mention only a few. Because both China and Japan were inaccessible to foreign exploration until about the middle of the last century, it was not until then that the western world became aware of the wealth of plant materials to be found there. Before the mainland of China and the islands of Japan were open to outsiders, a few ports were used as trading places by Europeans. The Portuguese during the sixteenth century were the first Europeans in China. They founded a settlement at Macao but showed little interest in plants. It was chiefly the Dutch, the English, and the French who saw the potentialities of Asiatic plants. When the first Europeans visited China and Japan, they found that many native plants were being cultivated in gardens, some probably had been for hundreds of

years. Hydrangeas were among these, and *Hydrangea macrophylla* was doubtless the one cultivated for the longest time. A form of this species, called *Ajisai* by the Japanese, is said to have been cultivated in Japan for twelve hundred years (1). This was also the first of the Asiatic hydrangeas to be introduced into Europe. It was brought to Sweden in the early 1780's from Japan and in the late 1780's it was brought from China to England. However, even before the 1780's this plant was known to the French.

Philibert Commerson (1727-1773), the naturalist on the expedition around the world under the French navigator, Bougainville, sent material of a form of *H. macrophylla* from Mauritius to the Jardin des Plantes in Paris. Commerson resided in Mauritius from 1769, after he left the Bougainville expedition, until his death. At this time, French ships carrying on trade between France and China and India stopped at this island. Commerson found *H. macrophylla* in cultivation on Mauritius (2). He designated the generic name of *Hortensia* for this plant but the name was not published until 1789, which was after the name *Hydrangea* had been published, and hence could not be used. Since Commerson's *Hortensia* was that form of *Hydrangea macrophylla* having all or nearly all sterile flowers, his name has come into popular usage as a common name for such plants. It is known that Commerson sent living plants from Mauritius to the Jardin des Plantes. If *H. macrophylla* had been among these, this probably would have constituted the first introduction into Europe of this plant. The material known to have been sent to Paris was a dried herbarium specimen.

Another early European contact with *H. macrophylla* was by the Portuguese missionary, Juan Loueiro (1715-1796), who spent many years in Indo-China. In 1790, in his *Flora Cochinchinensis* he described a plant as *Primula muta-*

*Numbers in parentheses refer to references in the bibliography, given at the end of this paper.

bilis, which was apparently a cultivated specimen of *H. macrophylla* (3). Loureiro's contact did not result in an introduction of the plant into cultivation, but it shows the widespread distribution of the cultivated forms of this Japanese plant.

The Dutch East India Company had a trading post on Deshima, an artificial island in Nagasaki Bay, the one Japanese port where Dutch and Chinese were permitted to trade and from which other nations were banned. Engelbert Kaempfer (1651-1716), a physician and surgeon for the Dutch East India Company, spent from October 1690 to October 1692 on Deshima and was the first European to study the plants of Japan. *Hydrangea* was known to him and is mentioned in his account of Japanese plants.

More than three-quarters of a century after Kaempfer resided on Deshima another physician of the Dutch East India Company came to this island. Carl Peter Thunberg (1743-1828), a student of Linnaeus in Uppsala, Sweden, entered the services of the Dutch East India Company as a surgeon after having met N. L. Burman in Amsterdam. Burman suggested to several wealthy gentlemen of that city the possibility of obtaining new and interesting garden plants from Japan by sending Thunberg on a trip there. Burman's suggestion was carried out and thus was formed the first recorded syndicate for the introduction of plants from Eastern Asia into European gardens (4). Thunberg arrived at Deshima in August 1775 and resided there until November 1776. As Kaempfer before him, he was virtually a prisoner on the island during most of this time. However, he managed to obtain specimens of over nine hundred species of Japanese plants. Many of these he picked out of the fodder sent from the mainland around Nagasaki for the livestock animals kept by the Dutch on Deshima. He also encouraged the Japanese whom he knew to bring him plants from the mainland. Most of the plants that Thunberg saw came from this restricted area with the exception of the few that he was able to collect on the trip he made as a member of the party headed by the Dutch Ambassador on his annual visit of homage to the Sho-

gun at Yedo (now Tokyo) (4). Thunberg returned to Europe in March 1779, and in 1784 he published his botanical classic, *Flora Japonica*, in which he described five hydrangeas including *H. macrophylla*. Unfortunately, no list is available of the plants introduced into cultivation by Thunberg; however, it is known that one of the plants which he brought back to Uppsala was the selected form of *Hydrangea macrophylla* called *Ajisai*, which he grew in Uppsala in his garden (1).

Sir Joseph Banks (1743-1820) is credited with importing into England from China in 1789 a living plant of *H. macrophylla*. It was a novelty and attracted considerable attention. "It had begun to flower in the Custom House, and its green petals were a puzzle to the botanists of the day. The next day he [Sir Joseph Banks] exhibited it at his house in Soho Square, from whence it was removed and lived in Kew." (5). Three years after its introduction by Banks, this plant was named *H. hortensis* by Sir James Edward Smith. The plant must have been distributed to the garden trade soon after its introduction, for, according to William Curtis, it was so well known in 1799 that it "would be superfluous to describe minutely a plant now so very common." (7) It might be inferred that Sir Joseph Banks' plant at Kew was the "parent plant" from which was disseminated much of the vegetative progeny of this hydrangea cultivated in so many gardens in England and other countries of Europe. Lemaire (6) in 1846 stated that J. M. Cels, the well-known French horticulturist and botanist, obtained this plant from Kew and distributed it in France. Cels, who died in 1806, had a garden near Paris which was noted for its interesting and rare plants.

Probably because Sir Joseph Banks' plant went to Kew and from there was distributed to other places, another importation of *H. macrophylla*, made about the same time as that of Banks', is sometimes overlooked. William Curtis stated in 1799 that a plant of *H. macrophylla* was imported by a Mr. Slater about the same time as the Banks' plant (7). There were two brothers, Gilbert and John Slater, both directors of the East India Company, and both imported a number of plants from

China for their gardens (8). It was one of these two brothers who made the other importation of this plant. The plants of *H. macrophylla* imported to England by Banks and Slater came from China, probably Canton or Macao, both of which were open to the East India Company vessels.

F. P. von Siebold (1796-1864), who was sent by the Dutch East India Company as a physician-naturalist to Japan, spent six years, from 1823 to 1829, at the trading post on Deshima, where Kaempfer and Thunberg had been before him. His activities, as had been those of his predecessors, were confined to the island except for special permission. However, Siebold, because of his prestige as an eye surgeon, was allowed enough liberty to explore the area around Nagasaki. He was much interested in garden plants which he thought could be used in Europe. When he returned to Holland, he took with him a number of Japanese plants which eventually were introduced into European gardens, among which were several forms of *H. macrophylla*. Some of these were named and pictured in the *Flora Japonica* written by himself and Zuccarini.

Robert Fortune (1812-1880), a Scotchman, the first of the great professional plant collectors, was sent to China by the Royal Horticultural Society in 1843. Fortune, the first European collector to make extensive collections in China, visited the ports then opened to European trade, but also visited interesting places in the interior of the provinces of Fukien, Chekiang, and Anhwei. He sent back to England many new ornamental plants, as well as seeds and herbarium specimens. These included hydrangeas. In a nursery near Foochow, Fukien Province, 1845, he saw garden forms of *H. macrophylla* cultivated for their deep blue flowers (2).

Carl Maximowicz (1827-1891), the Russian botanist who became one of the foremost authorities on the plants of eastern Asia, collected many plants in Japan during the years from 1859 to 1864. Among the plants from Amur, Manchuria, and Japan which he introduced into the Botanical Gardens of St. Petersburg are several hydrangeas. *H. macrophylla* was one of these (2).

The forms of *H. macrophylla* having large clusters of all or nearly all ster-

ile flowers have been considered by some horticulturists to be hybrids. This was due in part at least to the fact that until E. H. Wilson (9) found this species growing wild in Japan in 1917, its native habitat was uncertain. Wilson, who had made several previous trips to China, had always looked there for this plant in the wild. He had found several hydrangeas in China but not *H. macrophylla*. In 1917, he visited an area on the coast of south-central Japan not far from Yokohama. There he found plants of a hydrangea whose resemblance to the cultivated plants which he knew was immediately apparent. They differed from the garden hortensias only in having most of their flowers fertile with only a few sterile flowers. Wilson's discovery established this part of Japan as one of the native habitats of *H. macrophylla*. The area is restricted to Chiba (or Boso or Boshu) Peninsula and the islands of Oshima and Hachijo. The sterile-headed plants may have arisen here as mutations, or they may have arisen in cultivation. Because of their ornamental quality, they were selected hundreds of years ago by the Japanese and grown in their gardens and from Japan they were taken to China. The introduction of such plants into European gardens was simply a transfer of these selections from China and Japan.

A botanical study of the genus *Hydrangea* has shown that *H. macrophylla* has four variants which are worthy of naming, each of which occupies a different geographic area. The variant discussed in the above paragraphs, discovered first as a cultivated plant and not found in the wild until nearly a century and a half later, is called *H. macrophylla* subsp. *macrophylla*. A second variant having a much wider geographic distribution occurs in the mountainous region throughout Japan. It is called *H. macrophylla* subsp. *serrata*, but may be known in cultivation as *H. serrata*. This differs from the coastal variant in having its leaves of a slightly appreciably thinner texture and its fertile flowers very slightly smaller. It is because these two variants are so similar that botanists consider them to constitute two subspecies of a single species. Two additional variants of this species occur in China. One of these which occurs in the eastern Himalayas and ad-

jacent western China has been given the name *H. macrophylla* subsp. *stylosa*. It was introduced into England about a hundred years ago but almost certainly has long since been lost. The name given to the plant *H. cyanema* (10) at the time of its introduction has persisted as well as the relationship attributed to it at the time. *H. cyanema* is listed in the Royal Horticultural Society's *Dictionary of Gardening* as a synonym of *H. robusta*. The plant to which the name *H. cyanema* was given was grown in England by Thomas Nuttall from seed sent from the eastern Himalayas by his nephew Thomas J. Booth in the early 1850's. Nuttall, who had spent his early years in the United States where he had collected extensively and published a two volume work titled *Genera of North American Plants*, grew rhododendrons and other plants from seed collected by Booth. It is now known that the plant which Nuttall grew as *H. cyanema* is not related to *H. aspera* or its variant *H. robusta*.

Hydrangea involucrata, which occurs only on Honshu Island in Japan, was found first by Siebold. In writing of this plant in 1829, Siebold said that it was reported to him to grow in the mountains of Japan and that cultivated material sent to him from Osaka flowered in the botanical garden at Deshima. The plant was illustrated and described in the *Flora Japonica* in 1840 by Siebold and Zuccarini, who stated that there were three forms of the species in Japanese gardens, one with rose-colored flowers, a second with lavender flowers, and a third in which both sterile and fertile flowers were double and rose pink. This latter form was illustrated again in 1846 in a Belgian garden journal (6) with an illustration based on the one in *Flora Japonica*. The description accompanying the 1846 illustration credits Siebold as the source of information regarding the plant, but states that Siebold did not introduce living material of it into Europe. Because of the publication of this illustration, one might infer that the plant was cultivated in Europe at this time. However, since it is stated that Siebold did not bring material of it to Europe (in fact no actual mention of its introduction is made), and since the illustration was based on the previously

published one, the plant may not have been cultivated in Europe at that time. Hemsley, in an account of the hydrangeas emphasizing the ones in cultivation and written in 1876, included *H. involucrata* and he cited the above-mentioned references (11). However, if this plant was not being cultivated in Europe during the latter part of the nineteenth century, according to Schneider it was in cultivation in Germany in 1905 (12). It was imported into England in 1906 according to Haworth-Booth (13). At the present time, it is not common in cultivation but it can be obtained from some of the best shrub nurseries. It is said to be distinctly ornamental, to flower profusely with a minimum of care. It was given an Award of Merit in October 1956 by the Royal Horticultural Society in recognition of its good qualities. The specimen given the award was grown at the Royal Horticultural Society's Gardens at Wisely where "it flourishes in a shady spot on a west-facing wall. Smothered with double flowers, this plant is a charming sight." The specific name, *involucrata*, was given to it because of the prominent, rounded bracts covering the unopened clusters of flowers. These bracts do not occur in any of the other Japanese species nor in the Chinese, but are found on the hydrangeas in Central America and South America.

Hydrangea paniculata was named for its paniculate or pyramidal flower cluster, seen only in one other species of the genus, the North American *H. quercifolia*. It was found by Siebold during his stay on Deshima, and was known by him to be cultivated near Osaka. In 1840, it was illustrated in *Flora Japonica* by Siebold and Zuccarini, who stated in the accompanying description that it grew in the mountains of Japan but was cultivated frequently in gardens where there was a form with all sterile flowers.

This sterile-flowered form was introduced first into Europe about 1864 by Siebold who sold material of it to the French nursery firm of Lemoine in Nancy. Carrière, writing of this plant in 1873 (14), said that it was hardy and easily propagated. It was established in England in 1875 (15) at Knap Hill, where it was grown at the nursery of



E. F. Marten

A nice specimen plant of Hydrangea quercifolia growing in the University of Washington Arboretum at Seattle.

Two of the four subspecies of Hydrangea aspera:

sargentiana, (top), growing at the Strybing Arboretum and Botanical Garden at San Francisco, having broadly ovate leaves and stem and leaf petioles covered with stiff straw-colored hairs.

strigosa, (bottom), in the University of Washington Arboretum, having lanceolate leaves and appressed pubescence.



C. E. Crompton



E. F. Marten

Anthony Waterer and considered noteworthy for its hardiness and showy pyramidal inflorescences crowded with large, white, sterile flowers. This same form was introduced into the botanical garden at St. Petersburg by Maximowicz, who obtained it from a commercial nursery in Japan (2). This form, referred to as *H. paniculata grandiflora*, is better known than other forms of this species in the United States and Great Britain, where it is commonly called the "peegee" hydrangea. In England, a selected clone of the species, known by the name of *H. paniculata floribunda*, "whose every shoot and side shoot terminates in an inflorescence of mixed fertile and sterile flowers of a creamy white with a small red eye," is said by Haworth-Booth to be superior to *H. paniculata grandiflora* (13).

Hydrangea paniculata has a geographical distribution from south-central and eastern China to Japan and southern Sakhalin. It is important as an ornamental shrub because of its hardiness. In New England, it is reported to have escaped from cultivation and to have become naturalized in a swamp near Lincoln, Massachusetts. The plants growing in this area had panicles with only a few sterile flowers, the numerous fertile flowers producing capsules and apparently ripe seeds. It was suggested that these plants were not being reproduced from seed but rather had been reproducing vegetatively by root shoots (16). However, regardless of the method by which these plants were propagating themselves, they were well established.

