

THE NATIONAL
Horticultural
MAGAZINE



Please address all communications to

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The National Horticultural Magazine

The National Horticultural Magazine is a quarterly journal, being the official publication of The American Horticultural Society, Incorporated. It is devoted to the dissemination of knowledge in the science and art of growing ornamental plants, fruits, vegetables, and related subjects. The Journal is printed by Monumental Printing Company at Thirty-second Street and Elm Avenue in Baltimore, Maryland, and is entered as second class matter in the post office of that city in accordance with the Act of August 24, 1912. Additional entry for Washington, D. C., was authorized July 15, 1955, in accordance with the provisions of Section 132.122, Postal Manual. Subscription to the Journal is included in membership, which is \$5.00 a calendar year.

Original papers increasing the historical, varietal, and cultural knowledges of plant materials of economic and aesthetic importance are most welcomed and will be published as promptly as possible. Material of lasting interest appearing in related journals will be reprinted as available. Publications received for the Library will be reviewed and made available to members after publication of the reviews. These books are designated "Library" following the prices in the book reviews. Reviews of private collections will also be accepted and published. These books, however, are not available for loan to members of the Society.

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Narcissus

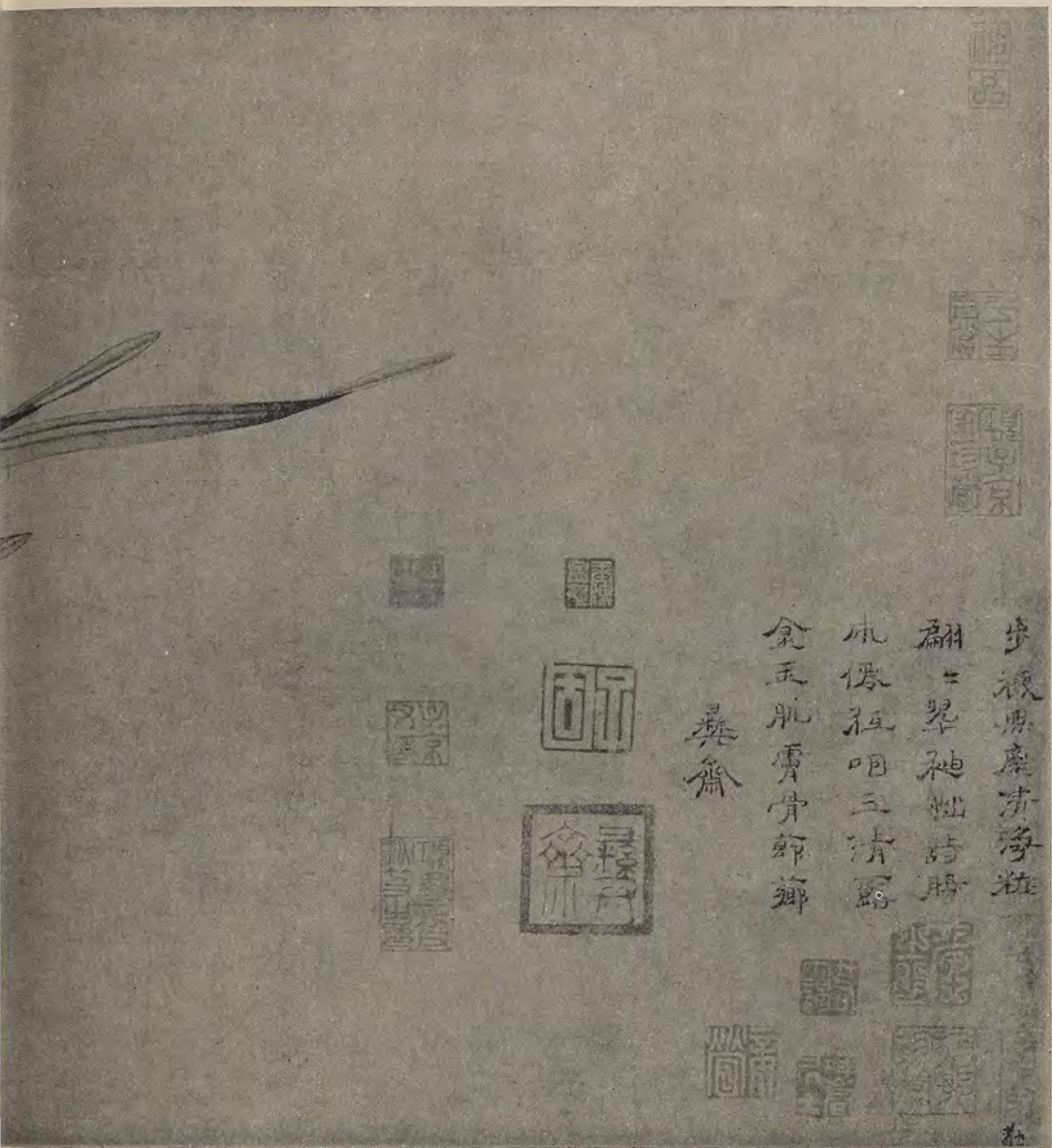
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Ink. Inscription & 35 Seals

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"Going cleanly shod and faultlessly adorned,
 With fluttering blue-green sleeves that wake the poetic soul,
 This perfect Narcissus drinks the immortal dew,
 Its golden flesh, its jade-like skin, its very nodes, are fragrant."

POEM BY LEUNG SHAU-YAN (RIGHT HAND SIDE OF PAINTING). TRANSLATED BY A. G. WENLEY, DIRECTOR, FREER GALLERY OF ART.

Concerning Ceanothus

MARJORIE G. SCHMIDT

The genus *Ceanothus*, commonly known in California as Wild Lilac, is a singular group of plants which has only recently become popular. An overall picture of the genus will show that it affords, aside from a race of evergreen, blue-flowering shrubs, which in itself is a notable thing, plants which are prostrate or mat-forming; plants which are medium-sized shrubs of dense and compact habit; and a few plants which approach tree size. These variable traits make for exciting and almost endless adventures in natural and man-made crosses. Thus the potentialities for reselection and hybridization are only now being touched upon in the California area, and it seems safe to predict that the future will see a great array of new garden forms.

Taking a review look at the great variety of species, it is amazing to realize that we have so long ignored their possibilities as garden plants. A few gardeners, and of course the botanists, were well aware of the great number of unique plants which grew in the West, many of which were entirely new to the rest of the world. But gardeners in general have only recently begun to ask for "native" plants at the nursery. Probably the beginning of a deeper interest in *Ceanothus* came with the publication of the book on *Ceanothus* by Maunsell Van Rensselaer and Howard E. McMinn in 1942. Their work, along with that of a few forward-looking horticulturalists in collecting, classifying, and testing the various *Ceanothus*, will be touched upon as we go along.

But first let us take an armchair tour around the State to see their wide distribution and the many situations in which they are found. Tourists must get to the high mountains early to see the small round clusters of lavender-blue flowers on *Ceanothus prostratus*, called the Squaw Carpet because it is one of the most perfect of the creeping ground-cover types. Another attractive variety of the northern Sierra Ne-

vada mountains is *C. velutinus*, commonly called Tobacco Bush. This is a broad, low shrub which makes thick stands in the open spaces of the pine forests. The polished oval leaves have a spicy fragrance, and in summer there are large clusters of ivory-white flowers. *C. integerrimus*, called Deer Bush, is native to the mountain regions of five western states. In California it grows in the yellow pine belt, as well as along the redwood regions of the north coast. The Deer Bush is a slender shrub with thin, light green leaves, and showy compound flower clusters in many shades of blue, but often also with flowers of pink or white.

Many of the garden forms of *Ceanothus* have come from the species which inhabit the wooded foothills. A representative of this group might be *C. foliosus*, the Wavy-leaf *Ceanothus*. Found in and around the central coast range mountains, this spreading shrub has distinctive wavy-edged leaves and vivid blue flower spikes. Another woodland species is *C. thyrsiflorus*, one of the first varieties to be discovered by the early explorers. Commonly called Blue Blossom, this *Ceanothus* assumes a number of forms, from a large bush to some selected prostrate types which will be discussed later. The large bush form which grows in association with the redwoods is a glorious sight in March and April when it blooms with abundant masses of bright blue flower clusters. Three or four other species grow in or near the redwoods, one of the most interesting of which is *C. papillosus*. Dark green, rough-textured leaves make this variety an attractive bush even out of flower. The flower spikes are a deep bright shade of blue, and burst from rosy flower buds in mid-April. Observation in areas where *C. papillosus* is native will show a variation in the size of the inflorescence, pointing to the value of reselection. A geographical variant of *C. papillosus*, *C. roweanus*, is a well-known garden plant of low, compact habit, with brilliant, dark blue flower clusters.

Many *Ceanothus* species grow in that vast region of the dry foothills known as the chaparral. A representative species of this region might be *C. cuneatus*, which inhabits the sunbaked foothills from Oregon to Lower California. Known as Buck Brush, but sometimes also called Wedgeleaf *Ceanothus* from the shape of the leaf, this species is a rigid, evergreen shrub, with short spurlike branches, or sometimes having long, arching branches. The white flowers occur in little clusters along the branchlets, and have a honeylike fragrance. On warm slopes the flowers appear as early as January, with a long blooming period often extending into April. The Buck Brush is one of the main components of the chaparral, and, when in flower, whole regions take on a hazy or smoky appearance from the abundance of gray-white flowers. A similar species grows in the arid regions of the south coast range, known as *C. megacarpus*, the Bigpod *Ceanothus*. The warm foothills in back of Santa Barbara are white as snow in January and February with the abundant flowers of this variety.

To complete our tour, we must look at the effective way in which some of the *Ceanothus* species drape the sea-facing cliffs. These seem almost to be a special race of plants created for the express purpose of covering the ocean bluffs with their evergreen carpets. Along the coast south of San Francisco, *Ceanothus horizontalis*, the Carmel Creeper, forms solid mats on wind-swept bluffs. With it grows *Ceanothus rigidus* in low, dense thickets, blooming with a profusion of blue-purple flowers in March and April. *C. gloriosus*, the Point Reyes Creeper, grows along the coast north of San Francisco. Distinctive toothed leaves, rounded clusters of lavender-blue flowers in March and April set this species apart from those so far described. It is often associated here with *C. repens* whose light blue flowers mingle effectively with those of *C. gloriosus*.

To conclude this general description of the *Ceanothus*, we might add a few words about flower color, leaf form and the fruits. Although blue in many tints and shades is the most common color, lavender, purple, pink, and white are also found. The types

of inflorescence can be roughly divided into three: 1) rounded, short-stalked clusters, growing along the upper sides of the branches, as in *C. gloriosus*; 2) extremely long, compound flower panicles, such as in *C. cyaneus*, and some of the new hybrids; 3) might be called an intermediate type, a short flower spike, profusely borne as in *C. impressus*.

In the leaf form there is quite a variation, running the gamut from the tiny-toothed leaf of *C. prostratus* to the large three-inch leaf of *C. arboreus*. In between these extremes are the shiny, wide, oval leaves of such varieties as *C. griseus*, and *C. velutinus*, the rough-textured leaves of such varieties as *C. papillosus*, and many inter-grading forms. Many of the chaparral forms have thick, leathery leaves, while the woodland forms have a thinner leaf, sometimes prominently veined. In some varieties of *Ceanothus* the leaves have a delightful odor, variously described as pungent, balsamic or resinous.

The fruits too are distinctive, being rounded, three-sectioned capsules. With some species there are three prominent horns subtending the whole capsule. The capsules are usually dark green or brown in color, but a few species have russet-red capsules and, when these occur in combination with red-stemmed types, the effect is very colorful. *C. griseus* has clusters of jet-black fruits following the flowers. By late June the blunt seed spike of *C. repens* is thickly set with the bronzy-green capsules, and very ornamental against the dark green leaves.

Coming to a consideration of the *Ceanothus* as a garden plant, we find that *C. impressus* was one of the first in the recent upswing of popularity to be wholeheartedly accepted. *C. impressus* is native to Santa Barbara County, and was brought to the attention of the gardening public through the efforts of the Santa Barbara Botanic Garden. William Van Dersal, in his fine book on *Ornamental American Shrubs*, written in 1942, lists *C. impressus* as the one most often mentioned by California gardeners. *C. impressus*, usually called the Santa Barbara *Ceanothus*, is a wide, spreading shrub grow-

ing to about five feet. Each branch is well clothed with small, dark green leaves having a roughened surface. It flowers in late March to mid-April, with an abundance of short, globular flower spikes. The flower color is a bright blue, and so completely is the plant covered with flowers that it gives a hazy-blue appearance from a distance. As with many of the species, the Santa Barbara Ceanothus is especially fitted for the hardy border where no summer water is given. In my garden, *C. impressus* is planted in a far border among other native plants, with no fertilizer or summer water, and it flowers from top to bottom every spring. In the garden of a friend, a long narrow border between the driveway and the outside boundary was planted with *C. impressus* and flowering fruit trees. Here the delicate pinks and white of flowering crabapples and peaches made a beautiful spring picture with the blue of the Ceanothus.

A close second in popularity as a garden plant is *C. griseus*, the Carmel Ceanothus. Broad, glossy leaves, heavy trusses of medium blue flowers, plus a compact habit of growth make this species one of the most desirable for general purposes. The Carmel Ceanothus flowers in March and April, makes a nice filler shrub among other shrubs or trees, and is also highly recommended as a roadside plant for the coastal regions. *C. griseus* can stand more pruning than many of the species, and recently I saw an old planting of it in an area which was originally meant for a park, but which had since been included in a housing development. In some places *C. griseus* had been trimmed to hedge form, and in other places to suit some home owner's idea of what a well trimmed shrub should look like. But in every case the new growth was thick and compact, with leaves which were clean and polished looking all the year.

C. horizontalis is the name which has been given to a carpeting form of *C. griseus*, commonly called the Carmel Creeper. This low-growing Ceanothus grows thickly on the windswept coastal bluffs, forming solid carpets for mile after mile along the coast. It flowers freely with thick spikes of deep blue flowers which almost hide the leaves when

it flowers in the spring. *C. horizontalis* is recommended as a ground cover in gardens where a drouth-resistant plant is needed, and where grass or a more tender carpeting plant is not feasible. *C. horizontalis* may also be used in a large rock garden, as a bank cover, or as a low foreground shrub. The clean, shiny leaves look well the year around, and the plant grows fast enough to make a good solid ground cover in two or three years.

One of the most floriferous, and certainly one of the most delightful of all of the low-growing species, is *C. vineatus*. Occurring naturally in a very small area north of San Francisco, this was first collected about ten years ago. On a recent visit to this area it was discovered that road crews using oil to kill weeds had sprayed the banks where this species grew and that it was just about completely destroyed. It is sad to contemplate that a plant which nature had developed over many centuries and which served such a utilitarian purpose as land-erosion control should have been destroyed in a few hours. On the other hand, we should be glad that someone did find it and propagate it before it was lost to gardeners forever.

It is a low, spreading plant, with wavy-edged leaves, which indicates its relationship to *C. foliosus*. *C. vineatus* spreads moderately fast, sending out long horizontal branches in all directions. There are also some arching, or upright branches, but these may be pruned out if a flat plant is wanted. It grows well in partial or high shade, and likes regular irrigation such as one would give to a perennial border. In April, the tips and all of the side branches burst into fluffy, compound flower trusses in clear, bright blue. Under the outer branches of a live oak tree, this Ceanothus has made tremendous growth, filling in an upper terrace on a gentle slope. Here it grows with the Evergreen Currant, *Ribes viburnifolium*, whose smooth, light green leaves contrast nicely with the crinkled leaves of the Ceanothus. In another part of the garden, *C. vineatus* grows on a dry bank in full sun, and has become a dense, compact shrub. It was given water only the first year, and, since becoming established, it has received no water, fertilizer or cultivation of any kind. The growth here has been slower,



George Martin, Landscape Architect

John Robinson

Ceanothus horizontalis (Reprinted from *Sunset Magazine*)

and the flower spikes possibly a little less generous, but its worth as a bank cover is well demonstrated.

C. gloriosus, the Point Reyes Creeper, is another member of the genus to have become quickly popular once plants were

made available to the gardener. The distinguishing feature of this form is the holly-like, glossy green leaf, one-half to more than an inch in length. In late March this spring, we found some exceptionally fine specimens of *C. gloriosus* along the coast north of San Francisco, with thick, glossy leaves, and very

deep lavender-blue flower clusters. In the garden, *C. gloriosus* likes more water than most of the species, and enjoys filtered shade. *C. gloriosus* may be used as a ground cover, as a spreading shrub in a large rock garden, or as a low plant for parking strips. It has been successfully used on a terrace where the long branches hang down making graceful curtainlike growth.

Two somewhat different forms of *C. gloriosus* now have separate status, and each one is an interesting plant in its own way. The first of these is a favorite of mine, a low-growing form called *C. porrectus*. This is a charming low shrub, quite amenable to garden cultivation, and responding in a different manner according to the situation in which it is planted. In the shade it sends out long flat branches, but in the sun the growth is more dense and compact. *C. porrectus* is a much-branched plant, with many stiff side branches well clothed with tiny, leathery, toothed leaves. In March, the flower buds begin to expand, and at this time the plant is almost more colorful than the actual flowering period. The flower buds are two or three shades deeper than the open flowers, and look like little blue pearls nestled close along the branches. The expanded flower clusters are rounded affairs in soft lavender-blue. *C. porrectus* remains neat and clean the year around, and has many times proved its value as a ground or bank cover.

C. exaltatus is the largest of this trio, a spreading shrub which grows about three feet high, and then expands to ten feet or more horizontally. The leaves are clean, leathery and hollylike, and the flowers which come in early April are small clusters of deep lavender-blue. *C. exaltatus* is excellent as a foreground or filler shrub for a large garden, and for parks where it will get along with a minimum of care.

Two very satisfactory garden hybrids have come from the seeds of *Ceanothus* 'La Primavera,' itself a hybrid of *C. cyaneus*. The latter *Ceanothus* is a narrow endemic species of San Diego County, and one of the parents of some of the beautiful new garden hybrids. The story of the two *Ceanothus* 'La Primavera' hybrids is well told in

the *Journal of the California Horticultural Society*, Vol. IX, Number 3, July 1948, in a paper titled "Origin and Description of New *Ceanothus* Hybrids" written by W. E. Lammerts. The first of these is *Ceanothus* 'Mountain Haze,' an exceedingly beautiful shrub which has accepted garden conditions with equanimity. Although this hybrid was originally described as being a low, spreading shrub of about four feet, it has grown to much greater size in most California gardens. In the author's garden it is a wide shrub, reaching a height of twelve feet or more after five or six years on the edge of the lawn. The leaves are neat, glossy dark green, with deep furrows on the upper surface giving them a textured appearance which contrasts nicely with the light green leaves of a nearby native Hazel Bush. *Ceanothus* 'Mountain Haze' is free flowering with an abundance of short spikes of clear, deep blue. The flowering period begins in late March, and the bush may remain in full color for as long as six weeks. A sudden warm spell in April may terminate the flowering abruptly, causing the flowers to drop and form a carpet of blue all around the plant.

Deep blue flowers and a rangy habit of growth might properly characterize the second *Ceanothus* hybrid developed from the *Ceanothus* 'La Primavera' seedlings. This one is called *Ceanothus* 'Sierra Blue,' and shows its relationship to *C. cyaneus* with its green bark, and smooth, oval, light green leaf. By the first week in May the long, out-flung branches of *Ceanothus* 'Sierra Blue' are heavy with the six-inch long, compound flower trusses, closely packed with the deep, vivid blue flowers. Some gardeners consider it is too leggy in growth habit, although pinching out the tips and some pruning will help to restrain the rapid growth. However, the author feels that it has a place in the informal garden where it may be used in the background, or as a filler shrub, and where the vivid blue flowers can still be enjoyed. In my garden it grows at the back of a section devoted to native trees and shrubs—with a native redbud on one side, and a deep blue *Ceanothus* 'Julia Phelps' in front.

One of the most engaging of the new *Ceanothus* hybrids is the one called *Ceano-*



John Robinson

Ceanothus 'Julia Phelps'
(Reprinted from *Sunset Magazine*)

thus 'Julia Phelps,' introduced about three years ago. The story of this hybrid concerns a discerning young nurseryman who noted markedly different qualities in a plant among a flat of seedlings, and set it aside for further study. It was grown separately so that the distinct foliage and flowers could be observed, and eventually it was named and its diagnosis published as a new hybrid form. *Ceanothus 'Julia Phelps'* is a compact shrub, reaching about eight feet at maturity. It is well branched from the base, with somewhat arching branches, and rigid side branches. Probably the most attractive feature of this variety is its habit of flowering for the full length of every branch, from the base to the top of the shrub. The flower color is the deepest of any known variety, a true cobalt blue. Every branch is crowded with dark green leaves, papillate on the upper surface. In late March, as the flower buds are swelling, there is an especially colorful period when bits of the vivid blue begin to show, bursting through the rosy-brown bud

sheath. *Ceanothus 'Julia Phelps'* remains in good flower color for three or four weeks, and the dark green, textured leaves make it a handsome shrub for the rest of the year. It may be planted as part of a sturdy border, or as an informal hedge.

A hybrid of some years standing is *Ceanothus 'Mills Glory,'* developed by Howard E. McMinn of Oakland, California. This was one of the first deliberate attempts to develop a hybrid for a specific garden situation. Mr. McMinn was searching for plant material to be used on the edge of lawns in gardens and parks. *Ceanothus 'Mills Glory'* was tested for seven years on the edge of a lawn, and in that time attained a height of two feet and a spread of eight feet. It is reported that specimens grown without water also survived. This variety is a cross between *C. gloriosus* and *C. purpureus* with a nicely toothed leaf in a dark green color.

Two new forms have been selected from seedlings of the prostrate variety of *C. thyrsiflorus*, and are known as *C. repens*. Each is a charming plant in its own way, and each should have a happy future as ground covers of rapid growth and great hardiness. My favorite is the one which is most ground-hugging, a plant which grows only one-half foot tall, but with a spread of six to eight feet. The long, flat branches are thickly clothed with small but shiny dark green leaves. Toward the tips of the branches in April and May are globe-shaped spikes of flowers in a medium blue without the hint of lavender so often found in the *ceanothus 'blues.'* It is a shade which I call a metallic-blue, but this term may not convey the correct color. Suffice it to say that the light blue flowers look very well against the dark green leaves.

The second form of *C. repens* is somewhat more upright in growth habit, although not more than a foot high. Here again is a carpeting shrub sending out long prostrate branches. The leaves are an inch or more long, light green and three nerved, and the large flower spikes are a good medium blue. I can visualize both of these forms of *C. repens* as bank covers where the long leafy branches would make interesting drapery.

Louis L. Edmunds of Danville, California, who seems to have unlimited enthusiasm for native plants, has developed and introduced a number of hybrids at his nursery. *Ceanothus* 'Blue Cloud' is one of these, coming from a cross of *C. impressus* and *C. spinosus*. A tall variety, up to fifteen feet or more, and very free flowering with an abundance of powder-blue flowers in fluffy short clusters. Here again the value of the hybrids is apparent. *C. spinosus*, although a tall, free-flowering shrub, can also be an ungainly plant. But *Ceanothus* 'Blue Cloud' is as attractive as the name, and, when viewed from below, it is indeed cloudlike when it is in full flower.

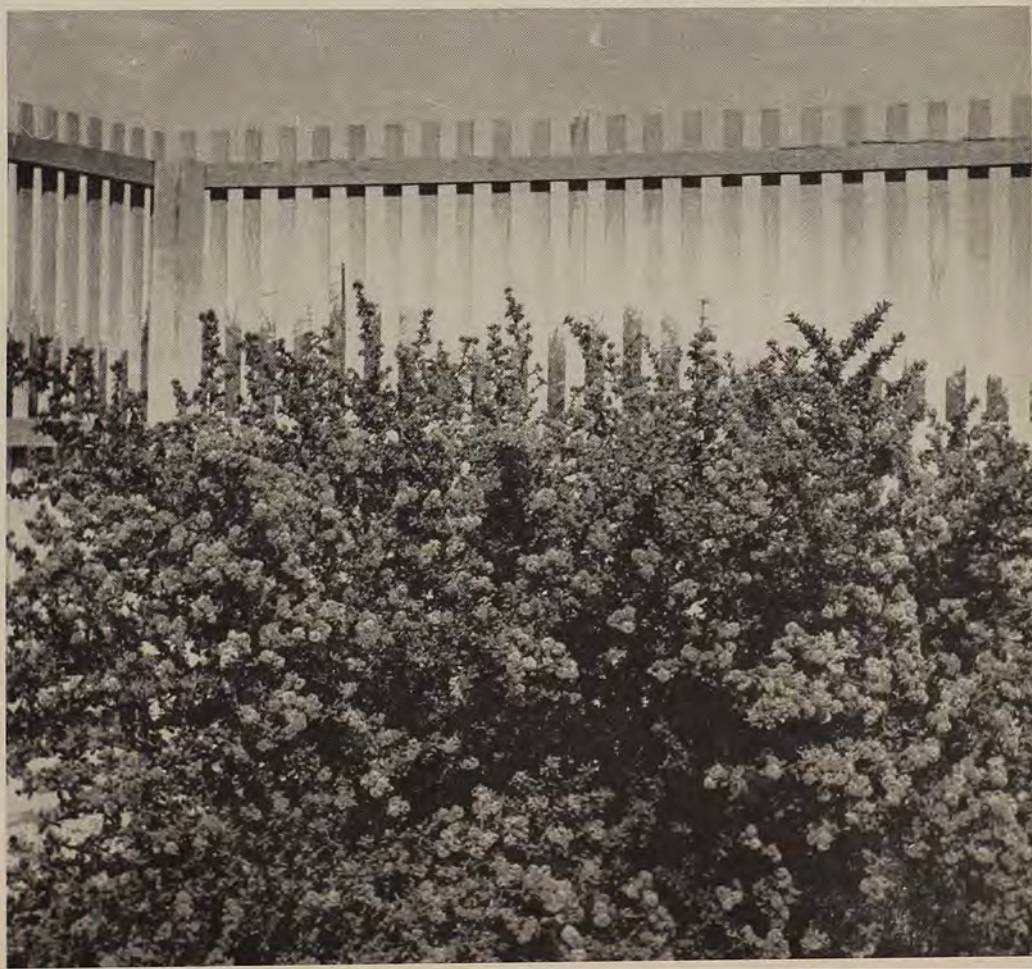
Ceanothus 'Mary Lake' is a low-growing form developed some years ago from *C. repens*, and *C. vineatus*. It is a low, spreading plant, one and one-half feet in the center, and with eight-foot branches. It is a perfect plant for a bank or the top of a rock wall where the long branches can spill down with generous displays of deep blue flowers coming from navy-blue flower buds.

Quite similar to *Ceanothus* 'Mary Lake' is another low-growing form called *Ceanothus* 'Royal Blue' because of the vivid rich blue flower color. This one is a cross between *C. repens*, and *C. griseus*, and is reported to grow somewhat taller than *Ceanothus* 'Mary Lake,' but with the same spreading habit. *Ceanothus* 'Royal Blue' is listed as growing from one to three feet high, and having a spread of six to eight feet. I have seen only a young plant of this hybrid, but I can visualize a bank or terrace covered with it, making a cascade of eye-catching vivid blue.

Another recently introduced hybrid from Mr. Edmunds is aptly named *Ceanothus* "Blue Cushion," a low form making an almost perfectly rounded shrub of dense growth. It is a hybrid of *C. repens* and *C. dentatus*. The latter form is native to a small area near the coast, and is distinguished for its thick flower spikes and dark green, square-tipped leaves. It grows about

(Reprinted from *Sunset Magazine*)

Ceanothus
'Julia
Phelps'





Morton Harvey

Ceanothus vineatus, edge of orchard in author's garden.



Morton Harvey

Ceanothus 'Mountain Haze' and *Ceanothus porrectus* used as ground cover—in the author's garden.



Reprinted from *Sunset Magazine*

John Robinson

Ceanothus horizontalis

a foot and a half high, but has an ultimate spread of four to six feet. Mr. Edmunds has been growing this one on a west-facing slope where it gets no artificial water. He feels, however, that it will tolerate artificial watering, and expects to try it under those conditions.

A spectacular, tall, new hybrid is *Ceanothus* 'Sky Blue,' introduced by Mr. Everett Farwell of Oakland, California. Apparently a hybrid between *C. arboreus* and *C. griseus*. It grows to about fifteen feet, and is as broad. The bush is a stunning sight in full

flower with upright compound flower spikes in a bright blue, giving a pyramidal effect to the plant. It is believed that this form might eventually supplant *C. arboreus* in the garden. The free-flowering habit of this hybrid, coupled with a long flowering period in summer, will make this an exceptionally valuable garden plant.

To bring the *Ceanothus* story right up to date, we make brief mention of some of the new forms as yet unnamed, but which are being watched at the Saratoga Horticultural Foundation. Invaluable experimental work

Ceanothus thyrsiflorus



Marjorie G. Schmidt

with all sorts of trees and shrubs is being done here, including development and re-selection of *Ceanothus* seedlings. Flowering in mid-March at the Foundation was a new form of *C. spinosus*, with beautiful, fluffy, compound flower clusters in vivid blue. This is a medium-sized, broad shrub with oblong, glossy, bright green leaves.

Also in the development stage is another hybrid, a compact selected form of *C. impressus*. This one is a nicely rounded, four-foot shrub, much branched, and each branch thickly clothed with rough-surfaced leaves, almost black-green in color. I can hardly suppress some feminine adjectives when I describe the overall effect of this self-contained little shrub. The leaves grow along the branches in rosettelike clusters, and, with the dark color and textured surface, the effect is that of a piece of rich brocade cloth. In mid-March, there is an abundance of bright but dark blue flower clusters, and by early summer a good crop of russet seed capsules has set on. Even without flowers this shrub would have a place as a colorful landscape plant, one which would make a nice contrasting picture with shrubs in a soft green color.

Hints on the culture of *Ceanothus* have been given for individual plants as they were described. It has been my experience that most of these plants, once they are established in the garden, can take almost any program of cultivation. That program should include perfect drainage, a consistent

program of irrigation according to whether the plant is a species or a hybrid, plus some pinching out of the tip growth and light pruning to shape or control the shrub as it grows. In general, the reselected forms and hybrids should be treated as any garden shrub. The species need water only until they are well established, and after that to be left alone.

Eastern gardeners are no doubt aware of the many hybrid *Ceanothus* forms which were developed in Europe some years ago. Many named varieties came from the crosses between *C. americanus*, native to the eastern and central United States, with *C. coeruleus*, a Mexican species. In sections of the country where the western forms of *Ceanothus* will not grow, gardeners might have success with these European forms. *C. 'Glorie de Versailles'* is one of the foremost of these, a variety grown throughout Europe and America. Other hybrids which have been listed as being suited to the Eastern States include, *C. 'Bijou,' C. 'Coquetterie,' C. 'Georges Simon,'* and *C. 'Marie Simon.'*

And so we are seeing in this work with the genus *Ceanothus* the development of what to all intents and purposes might well be a new race of garden plants. There is much yet to be learned about all of the native plants, and this activity in the genus *Ceanothus* may point the way to what can be done with other desirable and ornamental 'wild plants.'