Hydrangea aspera was discovered first in the Himalayas of Nepal by Francis Buchanan-Hamilton in 1802 but it appears not to have been cultivated before the beginning of the present century. Hemsley in 1876, in his account of the hydrangeas, does not mention it (11). The reason for this is obvious when it is realized that this species occurs in the Himalayas and western and central China and that few plants came into cultivation from these areas until E. H. Wilson was sent there by the English nursery firm of Messrs. Veitch.

Wilson made his first trip to China in 1900, arriving in Ichang in February and making this his base of operations until January 1902, when he returned

to England. Ichang had been the residence of Dr. Augustine Henry, who was Assistant in the Customs Service from 1882 until 1889. During this time, he collected several thousand herbarium specimens of plants which he sent to Kew. The Veitches became interested in the potentialities of Chinese plants from Henry's collections and this resulted in their choosing E. H. Wilson to go there to collect for them (17). Wilson made two trips to China for the Veitches before coming to Arnold Arboretum in 1906 at the invitation of Professor C. S. Sargent. Under the auspices of the Arnold Arboretum, Wilson made two additional trips to China between 1906 and 1911.

On Wilson's first trip to China he found *H. aspera* at Ichang and other places. This species is variable in size and shape of the leaves and in the amount of pubescence, particularly on the lower leaf surfaces. Some of these variants have been described as species and have been introduced under these names but these are now included in the four subspecies of *H. aspera* (22). *H. strigosa* was a name given to one of these variants with lanceolate leaves and appressed pubescence which Wilson found in western Hupeh in 1901 and again in 1907. This variant is called *H. aspera* subsp. *strigosa*. *H. villosa* was another name given to the variant found a century earlier by Buchanan-Hamilton in Nepal. This form, in which the pubescence consists of lax, somewhat curling hairs, was found in 1908 in Szechuan by Wilson. It is called *H. aspera* subsp. *aspera*. Still another variant with ovate-cordate leaves, found first in 1850 by Joseph Dalton Hooker in Sikkim and by him named *Hydrangea robusta*, is called *H. aspera* subsp. *robusta*. It was found again in Moupin, Szechuan, in 1869 by the French missionary, Armand David, and given the name *H. longipes* by the French botanist Franchet, and again found at Nanchuan, Szechuan, in 1891 by Bock and von Rosthorn and named *H. Rosthornii* by the German botanist Diels. It was found in western Hupeh by Wilson on the first Veitch expedition in 1901, and from this collection it was cultivated in England for the first time. Plants of *H. aspera* with large leaves (as much as twelve inches long and three to four

inches broad) collected first by Henry and given the name *H. aspera macrophylla*, were collected later by Wilson on the second Veitch expedition in 1904 and again in 1907 for the Arnold Arboretum. These probably belong to *H. aspera* subsp. *strigosa*.

Another large-leaved form with broadly ovate leaves and having the stem and leaf petioles covered with stiff straw-colored hairs was found in western Hupeh by Wilson in 1907. This variant was named *H. Sargentiana* in honor of Professor C. S. Sargent but is now called *H. aspera* subsp. *Sargentiana*. A share of Wilson's seed was presented to Kew by Professor Sargent in 1908. At that time, this plant did not give promise of being a hardy member of this genus as several young plants succumbed to winter conditions of 1909-1910. It has since proved to be a strong grower in a number of places in Europe and the United States. It needs good loamy soil and may be propagated from cuttings.

Hydrangea heteromalla, which ranges from the eastern Himalayas across China to the Peking area, was collected in this latter area by Russian collectors who were members of the various Russian Ecclesiastical Missions sent to the Chinese capital. Two collections made by P. Y. Kirilov in the 1830's and A. A. Tatarinov in the 1840's were named *H. vestita* var. *pubescens*. Emil Bretschneider, who lived in Peking from 1866 to 1883, collected seed of this plant in the early 1880's (2). Shortly thereafter, this seed was distributed to several botanical gardens under the name *H. vestita* var. *pubescens*. These botanical gardens included St. Petersburg, Darmstadt in Germany, and the Arnold Arboretum, and no doubt the distribution of this seed constituted the first introduction of this species into cultivation.

Following Bretschneider, other introductions were made from western China. E. H. Wilson collected it in 1908 at Tachienlu, Szechuan, and Moupin, Sikiang, at elevations of five to eight thousand feet. Other collections were made later by Joseph Rock from southwestern Kansu in the forest of Want-sang and in the T'ao River basin at elevations of nine to ten thousand feet, and Kingdon-Ward from Delei Valley in Assam at nine thousand feet. Although

usually considered hardy, this species in cultivation is variable in hardiness because it has been introduced from different localities throughout its wide geographical range. The amount of pubescence on the lower leaf surface varies throughout the range of the species, and cultivated plants collected in various parts of this range will show variation in this character.

In addition to the names *H. vestita* and *H. vestita* var. *pubescens*, *H. heteromalla* is also known in cultivation under the names *H. bretschneideri* and *H. xanthoneura*. Dr. Leopold Dippel, Director of the botanical garden in Darmstadt, gave the name *H. bretschneideri* to the plant grown at Darmstadt from Bretschneider's seed. A specimen collected at Nanchuan, Szechuan, by the two German collectors Bock and von Rosthorn, was named *H. xanthoneura*.

Hydrangea anomala is a deciduous climber which clings firmly to a wall or other support by means of aerial rootlets similar to ivy. The only other climbing hydrangea in cultivation is the Chilean *H. serratifolia*, which is evergreen. *H. anomala* has a wide geographical distribution from the Himalayas across China to Japan and southern Sakhalin. The Himalayan and Chinese plants, *H. anomala* subsp. *anomala*, sometimes called *H. altissima*, have nine to fifteen stamens. The Japanese plants, *H. anomala* subsp. *petiolaris*, sometimes called *Hydrangea petiolaris* or *H. scandens*, have fifteen to twenty stamens. There apparently are no other differences between the two subspecies.

Sir Joseph Dalton Hooker, writing in *Curtis' Botanical Magazine* for 1884, stated that *H. anomala* had been received twice at Kew, the first time being in 1878. He described the plants at Kew as having as many as twenty stamens, indicating that they were of Japanese origin. The Himalayan and Chinese form of *H. anomala* was said by Bean in 1937 (20) to have been introduced from the Himalayas about one hundred years previously and again in 1901 from western Hupeh in China by E. H. Wilson.

Hydrangea anomala was known to Siebold. It was described and illustrated by him under the name *H. petiolaris* in the *Flora Japonica*, but he does not

mention it as being cultivated by the Japanese.

Confusion has existed in literature and in the horticultural trade between *H. anomala* and *Schizophragma hydrangeoides*, a different Asiatic climber also cultivated occasionally. *Schizophragma* differs from *Hydrangea* in having sterile flowers which consist of a single leaf-like lobe, while in *Hydrangea* each sterile flower consists of four petal-like lobes. The two genera are closely related as may be seen by the similarity in shape and size of their fertile flowers. An illustration in the Royal Horticultural Society's *Dictionary of Gardening*, labeled *H. petiolaris*, is not *H. anomala* but is *Schizophragma hydrangeoides*.

The two North American species of *Hydrangea*, *H. arborescens* and *H. quercifolia*, were introduced from Colonial North America into England during the eighteenth century. *H. arborescens* was, in fact, the first species of this genus to be introduced to cultivation in Europe, having been brought there several years before *H. macrophylla* was. It is not an attractive plant and therefore has not become as important an ornamental as *H. macrophylla*.

The first recorded collection of *H. arborescens* was made in Virginia by John Clayton in 1734. Clayton collected plants in Virginia and sent them to Johan Gronovius of Leiden, Holland, who wrote about them in his *Flora Virginica*. The plant collected by Clayton and given the generic name *Hydrangea* by Gronovius in 1739 was described again by Linnaeus in 1753 in the *Species Plantarum* under the name *H. arborescens*. This species is now considered to consist of three subspecies separated by differences in pubescence or the amount of hairiness of the lower leaf surface; one, which is glabrous, is called *H. arborescens* subsp. *arborescens*, another, which is more or less hairy, is called *H. arborescens* subsp. *discolor*, and a third which is densely tomentose, is called *H. arborescens* subsp. *radiata*. The glabrous subspecies occurs in Virginia and the plant which Clayton collected belongs to it. Clayton (1685-1773), an Englishman who came to Virginia in 1705, had a garden of native plants in what is now Mathews County. Among his European botanical correspondents was

Peter Collinson (1694-1768) a prominent cloth merchant and botanist of London who is credited with introducing a number of American plants into English gardens. Collinson's interest in American agriculture helped introduce the cultivation of hemp, flax, silk, and grapes into the American colonies. Curtis, writing in the *Botanical Magazine* in 1799, credited Peter Collinson with the introduction into England of *H. arborescens* in 1736. Collinson may not have been the only person, however, to introduce this plant into England, for W. T. Aiton (19) stated that Samuel Brewer introduced it before 1736.

The subspecies with the densely tomentose leaves, *H. arborescens* subsp. *radiata* (*H. radiata*), a native of the southern Appalachian Mountains, was collected first by Thomas Walter (1740-1788) and named and described by him in his *Flora Caroliniana*. This book, which includes about a thousand species, was based chiefly on plants growing in an area about twenty-five miles square on the Santee River in South Carolina. Walter may have collected a plant in its native habitat and brought it to his garden on the Santee River where he cultivated many of the plants described in the *Flora Caroliniana*. According to W. T. Aiton (19), this plant was introduced into the gardens at Kew in 1786 by John Fraser, a Scotch botanist and gardener who, between 1784 and 1811, collected plants in various parts of North America. Fraser was a friend of Walter and no doubt he learned of this plant through Walter. It was for Fraser that Walter named the rose-red magnolia of the Carolinas, *Magnolia fraseri*, which was discovered by William Bartram on the Keowee River in the Allegheny Mountains of South Carolina.

Hydrangea quercifolia was discovered by William Bartram (1739-1823), early American naturalist and son of John Bartram. His discovery was made at Sweetwater Brook (now called Knoxville Branch) in Crawford County, Georgia while he was traveling through the Carolinas, Georgia and Florida from 1773 to 1777. Bartram wrote an account of these travels in which he portrayed vividly the plants and the wildlife of the country. It was in this account, known

popularly as Bartram's Travels, that this species is named and described for the first time.

According to W. T. Aiton (19), *H. quercifolia* was introduced to Kew in 1803 by William Hamilton. John Sims, writing about this plant in 1807 (20) in *Curtis' Botanical Magazine*, stated that "many living specimens were brought from America last year, by Mr. Lyons, and have been dispersed by his sale." William Hamilton (1745-1813), wealthy owner of a large estate which he called the "Woodlands" near Philadelphia, introduced to American horticulture from England a number of well-known plants, including the Lombardy poplar, the Norway maple, the camellia, the tree-of-heaven, and the ginko. John Lyon, a Scotchman, was his gardener from about the years 1796 to 1802 and again in 1808. Lyon, a good botanist and a collector of American plants, was keenly interested in growing new plants, some of which he introduced to cultivation both in American gardens and in England (21). Both Hamilton and Lyon knew Bartram, who may very well have turned over to them seeds of *H. quercifolia* which, having been grown at the "Woodlands," may have gone from there to England.

Hydrangea quercifolia takes its specific name from its lobed leaves which suggest certain oaks. Its large pyramidal clusters of flowers contain numerous fertile flowers and only a few sterile ones. In the autumn, the foliage turns a red or crimson color even in California where frosts are not as severe as in the eastern United States.

Hydrangea serratifolia is the only species of those in Central America and South America which is cultivated. It occurs in central Chile and was introduced from there into Great Britain in 1927 by H. F. Comber. It differs from the other hydrangeas in cultivation in that it is evergreen and usually lacks sterile flowers. Its habit of climbing by means of aerial rootlets is shared with the Asiatic *H. anomala*. Bean stated in 1937 that this species is hardy and promises to be an interesting evergreen climber (18). This has proved to be the case by the fact that the Royal Horticultural Society recognized it as worthy of an Award of Merit in 1952. Haworth-Booth, writing about this plant

in 1952 in *Gardening Illustrated* said that he has found it to be "a very beautiful climber, the young foliage being beautifully toned, making a highly decorative wall covering without the need for tying and training." It surely deserves more interest than it has received in England and in the United States.

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Rhododendrons in the Test Gardens of the American Rhododendron Society, Portland, Oregon, growing under ideal canopy of the towering firs.

3 photographs by J. Harold Clarke





American Rhododendron Society Test Gardens--Portland, Oregon

C. I. SERSANOUS

Twelve years ago, January 9th, 1945, a few Rhododendron enthusiasts of Portland, Oregon, voluntarily formed a non-profit corporation under the laws of the State of Oregon to promote and develop the growing of Rhododendrons throughout the United States; and further to associate together in membership persons interested in promoting and developing the growing of Rhododendrons. The idea spread rapidly and in a remarkably short time members were enrolled from New York State to Seattle, Washington—Vancouver, British Columbia, and Berkeley, California.

The membership has continued to increase and currently there are approximately 1300 members on the roster. Ten local chapters are located in: Portland,

Oregon; Seattle, Washington; Tacoma, Washington; Hoquiam, Washington; Vancouver, British Columbia; Eugene, Oregon; Oakland, California; New York, N.Y.; Montclair, New Jersey, and Richmond, Virginia. Portland, Oregon, is the National Headquarters, the Secretary's office being located at 3514 North Russet Street.

The Society issues a periodical called the *Quarterly Bulletin of the American Rhododendron Society*, each issue of which comprises approximately fifty pages, six by nine inches in size. It is well edited, carries many splendid articles of information to society members and to all Rhododendron enthusiasts. *Rhododendrons 1956* was published by the Society during the year 1956 and



J. Harold Clarke

Rudolph Henny

Some fine specimens in the Test Garden

Rhododendron dichroanthum
Rhododendron 'Loderi King George'

Rhododendron ficolacteum
Rhododendron chartophyllum

has had tremendous acceptance. There are 231 pages with forty-six illustrations. For the first time in the history of *Rhododendron* growing in the United States has an attempt been made to render hardiness and merit ratings for various hybrids and species of *Rhododendrons*. Some thirty pages are devoted to information of this kind, coming from *Rhododendron* growers from the East Coast to the Pacific Coast. Varieties for specific uses and localities, quality ratings, blooming seasons—early, midseason, or late—color, and probable height in ten years, are also given in this book.