Donovan Stewart Correll

. . . newly elected president of the American Horticultural Society, is a native of North Carolina. He attended Duke University, receiving his A.B. degree in 1934, A.M. in 1936 and Ph.D. in 1939. He was the recipient of a joint Fellowship from Duke University and Harvard University to complete a dissertation on the ORCHIDACEAE in the Oakes Ames Laboratory at Harvard University in 1938-1939. His published work, *Native Orchids of North America, North of Mexico*, is a well known volume and has established his position as one of the foremost scientists on the taxonomy of orchids. This was followed by a two volume work, *Orchids of Guatemala*, with Oakes Ames. His career has followed several phases since 1939 when he was a Research Associate at the Botanical Museum of Harvard University, until 1943. He was the recipient of a Milton Fund Grant, Harvard University in 1943; was a Botanist with the Alaska Highway botanical-geological survey party of the Joint Economic Committees, Canada-United States, 1943; became a United States Navy Gunnery Officer during the war years 1944-1946; was the recipient of a Post-service Guggenheim Memorial Fellowship, 1946-1947; and joined the staff of the Section of Plant Introduction, Horticultural Crops Research Branch, Agricultural Research Service, United States Department of Agriculture in 1947. In his present work he is the Project Leader for Specialty Crop Introductions in the Section. He is concerned with the exploration and introduction of drug plants such as *Dioscorea* and *Rauwolfia* and is interested in the economic botany and taxonomy of *Solanum*, *Vanilla*, and the Pteridophyta, as well as bamboo.

In 1947-1948 Dr. Correll made an exploration of the highlands of Central Mexico for wild potatoes for breeding, genetical research and subsequent systematic studies. He is currently engaged in a taxonomic study of the Section Tuberarium of the genus *Solanum* of South America. He has a published work on the genus for North and Central America. In 1953 he made an exploration of Cuba, Puerto Rico, and the Virgin Islands for breeding stock of sweet potatoes.

Besides his research on *Solanum*, Dr. Correll is preparing for publication in book form his work on the ferns and fern allies of Texas, recently published as a part of the *Flora of Texas*. The work will include the ornamental nature of ferns and their uses in landscape gardening.

Dr. Correll was Vice-President of the American Fern Society, 1950-1953. He is a member of the American Society of Plant Taxonomists, International Society of Plant Taxonomists, New England Botanical Club, Southern Appalachian Botanical Club, Botanical Society of Washington, and Washington Academy of Science.

While in Europe in 1954 to attend the Eighth Botanical Congress in Paris and to do botanical research, Dr. Correll represented the American Horticultural Society at the Royal Horticultural Society Sesquicentennial celebration in London and at Wisley Garden. He carried with him the Society's scroll which was presented to the Royal Horticultural Society. After attending these two important meetings, Dr. Correll visited many of the major herbaria of Europe in his work on the wild potatoes of Latin America.

The First National Daffodil Symposium

THE AMERICAN DAFFODIL SOCIETY

Some forty-five judges of wide experience covering every section of the United States have cooperated to produce the first nationwide Symposium of the best in Daffodils as grown in American gardens in 1955. The Symposium makes no pretense of being a "Popularity Poll" although no items are listed unless grown in a majority of the regions of the country and have considerable distribution. First year experiences are avoided.

All flowers are listed that received a numerical rating of 60 or more points out of a possible 100 and were reported from one or more of the nine geographic regions. The point score was determined by rating 3 for 1st choice, 2 for 2nd, and 1 for 3rd. This rating was made regardless of the number of varieties actually reported. For some classes, and in some regions, only one variety may have been reported.

Daffodils are listed according to their accepted classification divisions. In each classification items are listed in the order of their preference by the judges. Comment by the Symposium Committee follows each classification and a listing of "novelties" without rating as presented to the Committee is also given although no pretense of including all the new ones is made.

1A Trumpets (Self Yellow)

1. 'Kingscourt'
2. 'Hunter's Moon'
3. 'Milanion'
4. 'Moonstruck'
5. 'Mulatto'
6. 'Golddigger'
7. 'Cromarty'
8. 'Grape Fruit'
9. 'Ulster Prince'
10. 'Goldcourt'
11. 'Principal'
12. 'Burgomeester Gouverneur'
13. 'Royalist'
14. 'Dawson City'

Comment: 'Kingscourt' and 'Hunter's Moon' appeared in almost every report, favorite yellow trumpets. It is noteworthy that the elderly 'Royalist' and 'Dawson City' are still highly rated. 'Moonstruck' and 'Ulster Prince' are the two newest items to receive general approval.

Novelties: 'Luna Moth,' 'Spanish Gold' and 'Virtue' were the three most repeated suggestions for novelties to try. But 'Fine Gold,' 'Golden Dollar,' 'Arranmore,' 'Golden Goddess' and 'Moonrise' also appear to be future contenders.

1B Trumpets (Bicolor—white perianth with yellow trumpet)

1. 'Preamble'
2. 'Content'
3. 'Trousseau'
4. 'Effective'
5. 'Foresight'
6. 'Spitzbergen'

Comment: 'Preamble,' a new and fairly expensive item, closely followed by 'Content' and 'Trousseau,' are the clear pick of the bicolor trumpets. 'Effective,' a rather old one, while not rated first in many reports, was included in almost all the lists.

Novelties: Apparently the ones to watch among the novelties are 'Ballygarvey' (Dunlop), 'Lapford' and 'Pensive' by Wilson.

1C Trumpets (Self Whites)

1. 'Cantatrice'
2. 'Broughshane'
3. 'Beersheeba'
4. 'Mount Hood'
5. 'Kanchenjunga'
6. 'Tain'
7. 'Ardclinis'
8. 'Samite'

Comment: 'Cantatrice' is the overwhelming preference in white trumpets with 'Broughshane' and 'Beersheeba' appearing on most reports as number 2 choice. But 'Broughshane' and 'Cantatrice' are relatively new to be so widely distributed. There were complaints about

the health of 'Cantatrice' and coarseness of 'Broughshane' in several regions.

Novelties: Some impressive novelties are 'Alycidon,' 'White Prospect,' 'Glenbush,' 'Glenshesk,' 'Vigil' and 'Hindustan,' but of course the one all the fanciers are holding their breath to see is Wilson's 'Empress of Ireland.'

1D Trumpets (Reverse Bicolor—The reverse of 1B)

'Spellbinder'

Comment: There appears to be only one well distributed reverse bicolor. This is a small new class.

Novelties: Grant Mitsch's new 'Lunar Sea' is rated as a prime contender.

2A Large Cup (Self Yellow)

1. 'Galway'
2. 'Carlton'
3. 'St. Egwin'
4. 'Golden Torch'
5. 'Crocus'
6. 'St. Keverne'

Comment: 'Galway' is the overwhelming choice as the best self yellow big cup. Old 'Carlton' is next. Almost all reports rated 'Crocus' but down-graded it in many areas on health. The surprise in this list is 'St. Keverne,' a rather expensive, neat, refined, new one.

Novelties: The novelties most often mentioned are 'Mulrany,' 'Amberley' and 'Ormeau.'

2A Large Cup (yellow perianth, orange or red crown)

1. 'Ceylon'
2. 'Narvik'
3. 'Armada'
4. 'Carbineer'
5. 'Dunkeld'
6. 'Aranjuez'
7. 'Rustom Pasha'
8. 'Royal Mail'
9. 'Tinker'
10. 'Indian Summer'
11. 'Garland'

Comment: 'Ceylon' is a relatively new and expensive flower to be overwhelmingly first in this huge class and it proves that if an item is good enough the amateurs will buy it regardless of price. And

the placing of 'Aranjuez,' 'Carbineer' and 'Rustom Pasha' in such a list proves that if an item is good enough gardeners will go on buying it regardless of how old it is.

Novelties: 'Craigyarren,' 'Kindled,' 'Foxhunter,' 'Royal Charger,' 'Firemaster,' 'Galcador,' 'Revelry,' 'Lady Luck,' 'Red Idol,' and 'Red Rascal' were the new ones most often mentioned as those to watch in the future.

2B Large Cup (white perianth, yellow crown)

1. 'Green Island'
2. 'Polindra'
3. 'Brunswick'
4. 'Coverack Perfection'
5. 'Penvose'
6. 'Greeting'
7. 'Daisy Schäffer'

Comment: 'Green Island' is the overwhelming preference in this large group formerly designated as big Leedsii. And please note 'Daisy Schäffer' in the group although many reporters complained about difficulty in getting clean bulbs in some regions.

Novelties: 'Tudor Minstrel,' is the novelty everyone mentions in this group although several praised 'Bithynia,' 'Manchu,' 'My Love,' and 'Aldergrove.'

2B Large Cup (white perianth, red or orange cup)

1. 'Kilworth'
2. 'Duke of Windsor'
3. 'Selma Lagerlof'
4. 'Arbar'
5. 'Signal Light'
6. 'Rubra'
7. 'Fermoy'
8. 'Daviot'
9. 'Rococo'

Comment: 'Kilworth' is the unenthusiastic point winner of this class; in fact, with two exceptions, all the items in this group are placed by a great number of second and third choices. The two exceptions are the expensive newcomers, 'Arbar' and 'Signal Light.'

Novelties: The four most mentioned novelties are 'Fire Gleam,' 'King Cardinal,' 'Blarney's Daughter,' and 'Satin Queen.'

2C Large Cup (all white)

1. 'Zero'
2. 'Ludow'
3. 'Truth'
4. 'Carnlough'
5. 'Jules Verne'
6. 'Ave'

Comment: Guy Wilson's ice-white 'Zero' is the clear preference in big-cup whites, closely followed by 'Ludlow' and 'Truth.' The feature of this group again is the inclusion of a relatively new one in 'Ave.' Some regions complained of temperament in this group, especially in rainy seasons.

Novelties: The hot numbers to watch in this group especially include 'Woodvale,' 'Glenmanus,' and 'Pigeon.'

2D Large Cup (reverse bicolor: yellow perianth, white cup)

'Binkie'

Comment: 'Binkie' is the unanimous and sole choice in this very limited group.

Novelties: Grant Mitsch and several English hybridizers report some interesting seedlings in this class but no names have been suggested as yet.

3A Small Cup (yellow perianth, yellow, orange or red cups)

1. 'Chungking'
2. 'Market Merry'
3. 'Ardour'
4. 'Apricot Distinction'

Comment: 'Chungking' is the overwhelming preference in this group, with 'Market Merry' rated largely on second performance votes. Mitsch's new 'Ardour' is the interesting item in the group and suggests that gardeners are out looking for a better 3A.

Novelties: The only new one urged in this group is 'Arnhem' which is not too new at that.

3B Small Cup (white perianth, colored cup)

1. 'Limerick'
2. 'Blarney'
3. 'Mahmoud'
4. 'Bravura'
5. 'Carolina'
6. 'St. Louis'
7. 'Angeline'

Comment: 'Limerick' is the preference in this group by a close margin over 'Blarney.' This is a strong class and is closely contested.

Novelties: The novelty accent is on 'Corncrake,' 'Tulyar,' 'Carnmoon,' 'Lough Areema,' 'Artist's Model,' 'Glenwherry,' and 'Masaka.'

3C Small Cup (all white)

1. 'Chinese White'
2. 'Cushendall'
3. 'Frigid'
4. 'Bryher'
5. 'Portrush'
6. 'Foggy Dew'

Comment: 'Chinese White' is the overwhelming preference in the all-white cups with 'Cushendall' the runner up. 'Portrush' and 'Foggy Dew' are placed largely by second choice votes. Some reporters complained about 'Chinese White's' neck.

Novelties: No new ones have been suggested in this class.

4 Doubles

1. 'Cheerfulness'
2. 'Yellow Cheerfulness'
3. 'Swansdown'
4. 'Falaise'
5. 'Shirley Temple'
6. 'Mary Copeland'

Comment: 'Cheerfulness,' the old tazette gardenia daffodil, is the undoubted preference in this not too popular group. The group features two relatively new items in 'Swansdown' and 'Shirley Temple' that may suggest a trend.

Novelties: The big novelties are 'Gay Time' and 'Double Event.' There is also some interest in 'Golden Ducat' and 'Hollandia.'

5 Triandrus

1. 'Silver Chimes'
2. 'Rippling Waters'
3. 'Tresamble'
4. 'Thalia'

Comment: 'Silver Chimes,' a hybrid, looking like a white tazetta, is the overwhelming choice in the small cup triandrus group and 'Tresamble' the unquestioned preference in the large cup.

Novelties: 'Lemon Drops,' 'Thought-

ful,' and 'Rosedown' are the new ones to try.

6 *Cyclamineus*

1. 'Beryl'
2. 'Charity May'
3. 'Peeping Tom'
4. 'Jenny'
5. 'February Gold'

Comment: 'Beryl' is the preference in this nodding class but the popularity of the new 'Charity May' and 'Jenny' demonstrates eagerness in this group for better items.

7 *Jonquilla*

1. 'Trevithian'
2. 'Golden Perfection'
3. 'Chérie'
4. 'Golden Goblet'
5. 'Golden Sceptre'

Comment: 'Trevithian' is the overwhelming preference in this group.

Novelties: No actual novelties are reported but among the newer ones, 'Sweetness,' 'Tittle-Tattle,' and 'White Wedgwood' seem most promising.

8 *Tazetta* (Multiflowered, *Poetaz*)

1. 'Geranium'
2. 'Martha Washington'
3. 'Orange Wonder'
4. 'Cragford'

Comment: 'Geranium' is the point winner in a close race over 'Martha Washington' in this not too popular class.

Novelties: Among the newer items are 'Anna-Brita' and 'Laetitia'—very promising.

9 *Poets* (*Poeticus*)

1. 'Actaea'
2. 'Cantabile'
3. 'Seagreen'
4. 'Smyrna'

Comment: With only about half the judges reporting in this class 'Actaea' is clearly preferred with 'Cantabile' being boosted in the connoisseur corner.

Novelties: 'Groenlo?' is the only new one suggested.

10 *Species, Wild Forms and Hybrids; Miniatures* (under 10 inches)

1. 'Raindrop'

2. 'April Tears'
 3. 'Fairy Circle'
 4. 'Frosty Morn'
 5. 'Tanagra'
 6. 'Xit'
 7. *watieri*
 8. 'Lady Bee'
 9. 'Flomay'
 10. 'Sun Disc'
 11. 'Kidling'
 12. 'Yamolf'
 13. 'Mustard Seed'
 14. 'Angie'
 15. 'Sneezy'
- cyclataz*
'Dawn'
triandrus aurantiacus
triandrus albus
obvallaris
Pencrebar
rupicola
tenuior
Nor-nor
minor
Lintie
triandrus calathinus
cyclamineus
bulbocodium conspicuus
Tristesse
canaliculatus

Comment: Although a great many of the judges made no report on miniatures, those who did report indicated more than average knowledge of this fast-growing class. 'Raindrop' was the clear preference followed by 'April Tears' and the little 3B 'Fairy Circle.' The placings in the order of preference after the first 15 involved too much hair splitting to mean a great deal.

Pinks

1. 'Rosario'
2. 'Rose of Tralee'
3. 'Interim'
4. 'Moylena'
5. 'Ann Abbott'

Comment: 'Rosario,' an Australian 2B, is the preferred pink with 'Rose of Tralee' a close second.

Novelties: Of course, the new pink everyone wants to see is Richardson's 'Salmon Trout.' Other much talked of pinks are 'Karanja,' 'Belleek,' 'Rose Caprice' and Dunlop's 'Pink Isle.'



Arnold Arboretum

An interesting planting of shrubby ground covers on this bank in southwest Scotland, only a hundred feet from the sea, give a fine example of "ground cover plants." Included in this planting are: Veronica, Erica cornea, Ulex, Berberis, Cotoneaster and Pfitzeriana.

Ground Covers

DONALD WYMAN

There is a wide interest in ground-covering plants by many a modern gardener and professional plantsmen as well. This is not only true of the home gardener, but the landscape engineers who are responsible for landscaping our major highways are becoming more and more interested in seeking out plants that can be used to cover the ground along the highways which do not require the costly maintenance of grass.

It must be admitted that grass is the ideal ground cover. It can be kept closely cut, looks neat and it can be walked on and played on far more than any other plant, but it also must be admitted that, in order to be kept in good condition, one must spend considerable time in cutting, fertilizing and often in watering. On the other hand, there are many plants which,

although they can not be walked on as much as grass, nevertheless, make excellent ground covers and require far less maintenance once they are established. So, though we must admit there is no perfect substitute for grass, there certainly are many plants which can be used as ground covers. Only a few will be mentioned here but I am sure these in turn will easily suggest many others to the enterprising gardener.

There are always places where grass can not be used to good advantage. Take the steep or rocky bank, as one example. There are many such situations where grass can not be satisfactorily cut. Such plants as the Sweet-fern (*Comptonia peregrina*), Forsythia 'Arnold Dwarf', Aaronsbeard St. Johnswort (*Hypericum calycinium*), Fragrant Sumac (*Rhus*



Arnold Arboretum

Phalaris arundinacea picta (Ribbon Grass)—a quick spreader for a ground cover.
It may become a vicious pest unless kept within bounds.

aromatica), Virginia Rose (*Rosa virginiana*), Memorial Rose (*Rosa wichuraiana*), are just a few suggestions. Once established all these need very little maintenance and if any grow out of bounds they can be ruthlessly cut with a brush scythe, shears or one of the new brush-cutting machines with whirling knives, to keep the plants from growing out of bounds.

Then there are certain evergreen ground covers that can look well the entire year. Such would certainly include the Japanese spurge (*Pachysandra terminalis*), the native bear-berry (*Arctostaphylos uva-ursi*), several cotoneasters, varieties of Euonymus and junipers, the excellent little Canby pachistima, the low wineleaf cinquefoil (*Potentilla tridentata*), and several low-growing sedums.

The merits of any evergreen ground cover are certainly obvious, and, in this respect at least, these plants prove superior to grass as ground covers.

Flowering and fruiting ground covers certainly add color to any planting. The rosy, creeping gypsophila (*Gypsophila repens rosea*) is beautiful when its pink flowers are open, and others like the Allegheny foam flower (*Tiarella cordifolia*), several kinds of violets, myrtle, several sedums, hypericums and the little crested iris (*Iris cristata*), the very popular bugle which comes in several varieties with different colored flowers, the evergreen candytuft (*Iberis sempervirens*), lily-of-the-valley, several of the phlox and primroses—all these are just a few that might be selected for the mats of flowers they produce. Some plants



Arnold Arboretum

The ground cover demonstration plots at the Arnold Arboretum where 150 kinds of ground covers are on display.

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Pachysandra terminalis—the Japanese spurge—grows better in shade than most other ground covers.

Arnold Arboretum



which bear bright and colorful fruits are valued as ground covers for the same general reasons.

Shade is no problem for with a careful search one can find the right kind of ground cover for the shaded area. There are certain obvious choices like the Japanese spurge and myrtle, but one misses a great opportunity for creating garden interest if he does not consider such less well known items as the Epimediums or Bishop's hats, one at least of which can almost be considered half-evergreen since its foliage lasts until mid-winter and even then, though the leaves are dead, they remain upright and rigid, carrying out their ground-covering effects until the new ones are formed early in the spring.

Nor are the dry soil spots a hazard. Take the ribbon grass (*Phalaris arundinacea picta*), or the fast spreading goutweed (*Aegopodium podagraria*), or the bear-berry, the New Jersey tea (*Ceanothus americanus*), bayberry, rose acacia (*Robinia hispida*), fragrant sumac and the polygonum species tall and low—these are only a few. Some of these can become vicious pests even in dry soils because they spread so rapidly.

Sometimes it may become necessary to plant a low barrier ground cover in order to keep pedestrians or pet animals from crossing a certain strip of land. There are some plants that can easily be selected specifically for this purpose and save the trouble of erecting an unsightly fence or tall view-obstructing hedge. A few of the barrier ground covers would be the vigorous growing vines like the honeysuckles or the five-leaf akebia, the low alpine flowering quince (*Chaenomeles japonica alpina*) which is also thorny, roses like the Virginia rose or the lower-growing memorial rose, and the most thorny of all—the cutleaf blackberry (*Rubus laciniatus*).

In the smaller gardens, there may be

situations where ground covers must be planted between stepping stones, or small areas where they will probably be run over by the lawn mower. Plants for such places would certainly include a few sedums, mazus (*Mazus reptans*), moneywort, ground ivy, wineleaf-cinquefoil, thyme, woolly speedwell, and goutweed.

Vigorous growth and the ability to spread quickly are two prerequisites of all good ground covers. Slow-growing plants and those that tend to remain in moundlike clumps are not nearly as desirable as those that spread vigorously. In fact some good ground covers like the polygonums, some of the low bamboos, goutweed, bittersweet and ribbon-grass can quickly become garden pests if unrestricted in the garden. These should be kept out of good garden soils and be used only in very poor soils or in areas where they can spread at will without crowding out anything else.

The Arnold Arboretum in Boston has been accumulating various kinds of ground covers and now has a demonstration plot containing 150 different kinds. There are others of course, and more will be added as some of these fail, but the point is that there are a large number from which to choose. One should know the type of soil available, and have some idea of the height of the plants which would be suitable—then he can have the pleasure of studying several different kinds that more or less fulfill the requirements, finally selecting just the right plant for his situation. One garden can easily display several different ground covers to excellent advantage. In fact, the right ground cover displayed properly in the right place extends the garden just so much farther and, if well grown, means just that much less land to weed or grass to cut.

See Page 107 for a review of Dr. Wyman's new book on Ground Cover Plants. Ed.



Figure 1. Copy of a drawing made by Cavanilles to show botanical features of *Ionoxalis tetraphylla*

Five Species of *Ionoxalis* from Mexico

WALTER C. BLASDALE

In this *Journal* for July of 1955 and in that of the California Horticultural Society for January of the same year, I described some of the South African and South American species of *Oxalis*. Since the climate of Mexico is also distinguished by well defined periods of warmth and dryness, interspersed by those of cold and wetness, it is not surprising to find that the Mexican Flora includes a goodly array of species of the Family *Oxalidaceae*, some of which are good garden plants. Unfortunately, the Mexican Flora has not been given as much attention by botanists and collectors as the other two and our knowledge of these species is more limited. The most

comprehensive study of them of recent date is due to the work of Dr. J. N. Rose which was published in *Contributions From The United States National Herbarium*, Vol. 10 (1910), pages 79 to 131.

In that paper the author follows the suggestion made by Dr. J. K. Small in his *Flora of the United States* who, after much study of this genus, came to the conclusion that certain of these species should be separated from that genus and placed in a new one to be called *Ionoxalis*, which happens to include all of the species with which I am here concerned, along with twenty-four others, seventeen of which are there described by Dr. Rose

for the first time. He writes "In Mexico *Ionoxalis* might well be called the harbinger of spring for it is one of the first plants to respond to the rains which break up the long dry season and is the very first to color the landscape. In my travels for many miles north of the City of Mexico I saw the high villages and plains blue, pink and white with *Ionoxalis* while none of the other vegetables have hardly started."

Ionoxalis tetraphylla Cav. This species was described and illustrated by the Spanish botanist Cavanilles in his *Rariorum Plantarum*, Vol. 3 (1784)¹ and more fully described by Zuccarini in his monograph of the genus in 1851. It was introduced into cultivation in Europe at an early date and became a fairly common plant for both conservatory and out-of-door planting. Like all of the species of *Ionoxalis*, it does not develop a supporting axis of any kind. The leaves arise singly in the spring and result from the conversion of the free ends of certain of the bulb scales into stout petioles from four to eight inches long, each of which becomes crowned with four, or rarely three leaflets, which form a pattern suggestive of a Maltese cross from two to four inches wide. Each leaflet is distinguished by a zigzag band of purple following a course nearly midway between the base of the leaflets and their outer edges. In Figure 1, I have reproduced an engraving of a plant made by Cavanilles. It correctly represents the distinctive features of both leaves and flowers except that the zigzag bands of purple are not shown.

Development of the first leaves is accompanied or even preceded by the appearance of a smaller number of peduncles which arise from the axils of certain of the bulb scales. They usually exceed the petioles in height and are held erect although Cavanilles in his drawing found it necessary to bend them over in order to suit the size of his drawing. Each peduncle ends in an umbel of from five to fifteen long-stalked flowers which develop successively over a long-time interval. The broadly expanded petals are in shades of red and rose but

yellowish on their lower clawlike ends. In all the specimens I have grown, the ring of stigmata is below both of the rings of anthers in the corolla tube.

The underground system also centers around a type of bulb formation distinctive of the genus *Ionoxalis*. Some of its features are shown in Figure 2, a photograph of a plant dug up in mid-summer and washed free from adhering soil. The original nearly spherical bulb is scarcely visible because many of its scales have decayed or become shrunken. The most conspicuous feature, very common in many of the species *Oxalidaceae*, is the carrotlike object which was once a small root but has made an unusual growth at the expense of the remaining roots.

This organ is composed of colorless cells filled with liquid but free from starch grains. Some plants produce several such structures, which not only draw water from deep in the earth but also store it up and prolong the length of the growing season.

Shrinkage of the parent bulb is accompanied by the appearance of white buds along the edge of the central button-like disk from which runners arise that terminate in a small bud that ultimately becomes a leaf-bearing bulb. By the end of the season the area immediately surrounding the parent bulb becomes sprinkled with bulbs of varying sizes which assure reproduction of the species even if no seed is produced. These bulbs are composed of from three to five broad paperlike scales surrounded by a very large number of decidedly narrow but symmetrically arranged scales which are filled with starch grains.

The unusual size and pattern of the leaves, the height of both the leaf and flower stalks, the long period over which the flowers open, added to the adaptability of the species to varied habitats, make this a very desirable garden plant. In England and in the Eastern United States it is considered somewhat sensi-

¹The Library of the United States Department of Agriculture was consulted to secure the photograph which is reproduced on Page 80. The original drawing was found in *Icones et Descriptiones Plantarum (Quae aut Sponte in Hispania Crescunt, aut in Hortis Hospitantur)* Vol. III, 1794, Antonio Joseph Cavanilles.—Ed.



Figure 2. Left: A young plant of *Ionoxalis tetraphylla*.
Right: A young plant of *Ionoxalis martiana*.

tive to severe frost and it is customary to dig up the plants in the fall and store them for replanting in the spring. In this part of California it seems to be perfectly hardy.

Unfortunately, this species is frequently known among horticulturists under the name of *Oxalis Deppei*. Modern botanists do not find essential differences between the plants sold under this name and *I. tetraphylla*. Still another name, *Oxalis esculenta*, has been associated with the species. It is in common use for what seems to be the same species as those growing in South and Central America where its bulbs are used for food. So far as I can ascertain, this name has never been associated with an adequate description.

Ionoxalis lasiandra (Zucc.) Rose. This species closely resembles in its general habit of growth and life history the one just described. The bulbs are similar; their outer protective scales are wide and paperlike, the inner ones fleshy, thicker and very narrow. They develop even less sturdy leaf and flower stalks soon after being planted.

The most conspicuous difference between the two species is in the number and form of their leaflets. Instead of four there are from five to eleven, which are long, narrowly wedge shaped and

rounded at their free ends. They are so poised at the end of the stalks as to form clusters very similar to those of a lupine. The ends of the stalks are enlarged so as to form a small saucer-shaped disk to which the leaflets are attached. They also show the phenomenon of "sleeping" such as is found in a very large percentage of the species of *Oxalidaceae*. During darkness the two halves of each leaflet tend to close together back to back and the free ends of each midrib tend to bend downwards producing the effect of a partially closed umbrella.

The long, slender flower stalks bear an umbel-like collection of as many as thirty long-stemmed flowers, each somewhat trumpet shaped and made up of a rose-carmine corolla of an unusually pleasing shade which has a spread of three quarters of an inch and a small greenish tube. Only two or three flowers open at the same time and the flowering period of each cluster extends over a six weeks period. Very few of the flowers produce seed.

The mature bulbs approach the form of a slightly flattened sphere with a short blunt point. As in *I. tetraphylla*, when planted several roots start at the base of the bulbs, one or more of which develop into carrotlike water storage reservoirs. Towards the end of the flowering period



Figure 3. Left: A young plant of *Ionoxalis lasiandra*. Right: The same species which has ceased growing for the season.

a ring of buds arises from the edge of the central bulb core each of which develops a very short stem terminated by a bud that develops into a bulb. These, unlike those of *I. tetraphylla*, remain close to the parent bulb and do not develop leaves until the following year.

The first of the accompanying photographs (Figure 3) represents a plant grown out of doors, about two months after planting; the second one, in which all growth has ceased, its bulbs have matured and its water storage reservoir is greatly shrunken.

This species was found in Mexico about 1834 by the German botanist Zuccarini by whom it was described. Bulbs of it were sent to botanic gardens in Munich and Edinburgh and it was found to be a pleasing and easily grown species. A paper by E. A. Bowles in *Garden Magazine* Vol. 13 (1936), p. 332, states that in spite of its many attractive features it had become a rare plant in England. In the paper of J. N. Rose, already referred to, it is reported that it had long been in cultivation in the Botanic Garden at Washington D.C. I have been able to procure bulbs of it from American dealers in rare plants and have found it is a pleasing summer-flowering species. It seems to be perfectly hardy in this part of California and prefers a sunny

situation. One of its unfortunate features is that both leaf and flower stalks are disposed to fall over and therefore do not display their unique beauty to advantage unless given artificial support. This defect is less objectionable when the bulbs are planted close together.

The type specimen seems to have been discovered in Yucatan, but it is now known to have a wide distribution including parts of Mexico and southern parts of the United States. Still more remarkable is its naturalization in both the Transvaal and Orange River Free State of South Africa. The agencies by which it reached these countries are an unsolved mystery. It has also acquired an unsavory reputation because of its aggressiveness in certain of our southern states.

Like the two species just described, it lacks supporting axes and its leaves are developed from bulb scales although they are decidedly shorter but more abundant than in either *I. tetraphylla* or *I. lasiandra*. There are only three leaflets which are distinguished by their broadly wedge-shaped form and widely separated lobes. The leaf stalks rarely exceed six inches in length but the number produced is great enough to give rise to a voluminous mound of foliage. The flower stalks are longer and end in a

few-flowered umbel of funnel-shaped corollas which attain a spread of three quarters of an inch of white or violet petals. None of my plants has produced seed but seed-bearing plants have been reported on. It is a fairly hardy and easily grown species of a type fairly common in species of *Oxalidaceae*. It has been classed as a somewhat aggressive species in some regions.

I. vespertillionis (Torrey and Gray) Small. This species, of which I have not been able to obtain either seed or bulbs, was first collected by John Torrey in the prairie regions of Texas and Arizona and published in Torrey and Gray's *Flora of The United States* between 1838 and 1840. At about the same time it was discovered in Mexico by a collector named Karminski who sent bulbs of it to the Munich Botanic Garden where it produced plants that were described by Zuccarini. Just how it came about that both botanists proposed the same specific name for it has not been explained. That name is, however, a very appropriate one for the remarkably narrow and widely divergent lobes of its leaflets suggest that of a bat (*vespertillio*) poised in mid-air. Later collections have been made in many parts of Mexico, and Guatemala. It is clearly related to *I. latifolia* and was transferred to the genus *Ionoxalis* by Small. I have not found records of its cultivation in either Europe or America.