Climatic conditions of the Pacific Coast with relatively cool summers, cool nights, and an average rainfall of thirty-six to forty inches occurring mostly in the winter months and spring with practically no rain all summer, all make for ideal propagation of *Rhododendrons* and *Azaleas*. Portland is the center of this activity, and ships annually to various states and cities throughout the United States approximately a half million *Rhododendrons* and *Azaleas*.

Three National Test Gardens have been set up by the American *Rhododendron* Society—one at the Morris Arboretum, Philadelphia, Pennsylvania; another located in Seattle, Washington, at the University of Washington Arboretum; and the third at Portland, Oregon, which is dedicated to and maintained by the Public Parks System of the City of Portland.

The Portland Test Garden was established in October, 1950, with appropriate ceremonies including the planting of two beautiful specimens of *Rhododendron* 'Cynthia,' which were then over forty years of age and approximately fifteen feet in height. They have grown to a height now of twenty feet and have bloomed consistently each and every blooming season, each plant producing fully two thousand trusses and making a sight to behold. This was the start of a breathtaking garden with over 2,500 specimen plants, species and hybrids now growing on this island known as Crystal Springs Lake Island. Crystal Springs Lake entirely surrounds the Island, which is one of the phenomena of Portland, the Lake being fed by five different underground springs—one of them having a flow capacity of a thousand gallons per minute. An under-

ground sprinkling system with a five hundred gallon per minute capacity motor-driven centrifugal pump furnishes ample water supply for the garden throughout the summer months and the Lake makes for cool nights, which the genus *Rhododendron* requires for perfection of growth and bloom. A splendid stand of trees of mixed nature, including Western Cedar and Douglas Fir, furnish sufficient shade to protect these plants from an occasional hot summer afternoon. Companion trees, such as *Magnolia*, *Pin Oak*, *Holly*, and *Birch* trees, also furnish color and add distinctiveness to the planting.

The path arrangement is unique, a circular path around the Island serves as a division between species and hybrids. Having more hybrids, it has necessitated the use of a few cross paths. There has been no set schedule or exact spacing in this test garden, for at the time of planting it was not known the extent of the collection that would be available. However, with the continued good growth of the plants and with many thanks to the donors, consisting of member nurserymen and home owners, some of whom gave us their larger plants, the three acres devoted to this project is fast approaching a status of crowding. Many plants will of necessity have to be moved to adjoining three acres, which will give us approximately six acres in all. Many of these *Rhododendrons* are over twenty-five years of age. In addition to 'Cynthias,' there are: *R. calophytum sutchuenense*, several *triflorums*, including some magnificent specimens of *augustinii*, *fasteosum flore pleno*, *ponticum* and *schlippenbachii*.

The adjoining three acres is a peninsula adjacent to the original planting and is the entrance to the test garden. An area is provided for automobile parking, having a capacity for thirty-five cars, which is entirely inadequate to serve a thousand or more automobiles during show time or on a Sunday during bloom time. At the end of this peninsula is a pedestrian foot bridge crossing Crystal Lake to the Island on which the test garden is located. This bridge is approximately three hundred feet in length. The early part of June finds the Lake nearly covered with thousands of wild mallard ducks that nest on the



J. Harold Clarke

Rhododendron degranianum

peninsula and Island, hatching their young during April and May. The ducks create much interest for young America, many of whom for the first time have seen wild ducks in their natural habitat. It is not an uncommon sight to see a mother duck at the base of a Rhododendron sitting patiently on her nest awaiting hatching time.

A very important test garden addition was completed the past year. While most any of the genus Rhododendron can be grown successfully out of doors in our Portland climate, there are exceptions which consist of the Arboreum, Boothii and Maddenii Series, plants which require protection under 36° Fahrenheit. Therefore, a challenge existed not only to make this test garden possible to grow these tender plants, but to make it a Rhododendron Botanical Garden. This idea came into being in the year 1953 and, in time for the Portland Chapter Show May 19, 20, 1956, this combination exhibition and cool house was completed. The building is of a quonset hut type, which was used extensively by the Army and Navy during World War II. It is built of steel and wood, approximately sixty-five feet overall, including a porch on three sides which is used for exhibition purposes.

The center portion of the cool house is built of steel curved to a twenty foot radius, which means twenty feet in height at the center of the building and forty feet in length and width. It is covered with a clear plastic roof corrugated to overlap an inch and a half. To our best belief and knowledge, it is the only building of its kind ever used for Rhododendrons. Heat is furnished by



Rudolph Henry

Rhododendron augustini

electric heaters suspended from the inside top of the building, thermostatically and automatically controlled to start at 36° Fahrenheit outside temperature and to close at 40° inside temperature.

Two exhaust fans, one in each end of the building, are set to start operating at a temperature of 85° Fahrenheit. Both fans are located in the center and extreme top of the building with self-closing louvers. Approximately sixty plants are housed in this cool house at present, which is about half the capacity. Two outstanding plants, *R. nuttallii*—measuring about eight feet in height and seven feet in width—and *R. polyanthum*—six feet in height—are wonderful specimens. The latter one will bloom this coming season.

The Maddenii series are very fragrant and as most of them have a good bud set, considerable anxiety and excitement will be manifested when they come into bloom for the first time in their new home.

The cost of this building and electric heating system was in excess of ten thousand dollars. We think it a worthy project and we believe the American Rhododendron Society is the only single plant society that we know of that has undertaken such a project.

This is a National Test Garden and this Exhibition-Cool-house is for the use and enjoyment of all who are interested in furthering their knowledge of the genus Rhododendron.

The Garden is open from March to September. An invitation is extended to anyone who may desire to see what we think is one of the beauty spots of America.

Oxalis rubra

WALTER C. BLASDALE

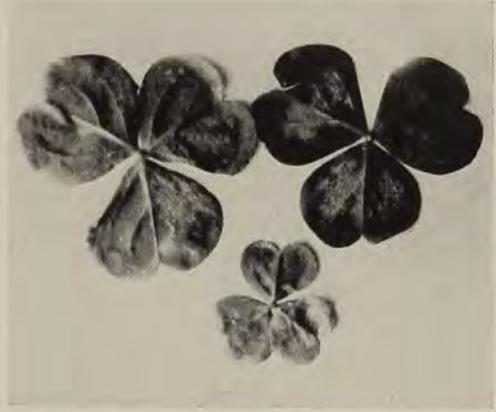


Figure 3. The lower surfaces of two large leaves of *Ionoxalis martiana* and of a smaller leaf of *Oxalis brasiliensis*, all of which show blotches of the uredo spores of *Puccinia oxalidis*.

Oxalis rubra is one of the first of the many species of *Oxalis* to be cultivated and is still one of the most meritorious of all of them. It was named by Saint Hilaire, a French botanist who explored much of Brazil and Argentina from 1814 to 1822 and published a description of it in 1826 in his four-volumed *Flora Brasiliae Meridionalis*, along with thirty-two others of the same genus. He reports it as growing on the banks of rivulets in the Province of São Paulo. Other collections have been reported on from near Buenos Aires, but I have no record of more recent collections of it. This species is closely related to or identical with certain other collections including those which have been called *O. articulata* Savigny, *O. crassipes* Urban, and *O. floribunda* Lehman. Of these, the last named has long been widely used in England but that name is now being rapidly replaced by the earlier one given it by Saint Hilaire.

I will first describe some of the distinctive features of *O. rubra* as I have grown it, making use of two illustrations made from photographs of plants grown out of doors. Figure 1 shows a

three year old plant whose roots were washed free from soil and whose voluminous mass of leaf stalks has been tied together. The seedling from which this plant developed soon formed a long tap root which penetrated deep into the soil and acquired a few stout branches also reaching well below the ground surface. The cotyledons of this plant were soon accompanied by leaf clusters which arose from points near the upper end of the tap root, while the latter slowly swelled up and acquired a turnip-like form that in time attained a diameter of nearly an inch. Later one or more leaf-bearing stalks began to form beneath the leaf clusters already developed, some of whose free ends also developed into turnip-like spheres. Figure 2 represents an older plant at its period of dormancy which is made up of twelve such spheres all attached to each other by stalks of widely varied lengths and thicknesses which have been called "articulations."

A cross section of one of these spheres will show that they do not include any true bulb scales. They consist of enlarged branches of a rhizome-like stalk whose outer surface shows transverse



Figure 1. A three-year-old plant of *Oxalis rubra* showing its root system and the lower part of its foliage system.



Figure 2. A dormant, five-year-old plant of *Oxalis rubra* showing its articulated tubers.

ridges which are all that remain of fallen leaf stalks. Such aggregations do not show any disposition to separate their component spheres but, when separated and properly planted, these spheres rapidly develop into vigorous plants. These features prevent the spread of the species unless the spheres are artificially separated, but they also make it easy for the gardener to either prevent or favor the spread of the species. These facts make it correct to call the spheres tubers and the stalks which separate them parts of a rhizome, although it is not uncommon for dealers to call them bulbs.

Figure 1 also shows some of the peculiarities of the foliage system, namely the abundance, compactness and uniformity in the size and length of the leaf stalks. It is these features which tend to bring the broadly obcordate leaflets into a more or less continuous surface, although the two halves of such

leaflets tend to fold together somewhat during cloudy weather. Plants which are not grown closely together tend to assume the form of a hemisphere or dome, a feature which makes the species especially suitable for small formal gardens.

The umbellate flower clusters of *O. rubra* are composed of from five to fifteen blossoms, each borne on two-inch pedicels held well above the foliage surface; they continue to open over a remarkably long period, in California for as long as seven months. The corollas have the usual narrow tubes terminating in five rather narrow petals that spread out to form a flat circle at least a half-inch in diameter, whose color ranges from pure white through shades of red and pink with lines of very dark red passing into the throat of the corolla.

A distinctive feature of the genus *Oxalis* is that many of its species produce

flowers in which there is a circle of five stigmas borne on styles of the same length and two rings of stamens whose filaments are of different lengths. In many of these species we find specimens in which the circle of stigmas is poised (a) below those of both anther circles, (b) between those of the two anther circles or (c) below both anther circles. Such species are called "trimorphic" and the three forms are designated as (a) short styled, (b) medium styled and (c) long styled. These peculiarities would be of minor importance were it not for the fact that the production of seed in such species is greatly restricted. Much careful experimental work has shown that no seed is produced by such species if the stigmas of such plants are pollinated with pollen from the same plant or from the pollen of any plant of the same form and species. To obtain seed from a trimorphic species, it is necessary to pollinate its flowers with pollen derived from flowers of either one or the other two forms. If plants of different forms are grown closely together, currents of air or the visits of honey-seeking insects may transfer pollen from plants of one form of a species to those of another form of the same species and insure seed production.

So far as I know, *O. rubra* has not been classed as a trimorphic species but it is known to be a poor seed producer. In California, I find short- and medium-styled forms but no long-styled ones. It is quite probable that a long-styled form exists in nature but has not yet been reported on. The well known Buttercup *Oxalis* (*O. pes caprae* also called *O. cernua*) is known to exist in all three forms in its native South African habitats, but only one of these forms has been introduced into cultivation and I have no record of any seed produced by cultivated plants anywhere in the world. Where patches of both short- and medium-styled forms are found growing closely together, I have usually been able to find a few seed-bearing capsules, which are relatively small and enclose not more than a half dozen small seeds of the usual form that germinate readily and produce good seedlings. I have also found that only rarely are seedlings to be found near such patches at any time of the year.

The meager seed-producing ability of *O. rubra* and the lack of a mechanism by which its tubers can be scattered naturally make it a non-aggressive species; nevertheless, I find it occasionally in waste places and lawn plots where it can become troublesome. Its pleasing features are not of the novel or spectacular type; its leaf and flower patterns are in full accord with those of the genus *Oxalis*, but it would be difficult to name another member of the genus which yields more pleasing plants for either the garden or conservatory with so small an expenditure of care and thought. The seven or more months of the year during which a continuous succession of leaves and flowers arise and the ease with which colonies of it can be established in widely varied situations are outstanding features of the species.

There is a less pleasing feature of *O. rubra* to which some attention should be given. This concerns its susceptibility to a disease caused by a parasitic fungus which is capable of developing within the tissue of its leaf blades. It is a true rust similar to those which reduce the yield of crops of wheat and other grains and injure such ornamental plants as the hollyhock, snapdragon, carnation and some of the hybrid perpetual roses. I first collected it in California on *Ionoxalis martiana* (formerly called *Oxalis martiana*) about fifteen years ago. This host plant is distinguished by a degree of aggressiveness equal to that of the better known *O. corniculata* which is, however, quite a different type of plant. It has now become a troublesome weed in many parts of the world, including several of our southern states and parts of California. I have already devoted several paragraphs in a paper devoted to this and related species and published in the April 1956 issue of this Journal. I regret being obliged to call the attention of prospective readers to certain omissions in that paper. The third paragraph of column one, page eighty-four, should have been introduced by the heading *Ionoxalis martiana* and the second paragraph of column two, page eighty-three, should have been introduced by the heading *Ionoxalis latifolia*. These additions are necessary for an understanding of the paragraphs which follow.

The agency and date at which both

Ionoxalis martiana and the rust were introduced into California can only be guessed at. I found them both in the summer of 1942 growing on a small patch of waste ground on the campus of the University of California at Berkeley, where both continue to grow but have not spread. About twelve years later both fungus and the same host plant appeared in my own garden and since then it has appeared on *I. martiana*, *I. latifolia*, *O. rubra*, *O. Bowiei*, *O. brasiliensis*, *O. adenophylla*, and *O. lobata*. The fungus has also been reported from several other parts of the state.

The disease appears on the lower surface of the leaves only, at first as a multitude of very small yellow spots which later become blotches of varied shapes and sizes. I have tried to illustrate some infected leaves in the photograph reproduced in Figure 3. Unfortunately, the lens of a camera does not differentiate between the yellow of the rust patches and the grayish green of the lower leaf surface as well as the human eye and they are not recognizable on some of the leaves shown.

An examination of the substance of which the yellow blotches are made up, with a microscope capable of magnifying as much as one hundred diameters, reveals only enormous numbers of one-celled objects of more or less globular form. Obviously they developed within the tissues of the leaves in such numbers as to finally break through the epidermal layer of the leaves. These "uredo" spores are easily carried by air currents or by insects to other plants where the spores may germinate and infect other plants with the disease. The appearance of the blotches is soon followed by withering and fading away of the infected leaves, but the root system is not greatly injured and such plants

may recover the following season unless reinfected.