Specimens of this plant were first collected in what is now southern Brazil and others were found later in other parts of South and Central America. Still later it appears to have become naturalized in widely separated regions, including the West Indies, Java, Mauritius, Ceylon, the Philippines and Sandwich Islands as well as certain of our Gulf States and California. Some of these collections were thought to represent new species and were given new names, including *O. bipartita* Graham, *O. corymbosa* de Candolle, *O. floribunda* Lehman and *O. urbica* St. Hilaire; all of these are now considered synonyms. The original name was used by Zuccarini in 1825 in commemoration of a certain

Dr. Martius; it was changed from *O. Martiana* to *Ionoxalis Martiana* by Small in 1903.

The accompanying illustration (Figure 2 at the right) shows a plant in late summer which had not yet begun to flower. In both foliage and flowers it resembles *I. latifolius* rather than *I. lasiandra*. Leaves are produced in great abundance and consist of somewhat flexuous stalks terminating in deep green obcordate blades. The petioles are somewhat longer and bear from three to six rather small flowers whose colors range from white to shades of violet and pink.

Although this species is not lacking in beauty, its aggressive nature puts it in the same category as the still more widely distributed *O. corniculata*. Unlike that species, it yields very little seed and its ability to establish itself in widely separated parts of the world results from its ability to produce large crops of very small bulbs every year. It appeared in my garden about three years ago and I found my first description of it in J. H. Howell's *Flora of Marin County* (1948) who reported it growing on a public lawn near Ross Station. Later I learned that it had been introduced into several of our coastal counties. One of the owners of the Brown Bulb Farm of Capitola told me he thought it had been introduced with other members of the family as many as fifteen years ago. This firm spent a lot of money in an attempt to exterminate it by treating the soil with methyl bromide but with poor success.

An examination of bulb-forming plants towards the end of the growing season will reveal runners originating from the base of the parent bulbs each of which produces from one to several small bulblets all of which are capable of producing plants the following season. I have counted as many as sixty such bulblets on a single plant. There is no question that the aggressiveness of this species is the result of its ability to produce large numbers of bulblets annually and the ease with which these bulblets can be scattered when the soil in which they grow is disturbed.



ERIK HANS KRAUSE

The Auricula is one of those modest flowers which caught the fancy of gardeners for several centuries, and particularly of the early 19th Century. Though there seems to be some confusion over the origin of this plant, it is mentioned as early as 1597 in Gerarde's *Herball* under the name 'Auricula ursi', the 'Beares' Eares' of the plain gardener.

The disputed parentage of the Auricula is apparently conducive to the development of numerous variations of flower- and leaf-structure, and of colors and combinations of colors rarely ever seen in other flowers. The few of the colors listed here could have been selected from a display of rare oriental silks: dove-grey, silver-green, café au lait, burnt sienna, Van Dyke brown, brick-red, and even black; old catalogs are listing colors which were the last work a century ago: 'murrey'—a dull purple, 'haire colour'—some-what like taffy. The German *Aurikel Flora* of 1801 lists 144 varieties, and R. Sweet's *Florist Guide* of 1822-32 illustrates some 42 varieties.

During this period, the popular interest in this plant and the gardeners' frantic attempts to create even more unusual varieties threatened to assume the proportions of a mania. Experts set up strict, if not ridiculous, standards, and several classes. The 'Borders', for instance, had to meet certain specifications as to the color of the marginal zone and of the body, the area and the texture of the 'meal' or 'paste', and the standards of the five types of 'Show' Auriculas, too delicate for outdoor culture, were even more severe. The Alpines without 'paste' had

to conform to similar standards to be acceptable.

The entire subject of "Auriculas" is quite involved from the botanical and horticultural standpoint, as will become quite evident to anyone who studies Sir Rowland Biffen's book and his bibliographical references. After reading this highly competent work, inspired by a real love of the subject, it is easier to understand how such a modest flower could capture the imagination and challenge the skill and patience of several generations of gardeners.

From the standpoint of public taste, particularly during the earlier part of the past century, the formal design of the Auricula flower, the comparative ease with which unusual color combinations were created, would make it a favorite. The style of the botanical artists of that period was also especially suited to renderings of this species. It is impossible to escape the charm of the Auricula paintings by Ehret and Robbins, Henderson and Reinagle, and many others whose works are hidden away in some archives. Even the more primitive, schematic, catalog illustrations showing the exact color areas permissible for the marginal zones, the discs and the eyes, are fascinating records of a civilization, which found satisfaction and a sense of achievement in a new Auricula.

Nearly a century and several devastating wars have gone by since Western culture became so excited over the 'Beares' Eares.' It would be interesting to find out how many of Kannegiesser's 144 varieties managed to survive the historical and horticultural upheavals.

Federal Plant Introduction Gardens

W. H. HODGE, H. F. LOOMIS,
LLOYD E. JOLEY, AND JOHN L. CREECH¹

Gardens for testing new or little known immigrant plants were recognized early by the United States Department of Agriculture as essential to the success of formalized plant introduction. Without ample growing facilities for handling plant introductions all the effort and expense involved in obtaining plant germplasm abroad would be for naught. But in specially equipped gardens or nurseries, seeds, cuttings, and plants may be increased, propagated, and tested prior to distribution throughout the United States.

Thus it was that 1898, the same year that marked the formal birth of a regular Federal program for plant introduction, saw also the establishment of a first Federal Plant Introduction Garden. This was a modest six-acre tract located on Brickell Avenue, close to what is now downtown Miami, but since returned to the original owners and the plants transferred to the Garden near Coconut Grove established in 1922. In 1904, enthusiastic citizens of Chico, California, became so interested in having their town chosen as a second site for a similar introduction garden that they purchased eighty acres of land and turned it over to the Federal Government for this purpose. An urgent need for a location near operational headquarters at Washington, D. C., finally resulted in the establishment in 1919 of the Garden at nearby Glenn Dale, Maryland, where immediate care could be given to plant material weakened by long transit periods from abroad and for purposes of quarantine isolation when necessary. The last of the four Federal locations, the Barbour Lathrop Plant Introduction Garden, Savannah, Georgia, was also established in 1919 as a gift of its namesake, who hoped to preserve for posterity a grove of the giant timber bamboo that had been established on the property.

Although the four Plant Introduction Gardens mentioned above constitute the only strictly Federal locations currently operated by the Agriculture Department's Plant Introduction Section,² other gardens have existed in the past. From 1909 to 1925 a Federal test garden was maintained at Brooksville, Florida. Its work was transferred to the Savannah Garden following the latter's establishment. Similarly, a garden leased at "Yarrow" near Rockville, Maryland, served the Washington, D. C., area from 1910 to 1919 when the present permanent Garden at Glenn Dale, Maryland, was set up.

Among the gardens now defunct were those once operated at Brownsville, Texas, and Bellingham, Washington. The latter location was especially selected for the increase of bulbous species. These locations were active at a time when tens of thousands of seeds had to be bought annually for free distribution in seed packet form through Congressional lists. This costly and highly ineffectual method of disseminating and evaluating plants ceased in 1925 and the years since have seen the practical termination of the program of indiscriminate distribution of free plants to hosts of private experimenters, mostly amateurs, unqualified for this type of work. Today the plant materials held at the Plant Introduction Gardens are not available to the general public but are destined for testing primarily by qualified researchers in the Department of Agriculture, their counterparts at State Experiment Stations, and other bona fide agricultural institutions, both here or abroad.

Many persons are often initially confused as to the exact functions of the Federal Plant Introduction Gardens. They are neither botanic gardens nor arboreta in the true

¹Plant Introduction Section, Horticultural Crops Research Branch, Agricultural Research Service, United States Department of Agriculture.

Since the receipt of manuscript, Dr. Hodge has resigned and joined the staff of Longwood Gardens, Kennett Square, Pennsylvania. Ed.

²Originally known as the "Office of Foreign Seed and Plant Introduction," then "Office of Foreign Plant Introduction," and until 1953 "Division of Plant Exploration and Introduction," of the former Bureau of Plant Industry, Soils, and Agricultural Engineering.

sense of these words nor are they true experiment stations. Yet some of the work of each of these types of organizations is shared by these Gardens. Plant Introduction Gardens are like botanic gardens in being, among other things, repositories of living plants; but unlike botanic gardens the collections in an Introduction Garden are limited to plants with present or potential economic value to man. Introduction Gardens may lack the well-groomed look and landscaping characteristic of botanic gardens and arboreta. For purposes of ready reference and economy of maintenance, it is easier to set out immigrant plants in simple blocks or rows. And for purposes of preliminary evaluation, once placed in the field, the plants must shift for themselves without undue special attention. The Plant Introduction Garden collections often have a quicker turnover in plants. Usually, valuable species, once widely established, no longer need to be held. Likewise, material definitely proved of no value is discarded.

The Introduction Gardens have been called the "Ellis Islands" of immigrant plants. They simply receive introduced plants, quarantine them if necessary (primarily at Glenn Dale), test them to see if they are in any way suitable for more extensive trial among America's plant scientists, and, if so, are increased and distributed, based on the orders of specialists at the headquarters of the Plant Introduction Section. To the Introduction Gardens go plants to be quarantined, woody species which cannot be handled as annual crops, certain types of ornamentals, and all little-known plants the potentialities of which are yet to be determined. Some introductions may even need to be grown to maturity to allow their correct names to be determined or verified. Introduced seeds or propagules of most of our common annual field and vegetable crops do not normally go to these Gardens but rather enter test programs in the United States through another series of regional plant introduction centers administered cooperatively by the Department with the State Agricultural Experiment Stations.

A large proportion of the introductions to be seen in the Plant Introduction Gardens

have come from professional plant explorers sent out by the Section. Other introductions have been received in the foreign seed exchange program maintained by the Section. Still others have come through correspondence with foreign sources, as voluntary gifts, or, in minor numbers, through other channels.

Because of the necessity for rapidly propagating a wide series of plant material, the growth requirements and life history of which little is often known, the Section undertakes research on propagation methods at its Introduction Gardens. The adaptability of various types of media for the germination of seed, the use of various wave lengths of light for seedlings and for the rooting of cuttings, the efficacy of growth hormones, and various techniques for the growing of plants, are or have been investigated. Since the Introduction Gardens have handled thousands of shipments of living plants, they have also utilized special techniques, such as the use of polyethylene wrapping and sphagnum rooting media, to insure that plants arrive safely at their ultimate destinations.

Some types of plants sent to the Introduction Gardens receive much more exhaustive tests than others. These have to do with material which the Section hopes to establish as entirely new crops for the United States or, if the material is not new, to establish a new method of utilization for an existing crop. Often the bringing together of related species and varieties for the study of their taxonomy, life histories, growth habits, adaptability, and economic utilization, requires investigations running into many years before selective introductions can be recommended to growers. Examples of now well-established specialty plants which have "graduated" from the Section's program include: Glenn Dale hybrid azaleas, avocado, date palm, tung, and Chinese chestnut; while among plants still "matriculating" can be mentioned certain kinds of bamboos, pistachio nut, and tropical cortisone-yielding yams. The better known plant introductions, like those just mentioned, enter directly into use in American horticulture; many others, often unimportant or even undesirable as regards their horticultural characteristics but

carrying much needed resistance to disease, play obscure though highly valued roles known only to plant breeders.

In the course of making exhaustive tests on certain categories of material, large collections are built up and held for long periods. Although these collections change during the course of years, at any one time each of the Federal Plant Introduction Gardens may have several thousand introductions being held in various stages of test. The Gardens therefore constitute important reservoirs or "banks" for plant germplasm.

*U. S. Plant Introduction Garden,
Coconut Grove, Florida*

As stated above, a garden concerned primarily with studies of tropical woody plant introductions has been conducted by the Department of Agriculture in Dade County, Florida, since 1898, when the first garden was established on Brickell Avenue in Miami. It was not long until this area became crowded with plants and another somewhat supplemental garden of twenty-five acres was begun in 1914 on the north side of Miami in a subdivision known as Buena Vista. By 1921 half of the Buena Vista Garden and all of the Brickell Avenue Garden had been planted and consideration was being given to additional acreage for expansion.

Late in 1921, it was learned that the Chapman Field Military Reservation, located about thirteen miles southwest of Miami near Coconut Grove, was to be abandoned by the War Department. Its potentialities were investigated and, on the basis of the opinion of David Fairchild and others familiar with both local conditions and with the requirements of tropical plants, a request was made for transfer of the Military Reservation to the Department of Agriculture. While direct transfer was not made, a permit for use of the Reservation for a Plant Introduction Garden, revocable on three years' notice, was issued on December 15, 1922. Later the area covered by the permit was reduced to ninety-five acres which included all the improvements of the Reservation. For many

years this area, plus an additional sixty-five-acre pinewoods area, used under an extendable five-year permit for the planting of rubber trees, constituted this U. S. Plant Introduction Garden. The military name, "Chapman Field," has been unofficially attached to the Garden. The 80th Congress transferred title of these leased areas, plus an additional one of approximately thirty-seven acres, in 1947.

The first permanent planting was made at the "U. S. Plant Introduction Garden" (the preferred name) near Coconut Grove, on April 26, 1923. During the next three years, much of the material that had been grown at the Brickell Avenue and Buena Vista Gardens was transferred to the new location. In September, 1926, a severe hurricane which swept the Miami area did great damage to the two early gardens and thereafter they were abandoned, most of their introduced plants having already been established at the new Garden. Today, approximately 125 acres of the 197 acres transferred are developed in plantings or are ready to receive them.

The largest part of the present Garden consists of what is known locally as "high pineland." This lies from three to twelve feet above the water table and is composed of very porous and rather soft oölitic limestone with only a thin covering of sandy soil, except in certain pockets of varying size where the soil may extend down to the ground water. Despite the inhospitable look of this rocky limestone, it disintegrates readily upon exposure to form a soil quite satisfactory to the growth of most woody species. On the east side the "high" pineland drops off to what once had been a mangrove swamp, but which, in 1917, was filled with dredged marl soil to form a level airfield a foot or two above mean high tide. This variety of ecological sites gives opportunity for testing introduced plants under the extremes of soil conditions as they occur in subtropical Florida.

Since the inception of the Garden, over 14,000 plant accessions have been received. The average per year is nearly 500. A number, of course, fail to become established.

These accessions represent seeds, cuttings, budwood, and plants, sent from every part of the subtropical and tropical world, and represent a wide sampling of the species of the tropics. Most plant accessions are seeds, usually planted on the day they arrive. The resulting seedlings, as well as other propagating material, are grown in propagating houses to a size suitable for planting in the field. Except in special cases where larger representation is needed, four plants of each introduction are set in permanent places in the field with several held in reserve for replacement.

The Garden at Coconut Grove is more like a botanic garden than any of its sister Gardens. The practice of setting out a few plants of each introduction received has now resulted in the establishment of a living collection of tropical and subtropical plants not equaled elsewhere in this hemisphere, and surpassed by few gardens in the Old World tropics. Well over 3,000 plant introductions, many represented by numerous specimens, are growing at the Garden. Especially noteworthy are the collections of *Acacia* (30 spp.), *Albizia* (25 spp.), bamboo (35 spp., half in *Bambusa*), *Bauhinia* (30 spp.), *Cassia* (25 spp.), *Cordia* (15 spp.), *Erythrina* (20 spp.), *Eucalyptus* (40 spp.), *Ficus* (85 spp.), *Lonchocarpus* (10 spp.), palms (about 200 spp. in 76 genera with *Coccothrinax*, *Phoenix*, and *Sabal* especially well represented), *Strophanthus* (15 spp.), *Tabebuia* (12 spp.), *Terminalia* (20 spp.), and a number of woody rubber- and latex-producing species (in *Achras*, *Castilla*, *Cnidioscolus*, *Cryptostegia*, *Ficus*, *Funtumia*, *Hevea*, *Landolphia*, *Manihot*, *Mascarenhasia*, *Mimusops*, and *Palaquium*).