This rust was first found in 1851 in the City of Mexico growing on *Ionoxalis martiana* and was given the name *Uredo oxalidis* because only single-celled "uredo spores" were produced by it. Then, in 1895, further specimens of it were found in the State of Mexico which also produced much larger "telial" spores composed of two cells each that made it necessary to change its name to *Puccinia oxalidis*. Still later it was discovered that an "aecial" stage of the same rust grew on *Mahonia aquifolium* in New Mexico. Both telial and aecial spores may have a part in the life history of the rust but are not necessary for the continuous development of the uredo form. I have never found either the aecial or telial forms of it in California. A detailed description of all three forms is to be found in J. C. Arthur's "The Uredinales Group of Fungi," in Vol. 7, Part 5, Page 391, devoted to this group of fungi.

It now remains to ascertain how many of the species of *Oxalis* and *Ionoxalis* are susceptible to this disease. It so happens that the two species which appear to be especially susceptible, that is, *I. martiana* and *I. latifolia*, are on the whole less meritorious from the point of the gardener and might well be eliminated from those already in cultivation. It is obvious that the aggressiveness of these species makes them a potent factor in the spread of the disease to all of the species which are subject to its attack. Prevention of the spread of rust diseases by spraying with chemicals has not been found very effective. It is especially difficult to make treatment effective on plants of *Oxalis* and *Ionoxalis* because of the difficulty of reaching their lower leaf surfaces.

Chunnenuggee Horticultural Society and Public Garden

LUCILE CARY LOWRY

A very extensive research in recent years was carried on to establish the location of the first Garden Club and Horticultural Society in this country. Athens, Georgia, has proved that they had the first Garden Club, organized in 1891. Pennsylvania and Massachusetts claim the first and second Horticultural Societies. After a thorough investigation through the archives of all the Southern States, however, it is an undisputed fact that the first Horticultural Society in the South was organized at Chunnenuggee Ridge, in the State of Alabama, on March 6, 1847, and a Public Garden was established during the same year. Chunnenuggee is an Anglicized Indian word meaning "High Bluff" or "Up and Down" and is located in an area in the southeastern part of Alabama, containing many square miles, but that part which is pertinent to this story is marked by a rather abrupt ascent of several hundred feet in height and is most typical in the vicinity of Union Springs, Alabama, and many miles east, that the name for the entire Ridge came to be known and was first bestowed "All deeds to property along this Ridge, described the land as being 'bounded on the North by the meandering of the bluff.'" The soil here, unlike that of the prairies below, was sandy and looked as if it might have been left there centuries ago by the receding waters of a great body of water. Beneath this layer of sand, however, there must have been nourishing soil as huge chestnut and other native trees flourished in it. After the Creek cession in 1832, this new territory was opened up for settlement, and many men from Georgia, former Virginians, North Carolinians, and other states, came here to develop this virgin soil, bringing with them, like the patriots of old, "their families, their

flocks and their slaves." At first they erected log houses in which to live on these new plantations, many of them containing several thousand acres of land. With bad roads, however, which almost imprisoned these people during the winter rains, they were denied even the simple pleasure of visiting from one plantation to another, which was one of the highly socialized habits of plantation life. Soon many of the planters began to realize the necessity of building homes on higher ground, left their broad acres in the lowlands to the supervision of overseers, who cultivated the land with the assistance of negro slaves left for that purpose, and moved their homes to the more ideal location of Chunnenuggee Ridge.

I do not know who pioneered the first home on Chunnenuggee, but I do know that Dr. Norborne Berkley Powell, a former Virginian, built there in 1844, on the site of the Indian War Council Lodge, and called his home "Old Field." There were no lumber yards in those days from which to buy timber, but the forests were full of magnificent trees suitable for the purpose and easily convertible into building materials; and as every planter had carpenters, bricklayers and other artisans needed on a large plantation, Dr. Powell soon had a comfortable home, which house and grounds alone required the aid of twenty slaves, each a specialist in his line, to keep it running smoothly. At the back of his house, beneath the bluff, flowed a cool and abundant spring, furnishing all the water needed for cattle and home consumption, as well as a primitive refrigerating system, known as a spring house, where dairy products, vegetables and fruits were kept cool and palatable. Like

all Southerners, as soon as Dr. Powell built his home, he also began to plan and develop, among other essentials, a flower garden, and ere long, amid the oaks, chestnuts and other native trees growing on these acres, there were magnolias, hedges of gardenias, crepe myrtle, roses, honeysuckles, and many other varieties of flowers to shed their delicious fragrance on "Old Field."

In the meantime, this unique and cultured settlement was growing and all were eagerly building for the good of the whole, and dreaming of a permanent little Eden for themselves and their descendants. In the early fifties, two colleges were chartered and church edifices built on Chunnenugee Ridge. The Dr. Powell of this story, who in 1836 and 1837 had been in the Georgia Legislature and had given his assistance in obtaining the charter for Wesleyan Female College in Macon, Georgia (the first college in the world to give women diplomas), was, no doubt, instrumental in persuading Dr. William Ellison, a former president of that institution, to take charge here of the Chunnenugee Female College. The citizens of the Ridge naturally took pride in their Female College, and schools for boys, and felt it a duty to open their homes to the children of nearby planters, feeling that these children, too, should be given the cultural advantages enjoyed by their own. Since there were no hotels on the ridge, the teachers of these colleges were also welcomed into the homes of the planters, these people feeling, as did that distinguished Southerner, Robert Toombs, of Washington, Georgia, who expressed their sentiments so clearly when he said: "We do not need a hotel in this village. If a man who comes here is a gentleman, he can find entertainment in my home. If he is not a gentleman, he has no business here."

Among the staff of teachers was an exiled Polish Count, G. Krzeckowsky, who taught French to the young ladies of Chunnenugee. On his return home he kept up a spirited correspondence with Chunnenugee friends, and I have in my possession a letter he wrote to one of the Blackmon girls who lived there. Another outstanding teacher in the Female College was a Miss Brown, from Boston,

who taught music. She stayed at the home of Mr. Blackmon for a term and became so deeply attached to the family that her constant denial of the unjust criticism of our beloved Southland by Northern people during the Federal invasion almost brought her in conflict with the authorities.

Many years passed after the Federal invasion of the South without any contact between these friends, but Miss Brown, now Mrs. Cogswell, was ill in 1893, and her thoughts were drifting back to those happy days spent in Chunnenugee and she longed to hear something of the kind friends who had entertained her so royally. She recalled that upon her arrival a special maid was assigned to do her bidding. Coming from a frugal family with one maid, she hardly knew what to do with one all her own, but gradually she accustomed herself to the ways of the South, where each girl had a maid and each boy a valet. She asked her brother to go down to Alabama to find out where and how those friends were. On his arrival he was told that Mrs. Blackmon, her daughter, Mrs. Goodwin, and her two young daughters were living in Washington City, so he left hastily to fulfill his mission as he feared his sister was nearing the end of a long illness. He was given a warm welcome by Mrs. Blackmon and her family and left bearing many loving messages and good wishes for his sister. After her death, Mrs. Welch, her only child, came down from Boston to visit them and the warmest friendship developed between these families. Mrs. Goodwin took Mrs. Welch on a visit to Alabama, where she was shown the old Blackmon home and introduced her to all the relatives, who gave her barbecues, picnics, dinners and drives over the country, which delighted her and made her realize why her mother held in her heart such fond memories of her stay in the Old South. This was the beginning of a long friendship between the second and third generations of Mrs. Cogswell's descendants, which will continue as long as they live.

In June, 1858, Lucy Jeanette Powell and Eugenia Blackmon graduated at the Chunnenugee Female College, showing great

efficiency in music, as well as in their studies, though Lucy was only 15½ and Eugenia 16 years old. Dr. Powell, ever mindful of the welfare of their Alma Mater, persuaded his youthful daughter and granddaughter to use their talents in teaching music in the college the following year, giving their salaries to the College, which they did. In payment for this, he took them on a tour of the famous Springs of his home State of Virginia, then to many of the largest eastern cities and places of interest. Among my treasures is a diary Lucy wrote describing her impressions of places and Southern people they met, many old friends of her father from Alabama and Georgia and elsewhere.

So, while the men of Chunnenugee Ridge were building schools and churches which were then running in perfect order, the women were developing their gardens, which by many visitors from the East were said to be the most beautifully landscaped gardens they had ever seen. Is it surprising then that we find a group of these men and women meeting on the evening of March 6, 1847, for the purpose of organizing a Horticultural Society with the intention of having monthly exhibits of flowers and, in season, fruits and vegetables? Thus was born the Chunnenugee Horticultural Society.

In the first minutes of this Society, which I have in my possession, I find the following preamble:

“And the Lord God planted a garden eastward in Eden . . . and there He put man whom He had formed . . . and out of the ground made the Lord God to grow every tree that was pleasant to the sight and good for food. The Tree of Life also in the midst of the Garden and the Tree of Knowledge of Good and Evil . . . (Gen. Ch. 2, vs. 8 & 9.)

“The first practical act of the Deity after He had formed the starry heavens, divided the waters of the great deep and bid the earth bring forth grass and the herb yielding seed and the fruit tree yielding fruit after his kind, was to place man pure and holy in the garden to keep it and to dress it.

“Can we doubt then that the first great

command of the Almighty still rests on us? There is no study better calculated to expand the soul, to improve the mind, to refine the tastes, to enlarge our comprehension of the useful and the beautiful, than the study of horticulture. Who can reflect on the beauty, sweetness and structure of the rose, without feeling his heart open in adoration to the Great Author of all good, who has left nothing unfinished from the revolution of a planet to the perfectness of the fragile snow-drops? None who has a head to think or a heart to feel”—Geo. D. Warthen.

“Deeply imbued with these truths we unite as members of a Horticultural Society, we claim not for it the cultivation of flowers only, we aim at usefulness and utility. We profess to embrace in our range, fruits, vegetables, manuring . . . to gather and interchange ideas as well as plants, and acquire a thorough knowledge of all that pertains to this healthy, useful and beautiful science; nor will we leave out our sturdy friends, the farmers. It is our desire to aid them, too, to get and to diffuse all the light we can on agricultural pursuits . . . to take our twin sister by the hand and unite our efforts for mutual instruction. Such we wish to make our society . . . a medium for increasing the knowledge and comforts of our fellow men, and a combination of the beautiful and useful. We, therefore, bind ourselves as members of this society to be governed by the articles which follow.”

A constitution with regulations was here written into the minutes which is quite long and contains many interesting details, one among them which provides for a fine if an inattentive member is found whispering during the proceedings.

At the third meeting of the society, on the evening of March 31, 1847, we find that on motion of Dr. Worthy two resolutions on the subject of a Public Garden were passed, namely, “Resolved that this Society does hereby agree to lay out and build a public garden on Chunnenugee Ridge;” second, “Resolved that a committee of six be appointed to examine and lay out the ground and negotiate for the same.” Whereupon the president, R. H. Powell, a son of the Dr.

Powell of this story, appointed a committee of six to consist of Mrs. Williams, Miss Cotton, Dr. Worthy, Mrs. E. J. Cary, Mrs. Carter and Mr. James Horten.

On April 9th, the same year, at a meeting of the Society, I find as follows: "The Committee to whom was referred the arranging and laying out of the Public Garden reported that they have selected a tract of land lying and being immediately before Dr. Powell's residence, and that they desire further time to confer with Dr. Powell who is absent at this time, to see if the same can be had by deed of gift."—Report of Mrs. E. J. Cary, Chairman.

On the evening of Monday, November 8th, 1847, there is recorded that, "The Committee reported that they had conferred with Dr. Powell and the doctor stands ready to make the deed of gift to the regular trustees appointed by the Society and their successors in office, and said tract reverting to him when it shall cease to be used as a public pleasure ground." On this same date the Society resolved to: "Petition the legislature of Alabama at its next session to charter the Chunnenugee Ridge Horticultural Society."

After the ground for the "Public Garden" had been secured, the members were then asked to send trained negro gardeners from their estates to clear the ground and make it ready for development, which was done under the supervision of a committee appointed for this purpose. Special attention was given to the time and type of planting, and numerous committees were appointed for the different phases of perfecting the garden.

As can be seen by the minutes, the Society grew larger and larger at each meeting and many persons from nearby cities in the South were admitted into the Society. Honorary members were also added, among them being nurserymen from New York, Augusta, Georgia, Columbus and elsewhere. Time went on and many forms of entertainment were given, such as suppers, monthly exhibits, with prizes for the different varieties of flowers, flower arrangements, etc.

Many dahlias were grown, bulbs being ordered in great quantity. It was decided, however, that anything shown for premium should not be procured elsewhere than in the home garden.

The members set aside, by vote, a small area in the Public Garden to grow strawberries and cotton, the proceeds of which were used to pay for the premiums at the flower shows. This also was cultivated under the supervision of a committee.

As the Horticultural Society and Public Garden developed, it was determined by the members to hold an annual Fair, to be known as the Chunnenugee May Fair, an annual flower festival which was always to be held about the first of May when the flowers were at their best and attracted visitors far and wide. And on the 18th of April, 1850, there appeared a notice in the issue of the Macon Republic, Tuskegee, Alabama, which read, to wit:

CHUNNENUGGEE HORTICULTURAL SOCIETY

The annual fair of this Society will be given at Odd Fellows Hall on Chunnenugee Ridge on Wednesday, first day of May, next, at which time and place there will be an appropriate address by Honorable Wm. P. Chilton. The public generally is invited.

Then only two years later, on May 6, 1852, we find the Editor of the Macon Republic writing as follows:

"On last Thursday we went down to the annual Horticultural Fair at Chunnenugee Ridge and we were much gratified with our visit. The Fair was held in the garden, which is new as yet, but which promises in a few years to be a very pretty place. It is laid out with a good deal of taste and well planted with shrubbery. The garden house is a neat circular building."

Before long, however, rooms were added to the building because we find that an exhibition house as commodious as a modern club was built in the Public Garden. It contained a "Large salon where concerts were given, a dining room, a hall and an open pavilion." The Salon, which was

always beautifully decorated for the occasion with a lavish use of cut flowers, was the place where the members and guests gathered on the first evening of the Fair. That the Fairs were well attended may be seen from the following extract of an old letter which states that "among the distinguished guests were the top of the pot socially from Columbus, Georgia, Mobile and Montgomery, as well as many from the Carolinas."

In another account of the May Fair in the early 50's, we find R. H. Powell mentioned as calling the meeting to order, as President, ladies then not being accustomed to speaking in public; and that "after an invocation by Rev. Wm. Henderson, the President's address followed and was described as replete with good sense and historical research, classical allusions and poetic beauty." Immediately after this address, the guests repaired to the dining hall where a sumptuous feast had been prepared. During this repast soft music floated out from a decorated bower where a small group of negro players sat, probably those belonging to Col. Luther Walker, who had been trained to play at the entertainments of his beautiful and accomplished daughters. We read that the dessert consisted of "ice cream, strawberries and plain, as well as pyramids of beautifully embossed cakes." Since there were no caterers at this time, these cakes were decorated by the skillful fingers of the ladies of the Society.

On one evening during this Fair there was a grand concert given by the young ladies of the ridge in the large salon in the exhibition house, and we read that "The young ladies were charming in their flowered Dresden silks as they sat at the harp and piano," and "following the concert an elegant collation was served." After a visit to this most delightful fair, a young man wrote as follows:

"Flora and Pomona, hand in hand, awakened in me a high admiration for the Chunnenugee ladies in particular and for a Horticulture in general, and I made a resolve to forsake bachelorhood and get unto myself a wife, a home and a garden."

Throughout the grounds of this Public Garden there were summer houses covered with honeysuckle and roses, mingling their perfume with hundreds of blossoms to be inhaled by the young men and women who rested in seats within these flowery retreats to chat or stroll leisurely on the green stretches of lawn beyond. The "Lover's Knot" was also an intriguing place to wander as well as to wonder. "It consisted of a growth of shrubbery planted in such an intricate design that it created a maze with its one concealed entrance, and once within its confines the young ladies and gentlemen were hopelessly lost." The only authoritative statement extant is the admission that "it took the young lovers at the Chunnenugee May Fair a remarkably long time to solve the difficulties of escaping from the confines of the tall flowering shrubbery of the Lover's Knot."

This being strictly an agricultural country, of course, no Fair would be complete without including specimens of everything grown in the soil, as well as samples of the skill of the housewife. On the last day of the Fair premiums were awarded for flowers, flower arrangements, etc. Special mention was made of a Della Robbia Wreath cleverly designed of strawberries and flowers by Mrs. E. J. Cary, for which she was awarded a prize, and in the American Cotton Planter of July 1856, we find that a premium for the best essay on horticulture was given Mrs. Homer Blackmon. A prize was also given the young woman most skilled in equestrianship, promoted by the young gentlemen of the Ridge. We read: "The Young Ladies wore sweeping riding habits and carried gold-topped riding crops, splendidly mounted on spirited horses. It was a thrilling moment when each took the course." As horseback riding was a universal accomplishment at Chunnenugee, the contest was animated with the rider's skill and daring.

Another reference which I would like to give is an article written by a visitor to Chunnenugee in the early fifties that was published in the Alabama Journal, to wit:

"The reputation of this pleasant section, so well known, is by no means exaggerated,

either in respect to its floral production, the beauty and accomplishment of the ladies, or the general high culture of its people. I left this pleasant section leaving my kindest thoughts for the genial and refined hospitality that greeted me at every step. Now, my dear Junior, as you are, I suspect, a marrying man, do not in your celibate wanderings forget to visit this garden spot of loveliness and pleasure and you will not wish to go further.

"Nowhere will you find more finished beauty, more heightened, refined and lady-like breeding, combined with all that is admirable in household virtues than in this flowery gem in the hills of Macon County.

"On the last night for the Fair, tableaux were given by the young ladies and gentlemen. One particularly effective tableau was the flower-filled barge of Elaine. A golden-haired Miss Cotton was breath-takingly lovely as the white-clad recumbent Elaine, with lilies at her breast, while a young West Point officer, with his sword at his side, was a handsome if unrepentant Launcelot."

Each Year in the American Cotton Planter and Macon Republic, the lists of premiums were published, as well as accounts of these Fairs; and among the descendants of Chunnenugee residents there must be extant many of the premiums given during the existence of this society of which I have no knowledge. However, there is in the pos-

session of Mrs. McRoberts and her sister, Miss Goodwin, of Chevy Chase, Maryland, a handsome silver cream pitcher given to their aunt, Mary E. Blackmon, at the age of sixteen, in 1856, for her superior equestrianism. I also have in my possession a large silver tray given Mrs. N. B. Powell by the "Chunnenugee Horticultural Society, 1856." This will suffice as positive proof of this once famous and beautifully cultivated "Public Garden," as well as proof of the Horticultural Society and the artistry of the private gardens there.

But, as is well known, early in April, 1861, a black cloud which had long threatened the Southland began to rise in the Northeast and, amid thunder of artillery and sounds of invading hoof beats, it swept farther southward. When it had passed, this peaceful serene landscape had been almost swept away and soon there was little left to tell of the past glories of this small but unique settlement of old Chunnenugee. The good Doctor and President Ellison's wife and child sleep near each other in the Powell graveyard on a picturesque knoll, back of "Old Field," and there now remain only a few shrubs and crepe myrtles, grown as tall as young trees, along the road near the once famous Public Garden of the Horticultural Society, and the private gardens have become but a tradition among the descendants of those early pioneers of the Ridge, the home of those kindly, nature-loving people of the Old South.

Dwarf Azalea Hybrids

ROBERT L. PRYOR¹

The azalea breeding program of the Ornamental Plants Section, Horticultural Crops Research Branch, began with the primary goal of production of evergreen varieties hardy in northern United States. Thirty-eight varieties for outdoor planting have been named and introduced as a result of the breeding work. Varieties with potential possibilities for forcing also have been developed, but the present report is confined to work on outdoor hardy types, particularly hardy dwarf hybrids. The parentage of all azaleas in this group, usually called the Beltsville, or USDA, azaleas, is generally different from that of varieties in the large group introduced by the Plant Introduction Section (former Division of Plant Exploration and Introduction) of the Department and known as the Glenn Dale hybrid azaleas.

About ten years ago the selection procedure was modified so that small seedlings formerly discarded the first year were kept and grown in the greenhouse. Analysis of plant heights for complete progenies revealed that many very small seedlings maintained thrifty growth but at a very slow rate. These seedlings are apparently genetic dwarfs with normal-size flowers, large and vigorous root systems, and very low spreading growth so that they are broader than high.

Parentage of Dwarf Azaleas

The parents of the dwarf azaleas were species hybrids of normal appearance. The pollen parent is now on trial for possible introduction into the nursery trade, but the female parent, a single-flowered seedling, was not sent out for trial. These parents had many of the characters desired for azaleas, such as hardiness, compact growth habit, glossy evergreen foliage, and large flowers with good color and texture.

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The parents of the two species hybrids belonged to two different groups, one known as Kurume azaleas and the other as Indian. The Kurume azaleas were developed from *Rhododendron kiusianum* (*obtusum* f. *japonicum* (Maxim.) Wilson), which is native on Hishi Peak of Kirishima, Japan, at an elevation of 3000 feet. This species was described as having small evergreen foliage, small red flowers, and dense twiggy growth, but some plants had small white flowers. Some early reports described the original Kurume azaleas as trailing rather than erect. The shrub form we know now was developed by years of selection and breeding. With good culture most of the Kurume azaleas attain a height of four to five feet in ten years. Some may reach a height of eight feet at maturity.

The Indian azaleas were developed from a number of rhododendron species. The European species *R. indicum* (L.) Sweet, *R. phoeniceum* f. *maxwellii* (Millais) Wilson, and *R. mucronatum* (Blume) G. Don are tall, reaching a height of six to ten feet when mature. The Indian group includes some American species such as *R. speciosum* (Willd.) Sweet, and *R. calendulaceum* (Michx.) Torr., which are tall shrubs.

The variety "Indica alba" of the Indian group, when crossed with the variety Snow of the Kurume group, produced seedling No. 236. This plant bore all white flowers $1\frac{3}{4}$ to 2 inches in diameter. When fertilized with pollen of similar hybrids, it produced some dwarf plants.

The pollen parent in the cross which produced the highest percentage of dwarfs was seedling No. 342. It came from a cross of the horticultural form Maxwellii of the Indian group and variety Snow of the Kurume group. In each cluster there are two flowers. They are hose-in-hose type, two inches across. The ten overlapping clear-rose-pink

TABLE 1. Height, width, and annual branch increment of normal and dwarf azaleas

Plant number	Height	Width	Mean annual branch increment	Size class ¹
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	
Parent 342	51	45	3.08 ± .30	A ₁
Parent 236	66	52	2.06 ± .12	A ₂
Seedling 769	42	36	3.32 ± .21	A ₁
Seedling 770	36	30	2.47 ± .23	A ₂
Seedling 953	15	36	1.42 ± .04	B ₁
Seedling 950	14	30	1.45 ± .04	B ₁
Seedling 945	12	24	1.15 ± .07	B ₂
Seedling 952	9	24	.99 ± .07	B ₃
Seedling 959	8	9	.97 ± .04	B ₃

¹All differences between the two size classes designated by the letters A and B are highly significant. There are further, smaller, but still statistically significant differences within the two size classes indicated by the subnumerals.

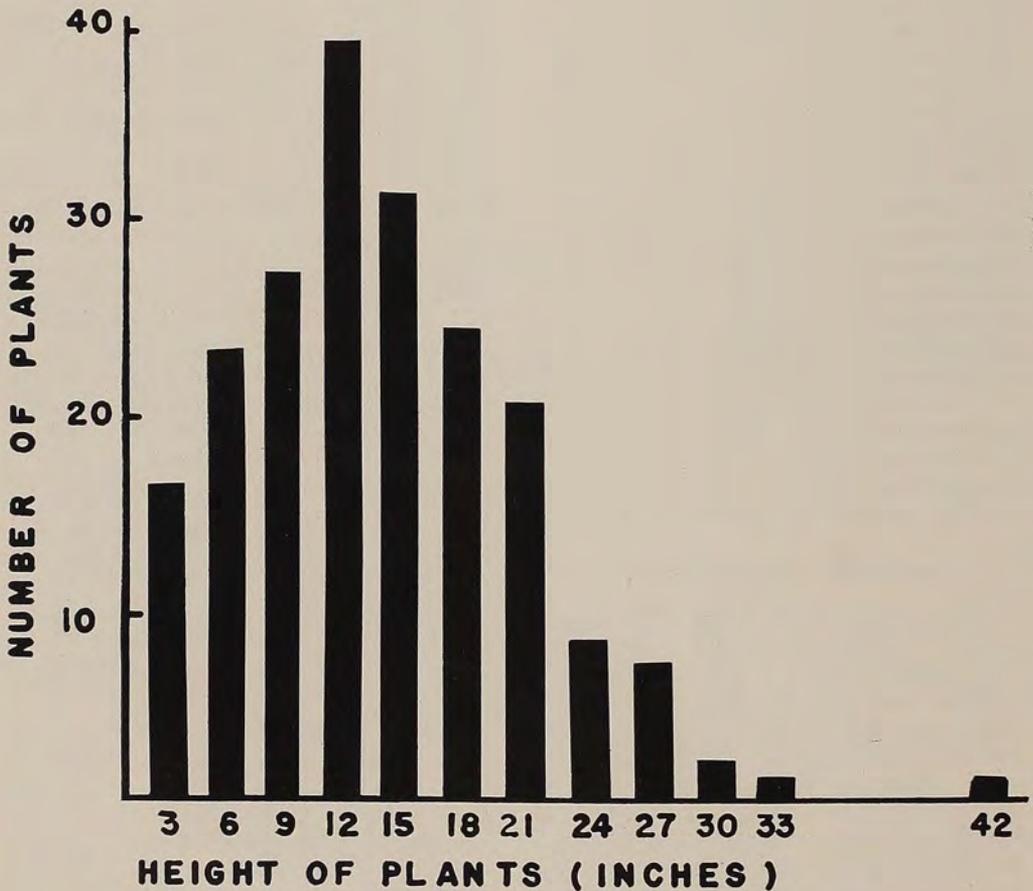


Figure 1. Height of two-year-old seedlings from cross which produced ten per cent dwarf plants.

petals have red dots in the throat. Five rose-pink filaments support brown anthers. The normal style is medium in length and a little longer than the filaments. The stigma is yellow.

Characteristics of Dwarf Azaleas

Internode length. The crosses of these two species hybrids, No. 236 and No. 342, yielded 199 seedlings. Measurements of the heights of these seedlings when two years old fell into a normal distribution (Fig. 1). The plants listed in Table 1 are medium and short individuals from the progeny obtained from the cross No. 236 x No. 342. The height and width of these plants were measured when the plants were nine years old. In addition, measurements were made of the annual growth in length of branches during each of the nine years. The distance between successive groups of branches that arise around each terminal flower cluster marks the annual increment of branch length and will be referred to in this paper as annual branch measurement. Similar data for the two parent plants were included for comparison.

The branch increment for each plant is the mean for 130 measurements. Many azaleas tend to be taller than broad, as shown for the parents and two of the taller seedlings. These four plants all have average branch increments of over two inches and are put in size class A, which statistical analysis showed to contain plants significantly taller than those in the other size class B. The plants that were short and considerably broader than tall were classified dwarfs. The data (Table 1) show that the average branch increment of these dwarfs is less than $1\frac{1}{2}$ inches.

Branching habit. A second characteristic greatly influencing the stature of these plants is direction of branching. Growth of branches of parent plant No. 236 tends to be vertical while that of No. 342 is more nearly horizontal. This type of growth has resulted in No. 236 growing taller than 342, even though it has much shorter annual branch increments. The dwarf plants are apparently a result of a recombination of two characters, the horizontal branch growth of No. 342 and the short branch increments of No. 236. Figure 2 shows a branch of a dwarf plant with short

branch increments and horizontal branches in comparison with a normal branch with vertical branching. Some dwarf plants, however, have vertical branch habit and are dwarf only because of their extremely short branch increments. Figure 3 shows two dwarfs, one with horizontal and one with vertical branching. True dwarf azaleas have larger root systems in proportion to their tops than do normal plants. Some plants may appear to be dwarfs only because of a small, weak root system. The two parent plants, No. 342 and No. 236, were of the same age and were grown under comparable conditions in the field. All the progeny were grown in the greenhouse where conditions were more favorable. It is likely that the differences between parents and progeny would be even greater if they were grown under similar conditions.