* The introductions of Indian and Philippine varieties of mangoes (55 clones) and the large series of avocados (40 clones in 76 introductions) from Mexico and Central America have contributed directly or indirectly to the development of the extensive commercial plantings of these fruits in the United States. Likewise, many of the lesser-known tropical and subtropical fruits now widely grown here came by way of this Garden as introductions from abroad. Of incalculable value to subtropical horticulture of

this country is the host of woody ornamentals first introduced through Coconut Grove and now widely planted in southern Florida, Puerto Rico, Canal Zone, and Hawaii.

The collection of rubber-yielding species and the work related to it deserves further elaboration in view of the fact that the United States is the world's foremost user of strategic natural rubber. A comprehensive collection of rubber-producing plants has been gathered and maintained since 1923. Extensive studies have been made concerning production possibilities in times of national emergency, physiological and chemical formation of rubber in the plant, methods of harvesting rubber from the various species, and the like. Rubber chemists have taken advantage of this world aggregation of rubber plants to secure fresh latex and rubber samples for studies that otherwise would require prohibitive travel and expense to get them in the wild.

The Para rubber tree, *Hevea brasiliensis*, has been the chief species of study. It was found very early that this strictly tropical species would grow sufficiently well in the deep-soil areas of Dade County, and could withstand hurricanes and light frosts with little more than temporary setbacks. It was discovered that the tree was not attacked by the serious diseases affecting it in tropical plantations and that it fruited well. Moreover, many of the selected varieties flowered from two to five times a season in contrast to the single flowering that took place in commercial plantings in the tropics. This fact has been used to effect intercrossing of varieties that do not have synchronous flowering under plantation conditions. The Garden at Coconut Grove has served as an intermediate *Hevea* quarantine station for almost a decade, a primary purpose of which is to screen and propagate living materials free from the danger of such virulent plagues as the South American leaf disease. Desirable clones are grown and from them budwood is shipped to any rubber-producing area of the world without fear of transporting any serious disease. To further this international program, as well as to aid rubber breeders, about 250 of the world's best clones are maintained. Included are hybrids con-



View at the Plant Introduction Garden, Coconut Grove, Florida, showing a Brazilian species of Chorisia (Bombacaceae), one of the unusual tropical ornamental trees introduced for possible use in southern Florida and California.

taining germplasm of *Hevea benthamiana*, a species resistant to leaf disease.

In 1954, a start was made on the establishment of germplasm collections of coffee and cacao (chocolate)—important export commodities of tropical America. A program similar to that conducted for the Para rubber tree is also now operating with these two tree crops. As in the case of rubber, very serious diseases exist in coffee- and cacao-growing countries. Old World coffee rust, an especially virulent disease, is not established in the New World tropics and strict quarantine is necessary to keep it from entering and destroying the important coffee plantings in Latin America. Serious virus diseases also occur in some cacao-producing areas. Both coffee and cacao can be maintained disease free in isolation in southern Florida where these trees, like rubber, cannot be grown commercially. The collection of coffee, chiefly varieties of the important *Coffea arabica*, already numbers over a hundred types and others will be added as they become available. The cacao collection is not as large. Disease- and insect-free material from these collections will be made available to cooperating countries as needed.

In recent years certain groups of plants have been found yielding steroidal materials which exert highly beneficial effects in arthritis and similar diseases. The more valuable of these plants are tropical or subtropical and can only be tested at relatively frost-free locations like Coconut Grove. This accounts for the collection of the African genus *Strophanthus*. Certain of these steroidal materials were first encountered in their seeds. The yam genus, *Dioscorea*, also largely tropical, now appears of more value than *Strophanthus* and has been undergoing field testing at this Garden.

As might be expected, the large aggregation of tropical plants available in the collections at Coconut Grove has been a source of interest to many scientific workers besides botanists and horticulturists. Since the collection represents a cross section of the higher plants, it has been much used for

screening them for materials potentially valuable in chemistry or medicine. Hundreds of samples of leaves, stems, roots, and fruits have gone to such agencies as the Department of Agriculture's Eastern Utilization Research Branch for general chemical survey; to the University of Vermont for analysis for antibiotics; and to the National Institutes of Health for screening for alkaloids of possible use in the treatment of heart disease.

During World War II the Garden was used for the training of Air Force personnel in the techniques of survival, using plants found throughout the tropics that yield food, or provide materials of aid in surviving on land or on the sea. The records show that these studies were instrumental in saving the lives of many Air Force personnel, particularly in the Pacific theatre of action.

Located as it is close to a large metropolitan population highly interested in horticultural materials, the Garden is much visited by local Garden Clubs for study of exotic plants, methods of seed sowing, and general propagation. The Garden is also seen daily by many transients interested in touring the grounds or in having special problems answered. School and university classes also use the Garden occasionally for conducted botanical or horticultural tours.

Statewide interest in the U. S. Plant Introduction Garden at Coconut Grove continues to be high because of the great amount of successfully established plant material from tropical countries that it has introduced and distributed. Many botanical and horticultural institutions elsewhere in the United States and in foreign countries profit from the plants and seeds the Garden offers for distribution. Closer home, cooperative relations of mutual benefit are maintained with the University of Florida at Gainesville; the University of Miami; the Subtropical Experiment Station at Homestead, Florida; the Fairchild Tropical Garden at Coconut Grove, Florida; and the Dade County (Greater Miami) Parks System.



Top: Method of handling clonal material of Hevea at the Plant Introduction Garden, Coconut Grove, Florida. Seedling trees are pollarded thus stimulating rapid shoot growth on which important clonal lines are budded for eventual distribution or maintenance.

Bottom: Lath house with tropical and subtropical plants being grown for establishment, Plant Introduction Garden, Coconut Grove.

*U. S. Plant Introduction Garden,
Chico, California*

The Plant Introduction Garden at Chico was established in 1904 for the purpose of evaluating, propagating, and distributing plant accessions under West Coast conditions. The original deed of eighty acres of land made by the citizens of Chico was later increased to 210 acres through the Federal purchase of adjacent lands and their water rights. Of the total acreage, approximately 150 are now under cultivation.

During the years when the Congressional Seed Distribution was in vogue, Chico was concerned with the culture and distribution of ornamental plants, many of them annuals, but now most emphasis is on the preliminary evaluation of introductions of deciduous stone fruits and nuts. Lying in the irrigated Sacramento Valley of northern California, the Garden is admirably suited for this purpose since it is at the center of one of the nation's leading drupaceous fruit and nut areas. Most stone fruits entering the country through quarantine at Glenn Dale generally go to Chico for evaluation.

In the present Chico germplasm collection are more than 1100 clones and varieties (as well as 3000 stone-fruit seedlings) comprising 250 cherries, 195 apricots, 450 peaches, 70 nectarines, and 200 plums. There are 250 to 300 miscellaneous woody-ornamental and specialty-crop accessions; 7 named pistachio-nut varieties in addition to 750 seedlings and 9 species of Pistacia; 200 English or Persian walnut seedlings; Oriental chestnuts; as well as miscellaneous fruits such as the Chinese gooseberry (*Actinidia chinensis*), Chinese date or jujube (*Zizyphus jujuba*), olive, pear, Oriental persimmon, and pomegranate.

Evaluation of any fruit or nut about which little is known consists of a year by year recording of tree characters including time of bloom and foliation, flower hardiness, disease and insect resistance, yield, and such fruit characters as size, color, quality, and maturity. Though only a few introductions may measure up to varieties grown in the United States, there are always outstanding

characters of interest to the fruit breeder who may utilize them in the development of still better commercial varieties.

Cherry collection. Of all the stone fruits, except possibly plums, cherries seem to offer the most promise of introducing foreign varieties suitable for direct production in the United States. This was not realized until 1941 as importations up to that time were not as extensive as with other stone fruits. Most of the cherry collection consists of the sweet varieties, with about 25 varieties of the sour type. Some 220 European varieties have been evaluated for their fruit characters and quality, but there are at least twice that number of named types still to be introduced and tested. An example of the evaluation program at Chico is the testing of fruit for cracking resistance. Samples are picked at four stages of maturity, beginning when the crop is commercially ripe, and cracking readings are taken after immersion in tap water for ten to twenty-four hours. With the increased interest in frozen cherries, freezing and storage tests also have been started to determine which of the numerous varieties are best fitted for such purposes.

There is, of course, much interest in co-operatively testing the Chico collections elsewhere. The Oregon State Experiment Station has used the entire Chico cherry collection for studies of virus control and variety testing at Corvallis. Research workers in California are testing selected varieties from Chico under their own particular conditions and are using pollen obtained at this Garden for breeding new varieties. Sour cherry varieties have been distributed to the State Experiment Stations in Wisconsin and Indiana for use in their local breeding programs. Miscellaneous cherry varieties have also been sent elsewhere for a number of specific purposes.

Apricot Collection. There are approximately 195 varieties and over 2,000 seedlings distributed among some 225 introductions of apricots. The varieties are largely from Europe but the seedlings represent introductions from all sections of the world where apricots are grown. Heaviest representations are from the world gene centers in



General view at Plant Introduction Garden, Chico, California, with seedling deciduous fruit introductions in foreground and greenhouse facilities in rear.

India, Afghanistan, Iran, Iraq, and the Soviet Union, although there are some from Argentina, Chile, and China. Evaluation work on apricots is largely concentrated on the large seedling collection in order to reduce as rapidly as possible both their numbers and the cultural problems they present.

Desirable qualities in apricots include late blossoming, consistent cropping, size, color, and quality. Blossoming and foliation records are fairly complete, but, with the early blossoming habit of the apricot, climatic factors beyond control often interfere with cropping. If judged solely on fruit quality alone, the majority of the seedlings, as with many other plant introductions, could be eliminated very rapidly. But to select types that meet both the requirements suggested by breeders from the Northeastern States as well as those of the West has resulted in a program of evaluation and selection that requires a considerable period of time. Too often climatic variations change ratings from "extraordinary" in one year to "very ordinary" the following year. Thus it requires at least three years of fruiting before one can fully tell just how well a seedling apricot can perform.

Peach and Nectarine Collection. There are approximately 450 peach and 70 nectarine varieties and 800 peach and nectarine seedlings. Blossoming and foliation records are quite complete for all seedlings and varieties. An informal list or inventory of each peach and nectarine variety in the collection exists. This includes the source of the variety, its origin if known, and descriptive notes made at Chico whenever these are available. Such notes may include the cropping, season of maturity, size, shape, skin and flesh color, quality, and the like. To cut down cultural costs, varieties rated either of no value or so widely distributed that they can readily be obtained again are discarded. Before they are removed, an opportunity to obtain propagating wood is given to all professional horticulturists interested.

In the evaluation of plant introductions, specialists must be opportunists. The very wet winter and early spring of 1951-52 made it impossible to apply the usual leaf-curl

sprays. Taking advantage of the leaf-curl epidemic that followed, a comprehensive survey was made of all peach and nectarine trees in relation to their susceptibility to this disease. Nematode or root-knot diseases have become an increasingly serious problem to the peach industry; consequently, foreign introductions carrying resistance to these diseases are of high interest to breeders. Introductions of the 'Shalil' and 'Yunnan' peach and 'Quetta' nectarine have produced seedlings highly resistant to this pest. To discover other resistant lines, a general program has been carried out to test progeny of all introductions whose origin indicates potential nematode resistance. A number of resistant selections have been discovered, an example being a seedling resistant to the virulent Javanica species of peach nematode.

Future studies on the peach collection will include, besides continuation of general fruit evaluation, screening for good freezing quality, and for kernel sweetness, a character of interest to breeders of both peaches and apricots.

Plum Collection. Some 200 varieties and 165 miscellaneous seedlings of plums are maintained. Fruit evaluations have been made in part but blossom and foliation records are rather complete.

Miscellaneous Fruit and Nut Collection. The jujube, or Chinese date, attracted considerable attention for a time, then this interest waned to the point where it was of importance only in home gardens and in arid areas where other fruits are grown with difficulty. Because of recent renewed interest, populations of 400 or more seedlings of several varieties and seedling selections have been planted out for fruiting. The objective is to find a jujube type with fruits that are larger, of better quality, and sweeter than those presently being grown. Also of interest is a selection characterized by a smoother-pointed and less dangerous pit.

There has long been keen interest in the pistachio nut, a potential new tree crop for this country. Recognizing this, the Plant Introduction Section, in 1930, began a combination introduction, evaluation, and re-



Pistachio trees, Pistacia vera, in the spring flowering season, Plant Introduction Garden, Chico, California.

search program to determine some of the problems limiting the culture of this nut crop. Although there are many problems to be solved, sufficient information has been accumulated so that trial plantings in suitable areas can now be started.

Losses following transplanting have constituted one of the major hazards to the culture of the pistachio nut and account for much of the reluctance of nurseries to propagate it. Consequently, much effort has been directed toward developing a suitable rootstock and one that is immune or resistant to nematode attack. Problems in pollination constitute another hazard in the production of good yields. Being wind-pollinated and having both male and female trees, it is evident that the male tree must be shedding pollen at the time the female flowers are receptive. Of 750 seedling introductions, about sixteen selections have been made and

three of these are of such good quality that they have been named to indicate that they are worthy of trial elsewhere.

A useful ornamental tree may be a by-product of the pistachio work. One of the introductions, *Pistacia chinensis*, puts on such fine color in the fall in the area of Chico that it looks like a desirable tree for roadside or other ornamental planting. Selections have been made to see whether ability to produce certain color is genetically linked.

Limited evaluation has been made on some 200 seedling introductions of the Persian walnut. Selections have been made and distributed for further trial to several of the State Experiment Stations and to Canada. Pollen obtained from the trees at Chico has also been used elsewhere in breeding programs.



Office and laboratory buildings, Plant Introduction Garden, Glenn Dale, Maryland.

*U. S. Plant Introduction Garden,
Glenn Dale, Maryland*

The establishment of a Plant Introduction Garden near Glenn Dale,³ Maryland, in the winter of 1919 resulted from the need of such a facility near Washington, D. C., the principal point of inspection for germplasm brought in from abroad by the Plant Introduction Section. Living plant materials often arrive considerably weakened because of long periods of transit and, hence, may require special care. They may also have to undergo quarantine to insure freedom from disease or pests. A center was thus required where plant introductions could be initially established, then propagated and grown under observation for a season or more until all possible danger of the development of disease was past and before any distribution was made to other parts of the country. During the period 1910-1919 these needs were partially fulfilled by a temporary field station located on property leased near Rockville, Maryland.

³Located about sixteen miles northeast of Washington, D. C., just off U. S. Route 50.

A permanent Plant Detention and Field Station, as it was first called, was established during the winter of 1919-1920 near the small community of Glenn Dale.⁴

On April 7, 1920, the first tree, *Pyrus calleryana* (P. I. 45687), was planted by P. H. Dorsett and Edward Goucher. This is of historical interest, for sixteen years earlier the same two men also had planted the first tree (a walnut) at the then new Introduction Garden at Chico, California. The original Glenn Dale tract included fifty acres. In 1940, an additional twenty acres were purchased; of this total about sixty-five acres are now under cultivation.

Today the Plant Introduction Garden at Glenn Dale carries on special quarantine functions; serves as an introduction, evaluation, and distribution center; and maintains

⁴The new Introduction Garden was located adjacent to an interurban line which then connected Washington and Baltimore. The stop point, very conveniently serving the Garden, was known as "Bell" and because of this association the Plant Introduction Garden is sometimes even today incorrectly referred to as the "Bell Station."



*A 32 year-old specimen of the handsome Chinese Bristletooth oak, *Quercus acutissima*, established at the Glenn Dale Plant Introduction Garden.*

The blight-resistant Chinese hairy chestnut, an example of a well known horticultural "graduate" of the federal plant introduction program.



living collections of plants including valuable seed germplasm in its seed storage facility. Due principally to its quarantine activities, this is the most highly developed of the four Federal Plant Introduction Gardens.

Physical facilities of the Garden include an office with a laboratory for morphological studies attached to one wing and a drafting and supply room on the other wing. The greenhouses consist of thirteen units, all screened against insects. Of these, three are especially designed quarantine ranges with individually controlled compartments having no inter-connecting openings and screened throughout with 30-mesh copper screening. There is a total of 34,000 square feet of glazed area plus 5,000 square feet of screened outdoor beds and 29 cold frames. The seed storage building, completed in 1952, is 22 by 44 feet, where temperature is maintained at 33° F. and relative humidity at 30%.

Quarantine. In general, plant introductions subject to quarantine are those imported as vegetative or clonal propagations. Plants introduced as seed are seldom prohibited by quarantine procedures, but even here there are exceptions. Quarantinable material is of two categories: 1) that which may be introduced and grown under specified conditions of isolation and periodic inspection until certified as free of injurious insects and diseases (post-entry quarantine) and, 2) that entirely prohibited by law except when allowed to enter for research purposes by the U. S. Department of Agriculture. The Garden is concerned with both categories of quarantine. Much post-entry quarantine material is handled in an isolated nursery where it can be kept under observation by inspectors of the Plant Quarantine Branch of the U. S. Department of Agriculture. This type of quarantine entails the least work of all quarantine procedures. Examples of prohibited clonal material include grasses, citrus, grapes, white and sweet potatoes. Because it operates special quarantine greenhouse facilities, the Plant Introduction Section is excepted from this restriction and can bring in prohibited items for experimental and scientific purposes. Plants in the prohibited class to be quarantined are

grown in the specially constructed ranges where they are kept until fresh growth is secured for propagation, after which the original plant is destroyed.

The handling of clonal introductions of citrus illustrates the procedure followed in the quarantine ranges. Citrus introduction is a costly time-consuming program involving the budding of introduced varieties on indexing stocks, such as the Key lime, and on tolerant stocks. The buddings are watched for abnormal indications and if free of such are rebudded in a separate compartment; these in turn undergo a period of observation and the process is repeated, each time in a separate greenhouse section. After three such buddings, the varieties that are free of any abnormality are released for distribution as budwood to citrus experiment stations. In most cases the period of detention is two or more years. Vegetatively propagated introductions, such as sweet potatoes and white potatoes, undergo similar screening for viruslike symptoms prior to distribution. Introduced propagations are planted and released eventually in the form of new cuttings, propagated from single leaf cuttings in the case of sweet potatoes or in second generation tubers in the case of white potatoes.

Introduction, Evaluation, and Distribution. As many as 6,000 plant introductions are held in process of introduction, under observation or test, or undergoing propagation for distribution. Because of the ample greenhouse facilities and personnel needed for the rapid quantity propagation of introductions, vegetative material destined for test elsewhere is often increased initially at Glenn Dale. This applies even to seeds of tropical species which, once germinated in sphagnum moss, may be easily forwarded as seedlings to those locations where they are needed. During World War II, in cooperation with another Federal agency, some four million cinchona (quinine) seedlings were grown under glass and then distributed to Latin American centers for the establishment of new plantations. A large series of coffee varieties, useful for breeding purposes, and important clonal lines of black pepper have been propagated and distributed.



The introduction and evaluation of fruits, particularly deciduous types, is an important facet of the work. From 110 European cider-apple introductions, the best have been selected and crossed with hybrid crab apples. These have been combined so as to produce cold-hardy varieties of high astringency, early bearing, and small tree size. The juice of the fruit is intended for blending with that of our present standard apples. Since chemists generally agree that the apples used for juice manufacture lack the astringency and acidity necessary to produce a properly balanced beverage, there is reason to believe that the juice adjuvants will have a practical usefulness. Fire-blight resistance, rust resistance, and hardiness must also be determined in addition to other tree characteristics.

From a collection of foreign Mahaleb and Mazzard cherry introductions, evaluations are being made for disease resistance and vigor. Four Russian Mahaleb selections of unusual vigor and resistance to some virus diseases have been released to experiment stations for study. Further tests are being made to determine if this tree vigor is retained in the open-pollinated progeny. It has also been observed that there is a variation in the ease of propagation of these selections by cuttings and layering.

In 1954, 275 of 327 varieties of European cherries introduced as budwood were successfully propagated in quarantine. These are undergoing observation by a virologist and will go through an indexing program before being released to the Chico Garden for further study. This represents the largest single cherry importation made by the Plant Introduction Section in recent years.

Besides its work with fruits, the Garden has been associated for many years with the evaluation of introductions of ornamentals. The development of the Glenn Dale hybrid azaleas is representative of the research in this field. Work with azaleas continues. One phase deals with the breeding and selection of varieties evolved from the combination of the Glenn Dale hybrids with the introduced Belgian or florists' azaleas. A second phase has the objective of developing a deciduous race similar to the Ghent and Mollis hybrids but which will be heat tolerant and which will root readily from cuttings. Unlike the Glenn Dale hybrid azaleas, which were developed for the mid-Atlantic States, these will extend the range of highly-colored deciduous azaleas into the Southern Coastal Plain areas where they cannot be grown at present. Many of the azaleas being used in this breeding program are the result of domestic plant exploration in the Coastal Plain area two decades ago. Most of these native species have never entered into breeding work and are not represented in modern deciduous azalea races which stem mostly from mountain and cool-climate species.

In recent years the accelerated interest in the search for new plant sources for drugs has resulted in many explorations by botanists of the Plant Introduction Section. The Garden has been intimately concerned in handling the plant materials collected. Typical is the work on the wild yams of the genus *Dioscorea*, important as sources of precursor materials from which cortisone can be made. More than 200 introductions of this genus have been assembled to be held as living vouchers for material under analysis by chemists. At the same time best methods of propagating these wild plants have been dis-

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Top: Compartmentalized interior of quarantine greenhouse at Glenn Dale showing citrus introductions undergoing quarantine propagation.

Center: A wild tropical yam (Dioscorea sp.) from southeastern Mexico, an example of a species still undergoing tests ("matriculating") at one of the federal plant introduction gardens. The tuberous roots of this plant (insert) are important potential sources of diosgenin, a substance from which some day the drug cortisone may be synthesized.

Bottom: Seedling coffee plants, grown in sphagnum for convenient air shipment. Tens of thousands of plants of various species have been thus grown at the Glenn Dale Plant Introduction Garden for effective distribution throughout the world.

covered and stocks of high-yielding clones built up for evaluation in the field. Specimens of unknown or undescribed species are also being brought into flower and fruit for use in the taxonomic study. The Garden's excellent greenhouse facilities for growing tropical plants to maturity make it possible to ascertain the correct names of many species that were collected in the field in a sterile condition.

Oftentimes, plants brought in for a specific economic purpose are later found to have value in a completely different field. A good example is shown in those Middle American species of *Dioscorea* which have shown outstanding foliage characteristics making them desirable as subjects for ornamental horticulture. Other recent examples are the numerous bulbous members of the lily and amaryllis families originally collected in Africa for drug study. Certain of these species possess flowers which are highly ornamental or distinctive and for this reason they, too, may eventually find their way into horticulture.

Maintenance of germplasm. An important living plant collection is maintained. This includes several thousand introductions of miscellaneous species, mostly woody, to be found in permanent plantings on the grounds, as well as an equivalent number, many herbaceous, in the greenhouses. In the line of fruits is an extensive foreign varietal collection of apples including the majority of the cider apples and crab apples of Europe. Until recently, an extensive pear collection was also maintained, but, because of the fire blight problem, this was transferred in large part to interested State Experiment Stations.

The seed-storage building is the newest addition to the Garden's facilities. Though small, it serves as a storage center for certain types of seed materials handled by the Plant Introduction Section and is helpful besides in the storage of seed sent in by regional groups of states cooperating in plant introduction work. A part of the seed-storage task is the periodic checking on seed viability. This requires germination tests which are continually being run on stored seed. A seed-storage facility such as this, which includes both low temperature storage and low

relative humidity, increases greatly the length of viability of seeds, thus reducing the task of replanting at frequent intervals for purposes of revitalization.

*U. S. Plant Introduction Garden,
Savannah, Georgia*

Located some twelve miles south of Savannah, on U. S. Highway 17, is the smallest (fifty acres) of the Federal Plant Introduction Gardens. Like the one at Chico, it owes its existence to a gift, in this case not from a group of citizens but rather from a single man. The history of this garden is of interest because it deals with the story of an outstanding grove of the Japanese timber bamboo, *Phyllostachys bambusoides*, which has been growing on the Savannah site for over half a century.

As David Fairchild⁵ tells it:

"The bamboo grove of this Garden had its beginning in the plant interest of a Cuban gentleman, Mr. Andreas E. Moynelo, who introduced the plants from Japan in the early 1880's and set them out on his estate, 'Valambroso,' not far from the location of the present grove.

"In 1890, three small plants were transplanted to the site of the grove by a Mrs. H. J. Miller, who set them out beside her house near the point that is marked in this Garden and these three plants grew and spread, until today they cover over an acre of ground.

"In 1919, when only half its present size, the existence of the grove was called to my attention by [one who] told me that the then owner of the grove planned to cut it down, and I realized that, unless someone bought it, America would lose one of its largest groves of timber bamboo.

"As I had spent some time in Japan studying bamboos with that world traveler, Barbour Lathrop of Chicago, and had made a large collection of bamboo plants for him, which he purchased and presented to the Government, I half jokingly wrote him asking him if he didn't want to own this bamboo grove on the Ogeechee River. He replied at once, authorizing the purchase of the whole farm of forty-six acres and its presentation to the Office of Plant Introduction of the Department of Agriculture. His gift of this land for use as a Plant Introduction Garden was accepted by Act of Congress."

The Bamboo Collections. The large collection of bamboos referred to above by Fair-

⁵Fairchild, David: *The Barbour Lathrop Plant Introduction Garden*. 16 pp. Washington, 1928.

child had been made in Japan at the turn of the century⁶ and subsequently established at several locations in the United States. Once the Garden was set up, all bamboos, other than the tropical ones held at Coconut Grove, were transferred to Savannah. Additional introductions have been added from time to time so that today this garden can boast of one of the largest living collections of hardy running bamboos extant. Upwards of a hundred species and varieties have been estab-

lished. Principal genera of bamboos maintained and the approximate number of clones represented (in parentheses) include *Arundinaria* (50), *Bambusa* (30), *Cephalostachyum* (1), *Chimonobambusa* (1), *Phyllostachys* (75), *Pseudosasa* (1), *Sasa* (17), *Semiarundinaria* (5), *Shibataea* (2), *Sinobambusa* (5), and *Sinocalamus* (2). Most of these can be grown in the warm temperate parts of the country where soil and moisture conditions are favorable. The hardier genera are especially adapted where the minimum winter temperatures are between 5° and 25° above zero Fahrenheit.

⁶See Fairchild, David G.: *Japanese Bamboos and their introduction into America*. U. S. D. A. Bull. 43: 1-36. 1903.



Left: The Castillo bamboo, *Phyllostachys bambusoides*, a horticultural form of the common timber bamboo of China and Japan. This species, whose handsome yellowish culms are strikingly marked with bright-green rectangular panels, is an example of an introduction already successfully established but yet to attain the wider distribution as an ornamental that it deserves.

Right.: The original grove of timber bamboo, *Phyllostachys bambusoides*, as seen from a door of the museum building, Barbour Lathrop Plant Introduction Garden at Savannah.



Visitors to the Garden will find that the larger of the various kinds of bamboo are maintained in regularly spaced rectangular plots separated by grass strips. Since most of the hardy species in the collection are so-called "running types," with new aerial growth developing from vigorous-growing underground rhizomes, they have had to be kept separated in this manner. Even so, neighboring plots are becoming much intermixed and it is apparent that a pressing need exists for the reestablishment and maintenance of new "pure" plots in which protection is afforded against future intermixture by means of some sort of permanent underground barrier.

Although the restricted "plot" type of bamboo maintenance does not permit the best development of most of the running bamboos in the collection, one can still see to what extent such plants can increase by strolling through the original grove of *Phyllostachys bambusoides*. Even it is now kept within bounds.

One can say that down through the years a principal function of the Garden has been to demonstrate that hardy bamboos, considered in the Orient to be one of the most important plants, can and ought to be grown more widely in the United States. In order to implement this purpose, several lines of activities have been carried on at the Garden. First of all, many kinds of bamboos have been introduced and tested, and those successfully established have served to build up the valuable germplasm collection at Savannah. Secondly, once established, the collection has been the basis for a continuing

series of taxonomic and horticultural studies. Before any introduced plants can be widely distributed, they must be carefully named—often a difficult task in a group like the bamboos where important flowering characteristics may not be observed for decades (for example the big grove of *Phyllostachys bambusoides* has never flowered, although it has been growing for sixty-five years). Recipients of bamboo propagations must also be given information on how to grow these plants. Consequently, studies of horticultural practices best followed with bamboos have also had to be made. Distribution of potentially valuable species throughout the country for wider testing is a third activity which in one sense brings to an end the job of introducing a bamboo. Once distributed to the user, a species of bamboo is on its own to be accepted or rejected on its own merits.

Quite a few bamboos have proved acceptable following their original distribution by the Plant Introduction Section. The more important of these are available from various nurseries in this country. As others become important they, too, will be made available to the public through the commercial nursery trade. Perhaps the four most popular species are the utilitarian Chinese and Japanese timber bamboo (*Phyllostachys bambusoides*), much planted in the South because of its giant size; the hardy Fishpole bamboo (*P. aurea*), popular among followers of Izaak Walton; the oriental Hedge bamboo (*Bambusa multiplex*), a clump-forming species much seen in the Deep South; and Japanese Metake or arrow bamboo (*Pseudosasa japonica*), one of the hardiest of the ornamental running species.

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 Top: A test planting of the Chinese water chestnut, *Eleocharis dulcis*, a possible new specialty crop for the United States. The edible corms are seen in the insert. In the background are the main plantings of bamboo. Barbour Lathrop Plant Introduction Garden at Savannah.

Center: The Bamboo Museum, Barbour Lathrop Plant Introduction Garden, Savannah, Georgia. This building houses an interesting collection of articles illustrating the wide range of use that bamboos are put to in the Orient.

Bottom: View of the grove of timber bamboo, *Phyllostachys bambusoides*, as it appeared in 1919 when it and the adjoining land was purchased and donated as a gift to the government by Barbour Lathrop. The dirt road in the foreground is today U. S. Highway No. 17.

Aside from the common utilization of the species for fishpoles, most introduced bamboos have found their principal place in ornamental horticulture. Few Americans realize the many utilitarian uses to which the culms of these handsome species can be put. To demonstrate the many articles that can be fashioned from bamboo, a small museum full of such objects from the Orient is maintained at the Savannah Garden.