Frequency of dwarf plants. While dwarf azaleas have been obtained from a number of different crosses in which one parent or both were Kurume x Indian hybrids, the population described in Table 1 and Figure 1 yielded the highest percentage of dwarfs. When the plants were measured after two years of growth, the plants in the two smallest classes, those seven inches or less in height, were saved. About half of these grew into small and medium-sized plants. Others which remained dwarf were discarded because of poor flower quality or extremely weak growth. The percentage of the original population of 199 seedlings remaining dwarf after five to seven years was about ten. Eighteen other crosses between Kurume x Indian hybrids yielded even smaller percentages of dwarf azaleas. In two crosses, however the maternal parent was a Kurume x Indian hybrid and the pollen parent was Snow or Salmon Beauty.

Fertility. The dwarf azaleas are less fertile than azaleas in the Kurume groups. However, a few plants from crosses between some of the dwarfs have been obtained. Dwarf No. 539 x Dwarf No. 601, both bearing single flowers, gave ten dwarf and eleven normal plants, a 1:1 ratio. Only two other seedlings, one dwarf and one normal, were obtained from many crosses between the dwarfs.



Figure 2. Annual branch increments of normal and dwarf azaleas. The normal plant has long branch increments and vertical branching, while the dwarf plant has short branch increments and horizontal branching.

Figure 3. Dwarf azaleas fifteen months from cuttings. Plant on left shows horizontal branching; plant on the right vertical branching.



No seed has been obtained on any dwarf or Kurume with hose-in-hose flowers and growth regulators did not overcome the sterility. Some seed has been produced on double or partially double flowers whose doubleness resulted from a petaloid condition of the stamens. Such partially double flowers exist to a large extent in the Belgian Indica group of greenhouse azaleas.

Flowers and leaves. The dwarf azaleas have about the same range of flower color as the larger evergreen azaleas. The leaf characters vary more in the dwarf than in the Kurume and Indian groups. Some leaves are regular and of about the same size as those of Kurume and Indian azaleas; others are smaller and resemble the small leaves of English boxwood. Some have twisted or ruffled edges. Still others have leaves larger than either parent. Leaves of some dwarf azaleas are long and narrow, about the shape of weeping willow leaves, but not as large. Several types of leaves from dwarf azaleas are shown in Figure 4. A few of the dwarf plants, the nearest to a yellow-flowered evergreen azalea that we have so far, develop yellow or albino leaves early in the spring. From a distance these leaves look like yellow flowers. Later, as the second set of leaves appears these yellow leaves abscise. These yellow leaves did not turn green when treated with sequestrene iron, indicating that the yellowing is due to a genetic character, not to a physiological condition caused by deficiency of iron. The plants with deep yellow foliage color have never bloomed, but some with the brighter yellow and albino leaves have flowered.

Propagation

Seed production. The methods of crossing, handling seed and young plants, and propagation by cuttings are much the same for the dwarf azaleas as for normal ones. Female plants were emasculated before the anthers dehisced, usually several days before the flowers opened. The stigma was receptive about two days after the flowers opened. The pollen was transferred to the stigma by removing a filament with anther attached and rubbing the anther over the stigma. The pollen of azaleas pulls from the stigma in a string or sort of filament instead of the usual separate granules.



Figure 4. Branches from dwarf azaleas showing different leaf characters.



Figure 5. Stamen of mature azalea flower with string of pollen coming out of anther sacs.

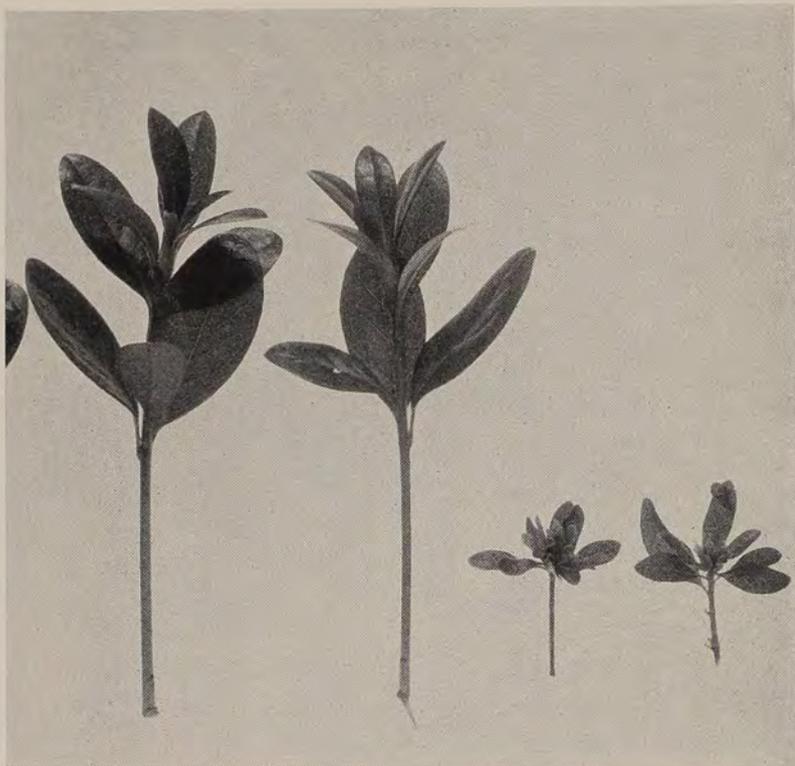


Figure 6. Cutting from normal and dwarf azaleas showing effect of annual branch increment on size of cutting.

Figure 7. Normal and dwarf plants fifteen months from cuttings.



All illustrations accompanying this article were made from photographs taken by Robert L. Taylor

Close examination shows the filament to be made up of the pollen grains clinging together (Fig. 5). Great care was taken in the azalea breeding program to control completely the pollination and prevent accidental selfing or insect pollination. The plants were grown in a screened greenhouse and sprayed with insecticides at 10-day intervals. The plants were grown in the greenhouse until the seeds were ripe, the average time being four to four and a half months. When the seeds were ripe, the capsule turned brown and began to open at the distal end. After harvest, capsules were stored in a dry place for a few days until the seeds came out of the capsule with ease. The seeds were very small and amber or light brown and were planted as soon after cleaning as possible.

Growing from seed. The seeds were planted in a mixture of 1/3 fine leaf mold, 1/3 Grade A horticultural peat, and 1/3 sandy soil. The leaf mold and peat were put through a 1/4-inch screen before thorough mixing with the sandy soil. Flats were filled with the loose mixture, which was then firmed down, and the seeds scattered thinly over the surface. Small amounts of seed were planted in rows. The seeds were covered with finely screened sphagnum and watered thoroughly. The flats were kept moist by frequent spraying until the seeds germinated and plants were firmly rooted in the medium. They were then watered more heavily and less frequently. The optimum temperature range for seed germination is 75° to 80°F. The seedlings were transplanted as soon as the first true leaves appeared and should be transplanted by the time they are one inch tall. The seedlings were transplanted in the same soil mixture used for germination and are grown at 65° to 70°F. Fertilizer and spray programs were the same as for all other azaleas.

Propagation by cuttings. Propagation by semi-hardwood cuttings was the same as for Kurume or evergreen azaleas. The proper time to take cuttings was determined by the ripeness of the wood, and no definite calendar date can be set. One learns the proper state of ripe-

ness from experience in handling the cuttings and observing their rooting behavior. The wood of many varieties is ready when the next year's flower buds are visible. Dwarf azaleas are generally harder to root than the larger Kurume azaleas because of their short branch increment. The short cuttings do not extend very far into the rooting medium. Roots are formed nearer the surface of the medium where it is more difficult to keep the moisture content uniform and prevent drying out. Dwarf azaleas vary greatly in the ease or difficulty of rooting, evidently because of their genetic makeup. Some of the dwarfs root very freely and easily, about 90 to 100 per cent, while other lines are very difficult to root, no more than 25 per cent rooting.

On the dwarf azaleas, with average branch increment of less than 1½ inches, many shoots are too short for even a very small cutting. This reduces the number of cuttings available and slows down the increase of new varieties. Figure 6 shows cuttings from normal and dwarf plants. Cuttings of the dwarfs grown continuously in the greenhouse have taken about three years to produce 4- to 6-inch plants. Most normal evergreen varieties make this size in one year. Figure 7 shows a dwarf and a normal plant fifteen months from cuttings.

Uses of Dwarf Azaleas

The development of these new dwarf varieties opens up many new uses for azaleas in landscaping modern homes. The low-spreading growth and evergreen foliage, coupled with the spring flowers that have made azaleas so popular this last decade, should put them in great demand once the public learns about them. While they are relatively slow to propagate, it is the very slow rate of growth that makes them such desirable shrubs.

These dwarf seedling varieties are now on trial at twenty-five locations in the United States. When sufficient information is available as to their hardiness and adaptability, some will be named and released for propagation by cooperating nurserymen. None are available now.



Cam-Art

Flowers of the Balsa tree, Ochroma lagopus

The Lightest Wood

EDWIN A. MENNINGER

The lightest of all woods, contrary to popular belief, is not Balsa. Doubtless responsible for this misconception is the fact that Balsa is the commonest light-weight wood with which most persons have had experience.

It is the wood of a Central American tree, *Ochroma lagopus*, which is occasionally seen in cultivation in South Florida though it is better known as the material from which youngsters fashion toy airplanes. "Balsa" is a native name signifying raft, for its chief use in Central America is as logs tied together to form a raft for quick, easy and sure navigation. It has a specific gravity of .12 which means it is one-eighth as heavy as water on which it floats.

But Balsa lacks a lot of being the lightest wood. Here are five trees the wood from which is much lighter than Balsa — how much lighter can be seen from the specific gravity figures:

Aeschynomene hispida Willd.

Specific gravity .044

This wood weighs only one-third as much as Balsa, and roughly one-twenty-fifth as much as water. It is a Cuban tree, allied in the bean family to *Sesbania* and *Daubentonia* which are cultivated in Florida. This species is not described in Leon's *Flora of Cuba* though several others are. The pith helmets used in India are made from a species of this same genus.

Alstonia spathulata Bl.

Specific gravity .058

This weighs half as much as Balsa. Samples were discovered as driftwood on a Pacific island by a representative of the Japanese Forestry Service and for a time considerable mystery surrounded them because the wood of this *Alstonia* tree is not ordinarily so light. Researchers discovered that the light-weight wood is found under ground in the tree's roots which often extend thirty feet and are very much branched. The tree grows in swampy land or in standing water, usually twenty-five feet high and a trunk diameter of six to ten inches.

Where the trunk joins the root there is a marked swelling so that the diameter of a six-inch trunk may increase to twenty-four inches near the ground. The density of the wood in this swelling is about midway between the rather hard wood of the trunk and that of the almost pithy root. Root wood is yellowish white, ivory colored, and feels like velvet. It is so soft it can easily be indented with the finger nail, yet according to Edmund Graefe, who wrote of it in a German magazine, *Umschau*, in 1934, it is used in making plywood, tropical helmets, life preservers and insulation. Eloise Gerry of the United States Forest Products Laboratory, reported in *Tropical Woods* 39:64, that a block of this wood, if compressed to a tenth of its normal size, will upon release of pressure return to about one-fourth of the original volume, and, if soaked, may regain its full size.

Herminiera elaphroxylon Guill. et Perr.
Specific gravity .065

This tree from the banks of the Nile in Tropical Africa is quite unknown here. It is closely allied to the Cuban tree, *Aeschynomene*, and the wood is used for canoes, floats, etc. As the figures show, the timber is only half as heavy as Balsa.

Cavanillesia platanifolia H.B.K.
Specific gravity .103

This is a handsome big tree of the Panama Canal Zone, often to a hundred feet. Standley called it "one of the most remarkable trees of this region" and added: "The tree . . . is very conspicuous, especially when in flower, in late March and early April." The red-petaled flowers are small. The wood is white or yellowish, soft, coarse, and pith like. No commercial use is made of it, but the trunks are often used by the natives for canoes, or to float rafts of hardwood which would otherwise sink to the bottom. The timber is sixteen per cent lighter than Balsa.

Annona palustris L. Specific gravity .116

This "root wood" from Cuba is allied to the custard apple and soursop trees of Florida, all of them rather small of stature. The wood is only a fraction lighter than Balsa.

It is noteworthy that Balsa and the other five lighter woods listed here are all from tropical trees. Rowlee in the

Journal of the New York Botanical Garden (1921) observed that such trees with exceptionally light-wooded stems always occur in warm areas where high temperature and humidity are conducive to rapid growth, that they usually have tough, fibrous bark and large leaves, and that their wood is light-colored and perishable.

The Temperate Zone has only two trees that begin to compete in this contest for lightness. One is the wood from buttresses of the Tupelo or sour gum tree (*Nyssa* sp.) which has a specific gravity of .124 (almost as light as Balsa) and the other is timber from the Japanese tree occasionally seen in the United States, *Paulownia tomentosa* Steud., which has a specific gravity of .26 (twice as heavy as Balsa.)

There are a good many trees that are considerably heavier than water and timber from them will not float. The heaviest timber ever examined at the Yale Forestry Research Laboratories was a sample of letterwood, or snake-wood from British Guiana, taken from a tree known scientifically as *Piratinera* sp. which belongs to the mulberry family. It has a specific gravity of 1.36 when dry or 1.5 when wet, which means it is half again as heavy as water and would sink like a rock. This tree is not known in the United States, although a closely allied tree, called "butternut," *Brosimum alicastrum*, is occasionally seen in Florida.

Recent Research Results

DONALD P. WATSON¹

Quality of frozen green beans and strawberries: Using different freezing temperatures during a 10-month storage period has been shown to greatly influence the quality of frozen green beans and strawberries. R. T. Pierce, M. D. Shaw, J. G. Heck and Grace Bennett have demonstrated this difference in quality of frozen fruit and vegetables as a result of a very small difference in storage temperature.

Working at Pennsylvania State University the study was made to determine the effect of a 3° difference in storage temperature ranging from -3 to +12° F. "Tendergreen" snap beans were harvested and washed in cold water after the ends had been removed and the beans were cut into 1-inch pieces. Then the beans were blanched for 1½ minutes at 200° F. and cooled immediately in cold water. "Temple" strawberries were harvested, washed, drained, cut into uniform pieces and one part of sucrose was added to six parts of strawberries. Both the beans and the strawberries were packed into Polyethylene boxes with tight-fitting polyethylene lids. After the packages were placed on trays in the refrigerator and frozen at -12° F. they were placed in temperatures of -3, 0, +6, +9, or +12° F. Using as a measure of quality, ascorbic acid content, bacterial and mold count, color and flavor, these investigators concluded that the different storage temperatures had a great effect on the quality of the frozen green beans and strawberries.

Those stored at the lower temperatures showed a continually small decrease in ascorbic acid content with the increase in storage period. At the higher temperatures, however, there was more rapid decrease in ascorbic acid content. From their palatability scores it was apparent that beans stored at -3 and 0° F. were

superior to any of those stored at a higher temperature. With strawberries, the quality changes could be detected more readily by color and the results, while similar to those for green beans, were not quite as convincing.

The authors believed that since these two foods, quite different in their make-up, responded similarly that they might be used as an example for other foods. Their results indicated that when it seemed necessary to maintain a definite quality in a frozen product, a very few degrees in storage temperature could greatly alter the maximum storage time to be recommended.

R. T. Pierce, M. D. Shaw, J. G. Heck and Grace Bennett. Small storage temperature differences can affect the quality of frozen strawberries and green beans. *Refrigerating Engineering*, Vol. 63, No. 11: 52-57, November, 1955.

Earlier tomatoes from cold exposure: Being sometimes guided by commercial tomato growers who have noticed that outdoor-grown plants or those which are seeded directly in the field often produce fruits earlier than those that are started in a warm greenhouse, S. H. Wittwer and F. G. Teubner last year tested ten varieties of tomatoes and produced the results that are summarized in the accompanying table.

Seeds of the ten varieties listed in the table were shown in the latter part of March. As soon as the first cotyledonary leaves had formed half of the plants of each variety were grown at a 65-70° F. night temperature in the greenhouse and the other half at 45-60° F. night temperature in the coldframe. The seedlings which had been exposed to the lower temperature in the seedling stage produced more flowers on the first clusters. They flowered after fewer numbers of leaves had formed on stems composed of shorter internodes and greater diameters.

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Differences in growth and flowering between coldframe (left) and greenhouse (right) grown tomato plants. The "cold-exposed" plants (left) flowered after fewer numbers of leaves; produced more flowers in the first clusters; and had shorter internodes, heavier stems, and stronger sideshoots (variety, Valiant).

COLD EXPOSURE OF TOMATO SEEDLINGS

Early yields of tomatoes from greenhouse (65° F. night temperature) and coldframe (45-60°F. night temperature) grown plants (cumulative yields to August 8—East Lansing, 1955).

Variety	Early yields (pounds per plant)		Percent increase from coldframe grown plants
	Greenhouse	Coldframe	
Siouxann	4.5	10.5	133
Early Hycross	6.6	9.8	49
Hybrid A	4.5	8.3	84
Moreton Hybrid	5.5	7.9	44
Fireball	3.7	7.8	111
Big Early Hybrid	3.9	6.6	70
Valiant	4.6	6.5	41
Foremost E-21	3.3	5.5	67
Early Chatham	3.8	4.8	27
Cavalier	2.5	3.4	36
Mean	4.3	7.1*	65

* Increased early yields of coldframe-grown plants highly significant ($P = 0.01$).

These research workers observed that the greatest increases in the early yield as a result of the exposure to the cold were during the third and fourth weeks of harvest. Altogether the total marketable yield of the coldframe-grown plants was 18.3 pounds per plant compared to 17.8 pounds per plant on those which were grown in the greenhouse.

S. H. Wittwer, F. G. Teubner. Cold exposure of tomato seedlings for early fruit production. Quart. Bul. Mich. State Ag. Exp. Sta. Vol. 38, No. 4, May, 1956: 588-594.

Earlier flowering of bulbs and corms from x-ray treatment: While the use of x-rays has been shown to stimulate plant development as a result of seed treatment, John L. Spencer has demonstrated recently that there is a similar growth response with some vegetative plant parts. Using the following 12 genera including 16 species or varieties of Corolliferae: *Allium albopilosum*, *A. moly* L., *Colchicum luteum* Baker, *Crocus speciosus* Stev., *Gladiolus* cv. 'Gene,' *Hymenocallis calathina* Nichols, *Lilium henryi* Baker, *L. regale* Wilson, *Lycoris radiata* Herb., *Narcissus pseudonarcissus* L. cv. 'King Alfred,' *Sternbergia lutea* Ker-Gawl, *Tritonia crocosmaeflora* Lemoine, *Tulipa kaufmaniana* Regel, *Tulipa* cv. 'Mrs. Scheepers,' and *Zephyranthes candida* Herb., significantly earlier flowering resulted for 7 of these plants the first season after treatment. Six of these were non-hardy types that were planted in the spring.

One hundred bulbs of each variety were exposed to 5200 r of x-rays at 170 r per minute and then planted intermixed with 100 control bulbs or corms in a uniformly prepared soil. The hardier varieties were planted in the fall, the non-hardy types were treated and planted in the spring. Some of the lilies were radiated in the fall and planted. Others were radiated in the spring and planted. The non-hardy varieties were dug in the fall and replanted the following year. All of the doses of x-rays were applied in the laboratories of the School of Engineering, the University of Massachusetts in Amherst.

In general, the flowers from the radiated bulbs and corms of all genera except *Narcissus* and the fall-planted *Lilium henryi* appeared to open earlier than their controls the first season of planting. Statistical analysis of the compared dates for first flowers did not show a significance for all of these apparent earlier flowering tendencies in spite of the apparent trend. The author felt that there was a direct relation between the brevity of the period between exposure and flowering and the induction of earlier anthesis by x-rays. The average dates of first flowers for the second year showed no difference as a result of treatment and little, if any, loss of vigor from radiation was observed.

John L. Spencer. 1955. The effect of X radiation on the flowering of certain cultivated bulbs and corms. Amer. Jour. Bot. Vol. 42, No. 10: 917-920.

A Book Or Two

(Books noted "(Library)" are available for loan to the membership.)

Shady Gardens. How to Plan and Grow Them.

Emily Seaber Parcher. Prentice-Hall, Inc., New York. 1955. 282 pages. Illustrated. \$4.75. (Library).

Like many another book on American gardening—this is written primarily for the New England gardener. Although much of the material would be applicable to certain portions of the northwest or mountainous sections of the east, other statements would not hold for the large portion of the middle west and south.

The book is divided into three sections. The first section deals with degrees of shade followed by chapters on herbaceous flowering plants and bulbs that are tolerant of shade. Several of the plants listed are not suitable unless the garden is situated in one of the favored cooler regions. *Coptis trifolia*, *Cornus canadensis* and *Linnaea borealis* cannot be made to flourish unless the ground temperature stays below 50° F. *Trillium undulatum* belongs in this same category. The basic material in this section is very useful and the advice in most part is excellent.

The second section deals with foliage and woody plants. Ferns listed in one portion do not all seem to be chosen with care. Bracken would soon become a pest, whereas purple cliffbrake would be unlikely to grow at all well unless given proper conditions near limestone. None of the spleenworts are mentioned, although several are quite easily grown and are useful as well as beautiful in the shade garden.

The remainder of this section is quite well written and deals with deciduous and evergreen shrubs as fully as could be expected without going into undue detail.

The remaining section of the book deals with design of gardens, special types of garden and garden maintenance. The information presented is in a useful form and should be of considerable help in designing and maintaining a shade garden.

This book should be quite valuable as a guide in developing a shade garden if it is borne in mind that New England gardening practices will not always be suitable for the rest of the United States. The text is interesting and well written while the illustrations give some ideas of plant material and garden design.

F. W. COE

Geraniums. Pelargoniums. For Windows and Gardens.

Helen Van Pelt Wilson. M. Barrows and Company, Inc., New York. 1957. 240 pages. Illustrated. \$4.50. (Library).

The author has brought her book on the Geraniums up to date. In this she has given a bit of their history and present day interest. Next the many varieties are grouped according to certain characteristics from a horticultural point of view. The culture of the geranium is discussed from the gardener's standpoint as it would be followed in the East or as they would be grown in California. This includes outdoor growing, in window boxes, or in the home greenhouse. Her enthusiastic writing is of a kind to change a passive grower of this plant into one who starts to collect some of the dwarfs, those with colored leaves, the interesting scented-leaf types, or some of the many single- or double-flowered kinds. A final chapter considers a list of species and varieties with a description to help identify many kinds. To help, she has included many varieties and synonyms.

CONRAD B. LINK

Bulletin No. 1, The Louisiana Society for Horticulture Research.

Copies available from Mrs. U. B. Evans, Haphazard Plantation, Ferriday, Louisiana. 26 pages, illustrated in color and black and white. \$1.50.

This particular issue, under the editorship of Mrs. Truax, is full of new things and very exciting to those who live in the South in particular. Its main themes have to do with amaryllids, the reports by Dr. Traub and others on the plants brought back from Bolivia by Dr. Ira Nelson, with enough material to clear up some of the problems of nomenclature and one very exciting new species, *Amaryllis evansiae*. There is an equally exciting report on the collecting of Zephyranthes species by the Clints of Brownsville, Texas.

Any one who has any interest in gardening in the South and in Amaryllis will need this copy. The editor is delighted to bring it to the attention of the Society.

Annuals From Seed. Roy Genders. Gives details of growing many annuals and tells how to get the best results from sowing your own seed.

Cacti and Succulents. Lawrence W. Cahill & Peter J. Panting. The recent surge of interest in these plants has demanded the production of a reasonably priced booklet on their care. This one is essentially practical, giving the principles on which the maintenance of these plants in a healthy state depends.

Chrysanthemums for Everyone. Fred W. Loads. Specifically written for the novice with good information and advice on how to obtain the best results, whether in greenhouse or garden.

Climbing Plants For Your Garden. Douglas Bartrum. This one tells of many climbing plants. The handbook arranges the vines for appeal during the four seasons of the year.

Dahlia Growing. T. R. H. Leber. Although this one is written for the beginner, the booklet also has much that will be of interest and help the experienced in getting the finest flowers.

Flower Arrangement. Charles Hewitt. For Christmas, is a Potato Ball arrangement a new idea?

Garden Roses. Stanley B. Whitehead. Dr. Whitehead shows how it is possible to cultivate larger and better blooms by taking a little extra care with planning, soil preparation and planting.

Hedges, Their Planting and Care. Ray Genders. Why plant a hedge? Climate & Soil. Renovating. Coloured foliage. And other helpful items.

Indoor Plant Growing. Stanley B. Whitehead. Details the culture, management, and what to grow indoors.

Japanese and Miniature Gardens. Leslie Woolard. The accumulated experience of many years, embracing numerous secrets and wrinkles, has been crystallized into making this a most complete booklet on the subject.

Lilies and Their Cultivation. M. E. Leeburn. Written by an expert lily grower, this is a very helpful booklet on the cultivation of lilies.

Orchid Growing. John W. Blowers. He proves that orchid growing is not an impossible pleasure.

Rock Gardening. Roy Genders. Best position, selecting stones, propagation, likes and dislikes (of plants), maintenance, etc., are furnished in this one.

The above thirteen titles have these things in common: 1. Published under the general editorship of W. A. Foyle. 2. Published by W. & G. Foyle, Ltd., London, within the past three years mainly for the English climate. 3. Distributed by Dover Publications, Inc., New York. 4. Paper bound—approximately the same size. 5. Contain about a hundred pages. 6. Illustrated. 7. Cost 65 cents each. 8. (Library).

Roses for Every Garden.

R. C. Allen. M. Barrows and Company, New York, 1956. 218 pages. Illustrated. \$4.50. (Library).

Rose growers everywhere will welcome the new revised edition of Dr. Allen's *Roses for Every Garden*, which is an authoritative guide to American roses and includes many new developments since 1948.

The book commences with the story of roses throughout the world and their development to the present day. A section is devoted to the bush roses and their present day classifications. It includes hybrid teas, florabundas, grandifloras, polyanthas, hybrid perpetuals, shrub roses and shrub roses for hedges, miniatures, tree or standard roses and the old-fashioned roses. In each classification he gives a list of varieties popular in all sections of the country, based on personal observations, surveys and reports of amateur growers throughout the country. There are many handsome colored photographs of the roses listed.

There is a chapter entitled "Your First Rose Planting," with valuable suggestions on selection of varieties and proper location of plantings. This chapter is followed by pages on soils, planting and transplanting and a chapter on the care of roses. Pruning, cutting and disbudding, spraying and dusting each have their sections. In "Insects, the Common Eight," a description is given of each of these pests and the best methods of disposing of them. Methods of control of diseases are given in the chapter "Diseases, the Big Four." "Culture for Special Climates" is a valuable chapter, as is the chapter on "Pleasures and Pitfalls of Exhibiting," which covers the show field. With interest in propagation and hybridizing increasing daily among roses growers, the chapter on this subject will be of great value. On the lighter side is the delightful chapter on "Fun with Roses" and the novice will treasure the "Glossary on Rose Jargon" which will enable him to understand the "rose talk" of experts.

Readers of Dr. Allen's book will agree with the author that the future of the rose "is full of glorious possibilities" and that an enthusiasm for roses will not only result in more beautiful home grounds but "as a common denominator in human relations, they have no superiors and few equals, and many fine friendships have developed from a common interest in the rose."

KATHERINE BARRETT POZER

Party Flowers.

Constance Spry. Studio Publications, Inc., in association with Thomas Y. Crowell Company, New York. 1956. 80 pages. 19 colour and 22 black and white plates. \$2.95. (Library).

Mrs. Spry, internationally famous British flower arranger, chosen to do the flower work for Queen Elizabeth's coronation, describes her distinctive decorations for the 350-guest luncheon following the Abbey ceremony. Other illustrations picture her lavish use of garden and hothouse flowers, fruits, vegetables, foliage plants and shrubs from early spring through Christmas, both for formal parties and home celebrations.

M. C. L.

Ornamental Conifers.

V. Chaudun, translated from the French by Vera Higgins. Crosby Lockwood & Son, Ltd., London. 1957. 114 pages. Illustrated. 17/.

A book on a specialized subject aiming at the provision of sound cultural notes, description of recommended species, the whole arranged to give the maximum practical advice to professionals and amateurs in easy form. Gardeners will be surprised by the pleasing effects to be gained with conifers and with the help of the excellent color and monochrome illustrations will discover the best methods of obtaining them.

By choosing only those ornamental conifers which can be grown in Europe and by condensing within the limits of this book all that need be known in order to grow the plants well, a useful and practical work has resulted. After a quick look at the classification and the distribution of conifers in the world, so as to understand their cultural requirements better, the subject is developed in more detail for the benefit of the professional. As a guide to choice there follow lists, according to position or purpose, of species best adapted to each situation.

The larger part of the work is devoted to the description of the genera, species, and varieties with as far as possible the determining character, which make it possible in each case to unravel the errors in nomenclature frequently found in many gardens.

The Little Bulbs.

Elizabeth Lawrence. Criterion Books, Inc., New York. 1957. 248 pages. No illustrations. \$4.00. (Library).

The gardens of the author at Charlotte (erstwhile Raleigh), North Carolina, and of Carl H. Krippendorf at Cincinnati, Ohio, furnish the materials for this book. With one exception, the voice heard is largely that of experience and experiment, not of folklore and bibliolatry. The exception is the author's devotion to the still valid wisdom of Mrs. Loudon's *Ladies' Flower Garden of Ornamental and Bulbous Plants*, published in London a century and a quarter ago.

Snowdrops, snowflakes, squills, small daffodils, hardy cyclamen, crocuses, and small members of the iris and lily families are covered. Suggestions will also be found about growing oxalis, habranthus, zephyranthes, colchicums, nothoscordum, bulbous iris, oblidanthus, and many others. The reader will inevitably be seduced in trying species new to him. The author's own failures are readily confessed, however, which will tend to protect the reader's pocket-book. Even so, the book should delight the hearts and tills of Messrs. Giridlian, Hayward and Houdyshel, and possibly even the transoceanic Mr. Van Tubergen.

The Little Bulbs is non-technical, simple, perhaps homespun, but a great deal can be learned from it. It carries conviction.

FREDERIC P. LEE

Native Plants for California Gardens.

Lee W. Lenz. Rancho Santa Ana Botanic Gardens, Claremont, California. 166 pages. Illustrated. Published for the Garden by Abbey Garden Press. Pasadena. \$3.85.

This is an excellent book. It was planned for use of the home gardener and yet will be useful to more technically trained persons. It has been planned specifically to bring to the attention of gardeners in California many of the plants that are of very particular value to them and for very particular uses and locations. This reviewer, who once lived and gardened briefly in California, only wishes that it had been available in his time.

Many of the plants treated are better known abroad than in their native state although this is true of other plants native to America.

The illustrations are excellent and the text not only informative but pleasant to read. There are enough pointers in relation to culture of the plants under garden conditions to assure success, if attention is paid to them. This is the point that is most often neglected in texts that deal with native plants, all of which are not immediately amenable to garden conditions and practices.

As a non-resident reading the text one may be moved to covetous feelings and if the gardener-reader is any kind of an adventurer he will plunge into experiments, for not too rarely it comes about that plants that seem particularly happy under certain conditions of life will accept others with more than good grace.

The plants cited, insofar as this reviewer knows them, are all plants that are worthy of garden inclusions for their perfectly patent charms, and their suitability to specific use.

B. Y. M.

Orchids, Culture and Descriptions.

Marcel Lecoufle & Henri Rose. Crosby Lockwood & Son, Ltd., London. 1957. 112 pages. Illustrated. 17/. (Library).

Both authors are French and the book, as may be expected, has a characteristic French quality. Lecoufle probably is the best known contemporary French orchid grower and is well versed in orchid culture.

The book is written for the amateur orchid grower. It is well illustrated in both black and white and color photographs. The color photographs of the American "Alpine" orchids, *Miltonia* and *Odontoglossum* as well as Malaya's *Cypripediums* (*Paphiopedilums*) are outstanding. Some of the captions are in French, with English translations grouped together on one page.

The book touches on the ecology and anatomy of the ORCHIDACEAE, but major stress is placed on horticultural care and taxonomy of the better known orchid genera. The taxonomy is interestingly written and easily read, and includes the etymology of the genera listed. The cultural care has a definite French *savoir-faire*.

E. G.

The Guide to Roses.

Bertram Park. D. Van Nostrand Company, Inc., Princeton, New Jersey. 1956. 288 pages. Illustrated. \$5.95. (Library).

All information about roses and their culture published almost anywhere in the world will eventually cross the desk of that eminent rosarian, Sir Bertram Park, O.B.E., *Chevalier du Mérite Agricole*, Honourable Editor of Publications, National Rose Society of Great Britain and several other publications.

With such a wealth of data to draw from, coupled with a personal experience of practical rose growing extending over a period of several decades, it is reasonable to expect that a book on roses written by Sir Bertram would be authoritative and instructive as well as interesting to readers beyond the confines of the British Isles; and such is the case with his book.

Touching lightly on history, the author devotes a large part of the first chapter to the evolution of our modern roses. In succeeding chapters, he covers carefully rose culture from preparation of the soil, planning, purchasing and planting to pruning, watering and feeding. Other chapters deal with insect pests and their control, diseases and their cure or prevention.

Almost 150 pages, more than half of the book, are used to describe and classify popular roses of the five main classes or horticultural groups. Lists of roses recommended for specific use are included in the five chapters set aside for variety descriptions. Where known, parentage, originator, introducer and the American Rose Society's rating are given for each variety.

Chapters on potted roses under glass, propagation and hybridization give a clear and easily followed description of the procedure to be followed if one wishes to indulge in these special fields. So also the chapter on exhibiting roses; but the list of suitable varieties as well as notes on timing the blooming date by varying the pruning date according to varieties may be of little value in America.

Sir Bertram does not subscribe to the notion that modern roses have lost their fragrance. On the contrary, he feels so strongly on this point that a whole chapter is set aside to dispel the idea as false. He actually waxes indignant in his text defending the honor of our modern roses in this respect. His point is well taken, and it is easy to agree with him on this particular subject.

The chapter on culinary and medicinal use of the rose may be of interest to a limited number of readers; but the monthly reminders of work in the rose garden throughout the year and information about the great rose societies of the world as well as the various continental trial grounds are of general interest.

The concluding chapter covering all of two pages is a refreshing admission of a conservative rose grower that it may be possible to achieve success in more ways than one; that in rose growing there is no exact formula to follow.

Sixty-four color plates picturing 132 roses, 32 plates in black and white, most of them from photographs made by the author himself, plus a very good index, help to make this book a worthy addition to the library of any horticulturist.

NIELS J. HANSEN

Orchids for Home and Garden.

T. A. Fennell, Jr. Rinehard & Company, Inc., New York. 1956. 130 pages. Illustrated. \$2.95. (Library).

The author, nurtured, as it were, in an orchid jungle, is well qualified to write such a book on orchid growing. He is also the grandson of a man who, many years ago, purchased one of the most attractive hammocks near Homestead in Southern Florida and filled it with exotic orchids. He has also lived through the experience of seeing orchids, only a few short years ago, pampered as frailties to be grown in exacting greenhouses to the present day consideration as "toughies" in the horticultural world—to be grown in kitchens and bay windows and treated no better than we treat ourselves.

In this handy little reference book, which is also refreshingly readable, Fennell gives all the steps necessary for any novice to become an orchid enthusiast, from how, what, and where to grow orchids, how to buy them, how to take care of them, to lastly, what to do with the flowers.

The book is amply illustrated with photographs (eight in color) and drawings by the author. It contains a wealth of information and should be readily available to anyone who is interested in growing plants of this fascinating family.

D. S. CORRELL

Plant Propagation in Pictures.

Montague Free. The American Garden Guild, and Doubleday & Company, Inc., New York. 1957. 249 pages. Illustrated. \$4.95. (Library).

This is a "how-to" book on propagation done with photographs, mainly by the author but also taken from other propagation works. It truly covers the field from an amateur standpoint and one can skim through the material rapidly. In some instances, the details are too brief for a novice to follow, as in the case of budding, wherein the whole matter is discussed in six illustrations with a scarcity of text. Such important matters when to bud and cutting back of the stock are left to the choice of the individual so that another text must be resorted to. Despite such shortcomings which must be forgiven because of the extensive pictorial effort, it is a worthy book to have on hand and will give the gardener a number of good ideas that might be difficult to grasp from a text. This particularly applies to equipment and propagation methods.

J. L. C.

*Colchicine—in Agriculture, Medicine,
Biology and Chemistry.*

O. J. Eigsti & Pierre Dustin, Jr. The Iowa State College Press, Ames, Iowa. 1955. 470 pages. Illustrated. \$5.00. (Library).

This is a very complete study of the alkaloid *colchicine*. Dr. Eigsti, who has done extensive work on the effects of *colchicine* on plant material, has collaborated with Pierre Dustin, Jr., M.D., who, in turn, has continued his father's studies on the medical applications of this drug.

The first chapter deals with the historical aspects of the plant source of *colchicine* and gives a brief review of the medical and biological aspects of the drug which are much more extensively covered in later portions of the book. Chapters deal thoroughly with the mitotic effects of *colchicine* in both plants and animals, the sources of the drug in nature, its chemistry and pharmacology. Three chapters deal with the effects of the drug on animal material and plant and animal neoplasms. This is followed by a useful chapter on experimentally produced polyploidy containing definitions of common terms used in this work. Four more chapters cover the various forms of polyploidy and their criteria for judging them.

A section dealing with techniques of treatment will be of use to those interested in experimental application of the drug. Each chapter is followed by a very extensive bibliography and in addition there is an author's index. A thorough table of contents is helpful in locating material.

One minor error is noted in a reproduction of a drawing by Dioscorides (p.5). A "seed-producing portion of *Colchicum autumnale*" is depicted but this is obviously *Leucojum vernum* in bloom and not the seed pod of a *Colchicum*. All in all this is a scholarly work and of interest to those who wish to get all of the available material on *colchicine* and its uses. It can hardly be recommended for light reading.

F. W. COE

The Loganberry.

Mary E. Logan. (Mrs. James H.). Privately Published by the author, 539 Merritt Avenue, Oakland, California. 1955. 20 pages. Illustrated. (Library).

A small booklet telling of the origin and development of the Loganberry by Judge James H. Logan. The story has been compiled by reproducing sections from experiment station bulletins, newspaper accounts and notes made by the judge who was an amateur horticulturist. The Loganberry is a seedling from a cross between the California wild blackberry and a red raspberry thought to be one known as 'Red Antwerp.' The seedling fruited for the first time in 1882. After several years of testing it was turned over to the University of California for propagation and distribution and released to the public in 1893.

CONRAD B. LINK

Biology and Control of the Smut Fungi.

George William Fischer & Charles Stewart Holton. The Ronald Press Company, New York. 1957. 622 pages. Illustrated. \$10.00. (Library).

Those devoted to the strict practice of horticulture would be unlikely to acquire interest in the group of fungi commonly known as smut, or technically as the Ustilaginales. Relatively few of these distinctive and successful parasites trouble the plants dear to the home gardener. A few wild flowers, several aquatics and a number of minor ornamentals in the COMPOSITAE (The Aster Family) would embrace most of the hosts of smuts with which the horticulturist is concerned. Not so, of course, the growers of cereals, in which the smuts cause enormous losses. But if one's biological interests transcend the scope of everyday fruit and flower culture, if one is willing at least vicariously to explore a strange plant group, which in morphology and environmental relations is almost as distinctive among the fungi as that extraordinary family, the Cacti, among the flowering plants, so aptly termed the "Fantastic Clan," then here is a book that would reward others than professional mycologists. Written in terms that the layman will readily understand, and each chapter—such as Life History and Parasitism, Hybridization and Mutation, and Genetics—an integral essay in itself, not requiring the consecutive reading of the whole book, it is to be well recommended for extracurricular browsing.

F. A. W.

Handbook of Broad-leaved Evergreens.

Guest Editor Brian O. Mulligan, Associate Editor Peter K. Nelson. A special reprint of *Plants and Gardens* Vol. 12, No. 3. \$1.00.

Of all the excellent handbooks issued from the Brooklyn Botanic Garden this has by far the best "coverage" as far as geographic areas are concerned and its widely chosen contributors have among them a few souls who were willing to include things in their listings that are not often found in the average garden. It remains, however, a booklet, for the beginner rather than the old hand.

The articles not only cover the field of plant materials but various details of propagation and garden practice which are of great value.

The contents are sufficiently varied so that nearly everyone, except perhaps persons from interior California or the extreme tip of Florida will find something for their particular use.

For areas in which broad-leaved evergreens are almost impossible, there is the amazing report of work at Morton Arboretum in which are faithfully reported the "missing in action."

The address of the Brooklyn Botanic Garden is, of course, as always Brooklyn 25, New York.

B. Y. M.



A List of Organizations Affiliated With The American Horticultural Society

- American Association of Nurserymen
- American Begonia Society
- American Begonia Society, San Francisco Branch
- American Camellia Society
- American Gloxinia Society
- American Hibiscus Society
- American Iris Society
- American Peony Society
- American Rhododendron Society
- American Rhododendron Society, Middle Atlantic Chapter
- American Rose Society
- Bethesda Community Garden Club (Maryland)
- California Garden Clubs, Inc.
- California Horticultural Society
- Central Florida Horticultural Society (Orlando)
- Chester Horticultural Society (Virginia)
- Chevy Chase (D. C.) Garden Club
- Garden Center of Greater Cleveland
- Garden Center of Greater Cincinnati
- Garden Club of Alexandria (Virginia)
- Garden Club of Bellport, New York
- Garden Club of Chevy Chase, Maryland
- Garden Club of Danville (Virginia)
- Garden Club of Fairfax (Virginia)
- Garden Club of Virginia
- Garden Library of Michigan
- Georgetown Garden Club (D. C.)
- Green Thumb Garden Club (Virginia)
- Herb Society of America
- Holly Society of America
- Houston Horticultural Society
- Hunting Creek (Alexandria, Virginia) Garden Club
- Iowa State Horticultural Society
- Kenwood Garden Club (Maryland)
- La Salle Horticultural Society (Montreal)
- Manitowoc Men's Garden Club (Wisconsin)
- Men's Garden Clubs of America
- Men's Garden Club of Montgomery (Maryland) County
- Men's Horticultural Society (Tennessee)
- Michigan Horticultural Society
- Midwest Horticultural Society
- Moline (Illinois) Horticultural Society, Inc.
- National Capital Dahlia Society
- National Capital Garden Club League
- National Council of State Garden Clubs
- Neighborhood Garden Club (Virginia)
- New Orleans Garden Society, Inc.
- North American Lily Society
- Northern Nut Growers' Association, Inc.
- Ohio Association of Garden Clubs
- Pennsylvania Horticultural Society
- Perennial Garden Club (D. C.)
- Pittsburgh Garden Center
- Plainfield Garden Club (New Jersey)
- Potomac Rose Society (D. C.)
- San Francisco Garden Club
- Southern California Camellia Society
- Seven Seas Garden Club (Maryland)
- Takoma Horticultural Club (Maryland-D. C.)
- Talbot County Garden Club (Maryland)
- Washington (D. C.) Garden Club
- Worcester County Horticultural Society