Perhaps the greatest future potential for bamboo in this country lies in its utilization by industry. For example, bamboo is a proven source of fiber for the paper-pulp industry, and in countries like India, China, and Japan considerable quantities of paper are regularly manufactured from these plants. No commercial firm can take an interest in bamboo as grown in America until the total plantings are increased tremendously; conversely, no grower will plant bamboo for sale to industry until industry itself gives its active support. For this reason the Plant Introduction Section has felt that one way to demonstrate the potentialities of domestic-grown bamboo would be the support of certain lines of research on these plants. During recent years several contracts for re-

search have been negotiated with cooperating institutions to find answers to some of the problems concerning bamboo and its industrial applications. A bibliographic survey of bamboo was first made to serve as a starting point for any future work. Then, using the Barbour Lathrop Plant Introduction stands of bamboo as a source of experimental material, research was undertaken on seasoning, preservative treatment, and physical property studies of hardy bamboos. Finally, extensive research showing that locally grown bamboos can be made into a large series of paper types has been carried out.

Miscellaneous Plants at Savannah. Although the collection of bamboos is the major item of horticultural interest, there is also held a miscellany of other ornamental plants and species of so-called specialty crop nature. Among the most important are outstanding hollies, edible aroids and especially the various types of dasheens, disease-resistant Chinese chestnuts, and the quite distinct Chinese waterchestnut or matai. With its mild coastal climate the Garden at Savannah will continue to be a favorable location for the testing of introductions of possible interest to the South.

A Book Or Two

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

Winter-Hardy Azaleas and Rhododendrons.

Clement Gray Bowers. The Massachusetts Horticultural Society, Boston. 1954. 112 pages. 17 illustrations. \$3.00. (Library).

Here is a little book devoted to those types of hardy azaleas and rhododendrons that can be expected to do well in the *northeastern* section of our country. Dr. Bowers has written it especially for amateur gardeners who are eager to know more about this spectacular group of flowering shrubs. In this concise and comprehensive volume, the reader will find a guide for the culture of all the hardiest kinds.

In nine chapters, the author gives his readers a graphic presentation of the various winter-hardy species—their uses, soil requirements and general needs. He gives special attention to the most desirable places to plant specimens and to the control of insects and diseases, while his advice on collecting the most desirable forms is particularly helpful. The list of species, hybrid groups and clones add to the value of this little volume, written in a very pleasing fashion.

Native Australian Plants—Their Propagation and Cultivation.

Blombery, A. M. Angus and Robertson, Sydney, London, Melbourne and Wellington. 1955. 107 pages. \$5.00.

The Australian plants include many notable fine ornamentals which are particularly useful in those subtropical zones of the world which have the Mediterranean climate. Many of these present difficulties in both propagation and culture, but almost no help can be obtained from the standard manuals on propagation. The author of this small volume gives detailed instructions for collecting seeds of some elusive types, and for germinating various types which have hard seed coats. The use of fire treatment is also described.

Many Australian plants are susceptible to damping-off fungi and methods of reducing this difficulty are described. Plant species are listed which can be rooted from cuttings.

The book is profusely illustrated with numerous line sketches and a frontispiece in color.

V. T. Stoutemyer

The Lily Year Book, 1956.

The Royal Horticultural Society, London. 1955. 164 pages. Illustrated. \$1.65, postpaid. (Library).

This volume, the nineteenth in the excellent series of lily year books published by the Royal Horticultural Society, maintains the high standard of excellence set by its predecessors. Dedicated to Miss Isabella Preston, our beloved North American lily authority, it contains a biographical sketch emphasizing her lily activities.

Features are lists of American and Canadian hybrid lilies, lilies in decoration and the usual cultural articles. An article on *Fritillaria* followed by a discussion of this group will appeal to the cultivators of this genus.

G. L. Slate

Ground Cover Plants.

Donald Wyman. The Macmillan Company, New York. 1956. 166 pages. Illustrated. \$4.75. (Library).

. . . a compact little book concerning some 260 kinds of plants, both woody and herbaceous perennials, which can be used as ground covers in all but the extreme southern parts of the United States. There is a great deal of interest in this subject today, not only by the amateur home gardeners but also by the landscape engineers whose responsibility it is to plant the major highways of the country, and commercial growers have noted a marked increase in sales within the past few years for ground cover plants.

The author briefly describes the advantages (and disadvantages) of grass, admitting that it is the neatest as well as the most serviceable of ground covers, but points out what everyone knows, that it does take time and money to keep a lawn in good condition. Many of the plants recommended in this book, although not as neat as grass, have, nevertheless, other meritorious ornamental qualities and all of them take far less time to service, once they are established.

The first part of the book deals with hardness requirements of the plants (the hardness zone for each is given); methods of planting are discussed as well as means by which some can be made more interesting by interplanting with bulbs. General maintenance is given considerable space in the text, together with methods of fertilizing, replanting and mulching, as well as winter protection necessary for some. Pruning is also discussed, and some of the newer methods dealing with quick but effective pruning of an entire bed of ground covers are briefly described.

Considerable space is given to methods of propagation for, in the descriptive text following, the best means of propagating every plant described is given. This is done on the supposition that the home owner who is interested and has a horticultural tendency may want to increase the ground-cover plantings about his house, either on a large scale or else for replacements. Consequently, methods of growing from seed, cuttings, and division are all described in detail. The new type of home propagation unit now made possible by the use of polyethylene film is also described in detail. Even the construction of the electric hotbed is given in detail, for these units are usable on the home grounds for many other purposes besides raising ground covers.

One of the most useful parts of the book to the advanced horticulturist is that giving lists of ground covers selected for special purposes. Plants that increase rapidly always make the best ground covers and there is a list of 47 plants in this category. Then, there are lists of evergreens (70); ground covers for banks (49), dry soils (40), wet soils (32), shady places (47); special ones for seashore planting; those for between stepping stones, those that can be run over with a lawn mower and the like. All are listed with both their scientific and common names, affording an easy and quick reference for the plantsman, giving at a glance a list of plants from which he can select the one ground cover he thinks best suited for a specific difficult situation.

The main part of the book is made up of the horticultural descriptions of the plants in their alphabetical order. Important horticultural information is given about each plant including its height, hardiness zone, ornamental characteristics, and time of effectiveness of its flowers and fruits; special interest and color notes concerning its foliage, its habitat, best methods by which it is propagated and any notable varieties. Also, a descriptive paragraph is given concerning its usefulness.

Altogether a compact little book, filled with extremely usable horticultural information about some of the many plants that are becoming of increasing importance in modern planting as ground covers.

M. E.

How To Make Cut Flowers Last.

Victoria R. Kasperski. M. Barrows and Company, New York. 1956. 191 pages. Illustrated. \$2.95 (Library).

At last we have in one complete short book methods and techniques for extending the life of material used in arrangements. The author's invaluable six years' experience as the official flower arranger at George Washington's Mount Vernon together with considerable research on the subject, has given her a most extensive knowledge on the keeping possibilities of plant materials. Miss Kasperski has written practical suggestions on gathering and conditioning some 300 flowers, fruits, vegetables and foliages, from Acacia to Zinnia; and outlines special treatment for special groups, such as milky-, woody- or hollow-stemmed types, and one chapter explains drying, pressing, dyeing, and forcing, and making potpourri. Other sections cover transportation of material to shows, preservatives, and various other aids to conditioning.

This is a very good reference book, particularly to the show exhibitor, and useful, too, to anyone interested in making home, club, or church arrangements last for a long period of enjoyment.

M. C. L.

The Illustrated Reference on Cacti and Other Succulents.

Edgar Lamb. Pitman Publishing Corporation, New York. 1955. 311 pages. Illustrated: 32 color plates, 214 halftone plates. \$10.00. (Library).

Edgar Lamb has been growing Cactus and other succulent plants for over 25 years in England and has written several books on their culture.

Since 1949 he has published a series of photographs of plants as grown in his nursery in the south of England with cultural notes on each plate. These plates were sent monthly in groups of two to four pictures to subscribers and could be assembled in loose-leaf binders for reference.

The Pitman Publishing Corporation, has now assembled all of the plates issued from 1949 to 1954 into one book arranged according to genera. A supplemental list of other species found in cultivation in each genus increases the value of this work and the 32 color plates are an addition not included in the original subscription plates.

Collectors of succulent plants in the United States have asked for pictures as a method of identification of their plants but the pictures available

were few and then of fully grown plants in their natural habitat.

Therefore Mr. Lamb's book should meet ready acceptance in this country as illustrating cactus plants of the size likely to be found in cultivation.

Identification is by scientific name and this is the only possible satisfactory method. Common names vary in the various sections of the country. The rainbow cactus of Arizona is *Echinocereus pectinatus rigidissimus* while the rainbow cactus of Texas is *Echinocereus pectinatus neomexicanus*.

The well known "Hen and Chickens" name is applied in varying states to many species of Echeveries from Mexico or to several species of *Sempervivum* from Europe.

In Mr. Lamb's book the first 161 pages are on Cactus species and the remainder on the other Succulents arranged in alphabetical order of genera. Illustrated are Aloe and Haworthias in the Lily family, cactus-like Euphorbias, succulent milkweeds or Stapeliads, Orpines and Figmarigolds.

W. Taylor Marshall, Director, The Desert Botanical Garden of Arizona, Tempe, Arizona.

Soil Sterilization.

W. J. C. Lawrence, The Macmillan Company, New York. 1956. 169 pages. Illustrated. \$3.50. (Library).

The author has brought together in this book most of the information a gardener or greenhouse keeper should know about soil sterilization. Summarization of a few important facts in the book follows:

Soil sterilization by heat is an old practice. A safe sterilizing temperature is 180°F. for 10 minutes. Weeds and eelworms are killed at about 130°F., while virus diseases may require 200°F. To a reviewer in the United States these temperature and time requirements seem somewhat inadequate for certain circumstances. An unpredictable degree of chemical unbalance may result from heat treatments. Steam heat is commonly used but dry heat in ovens is sometimes practicable. The author describes in detail sources of steam, receptacles for holding soil, and various methods of applying heat. Recently a steaming plow has been developed in Denmark for use in greenhouses. Much labor is eliminated by use of this specially constructed plow.

Electricity can be employed directly or indirectly for supplying the necessary heat. In the direct or electrode system the current passes through the soil. This system is for use in greenhouses only; it takes too long and is too costly for soils in place.

Chemical sterilization is feasible in certain cases, although it is less thorough than when steam is used. Chloropicrin is a good fungicide and insecticide and is also highly effective against weed seeds. Also, it gives good control of root-knot nematodes. Formaldehyde is widely used in Britain because of its good fungicidal properties. Materials used specifically as nematocides include D-D mixture, ethylene dibromide and methyl bromide; these are highly effective when properly applied.

This is an excellent book; it tells what one should know about soil sterilization, particularly in greenhouses.

M. S. Anderson, U. S. Department of Agriculture, Plant Industry Station, Beltsville, Maryland.

Camellias In America

H. Harold Hume, J. Horace McFarland Company, Harrisburg, Pennsylvania, 1955. Revised Edition. Pp. xvi and 568. 234 Illustrations, 65 in full color. \$25.00.

Writing in *The American Camellia Yearbook* (1955), page 359, Dr. Hume mentions that "22 pages have been deleted and 124 pages of new text have been added" as well as other "changes and additions." Those most immediately noticeable on opening the new book are the additional plates with current emphasis on *C. sasanqua* and *C. reticulata* varieties. The dust jacket also shows the lovely *C. saluenensis* hybrid, 'Donation,' a figure repeated as a plate opposite page 396.

The chapters on the *sasanqua* and *reticulata* varieties are most rewarding. In the former, the only detail not given and of any significance to garden planners or planters in the North is the relative time of bloom. In the U. S. National Arboretum, Washington, D. C., those sorts that flower in October and early November are most likely to escape frosts. In Mississippi, the frosts—as yet—ruin only those flowers that happen to be open, with relatively no damage to buds. Other areas might give other stories. In the shorter chapter on *reticulata* varieties, not many data are given relating to plant growth habits, but the remark found under several "growth slender, open" should be noted. Nearly all the plants seen by the reviewer were "poor things" as compared to other camellias *in habit*; the flowers are another story.

No reviewer really should report his regrets on what he did not find, but this book is so superior that it is a regret—personal, if you will—that there was no review of current chromosome data appended to the chapter on "Camellia Breeding," a chapter that might well have been expanded, fortunately on the points raised on page 111.

But, reader beware of this book. If you are already a camellia grower, you will treasure it and wait eagerly for the next revised edition. If you are not now growing camellias, and live in a region where they can be grown, you will want to begin at once.

B. Y. M.

Miniature Daffodils.

Alec Gray, W. H. & L. Collingridge, Ltd. Transatlantic Arts, Forest Hills, New York, 1955. 57 pages, illustrated, 15 shillings net.

To any one who is at all familiar with the daffodil world at present in England, or who has known it through the last decades, the name of Alec Gray is already familiar. And something is surely known of the small daffodils that he has been exhibiting at shows through a busy life, not only wild forms and species, but also his own charming hybrids.

There is only one fault to be found with the present book; it is too short. For all else one can offer only grateful praise.

The reviewer has attended many daffodil shows in this country and exhibited as well. He himself never got beyond showing some *Narcissus triandrus* hybrids and some of the species jonquils, but he well recalls one show in Alexandria, Virginia, when Mrs. Watrous' lovely example of *Raindrop*, one of Mr. Gray's hybrids, practically stole the show. It was a good show, too.

The advice given comes from an expert. The

descriptions given are written with skill and no quarter is given to "gushing" for the plants need none, either quarter or gush. If you have a place for small daffodils, and it certainly need not be a rock garden, and have not tried them, by all means start.

From an old hand, do not try first with *N. canaliculatus*, which must be a lovely dwarf polyanthus, but which in most gardens devotes itself and its energies to a multiplication of bulbs and foliage. Do try any of the small true jonquils, even if nothing more than *N. jonquilla* itself as a start. And then the true forms of *N. triandrus*, rather than most of its hybrids with what used to be called Leedsii narcissus, for some are lovely beyond telling and some are rough. And do not be afraid of the doubles that may be offered for they have a charm that is very real.

Remember, this is a small book but excellent, and infectious!

Rhododendrons—1956.

J. Harold Clarke, Editor. The American Rhododendron Society, Portland 17, Oregon. 1956. 231 pages + index & advertisements. Illustrated. \$4.25. (Library).

No rhododendron fan will intentionally pass up this latest "annual" of the American Rhododendron Society. It is well done and it contains a wealth of both standard and topical information. Under such rhododendron signatures as James S. Wells, E. P. Breakey, Chas. J. Gould and Maksis Eglitis, Paul J. Bowman, Harold Epstein, Robert Bovee and David G. Leach, the first half of the book presents some excellent ideas on rhododendron propagation and culture, including a provoking analysis of breeding problems at home and abroad. The last half, under the evident guiding hand of Dr. Clarke, presents reference information on American breeders, American varieties, the ARS code, ARS awards, and so on. Of especial value are quality and hardiness ratings for some 200 species and 350 clones, to say nothing of an included cumulative index to all ARS Bulletins and Yearbooks to date.

H. T. S.

Cactus Guide.

Ladislaus Cutak. D. Van Nostrand Company, Princeton, New Jersey. 1956. 144 pages. 16 pages of line drawings. \$3.95. (Library).

This new book is a well written description of Cactus species frequently found in collections or available to collectors through the leading growers. The descriptions are not technical but should prove understandable to experienced cactists or neophytes alike.

Complete directions for home or greenhouse culture and soil and water requirements are given as well as a listing of possible pests and diseases and their control. Propagation from seeds, cuttings and offsets and the art and purpose of grafting are well covered both for the desert and the jungle species. Particular instructions for the care of Orchid Cactus species and a lengthy list of desirable hybrids add to the interest of the book, and the list of Cactus Clubs in the United States and the English-speaking countries is complete. A very good bibliography of available reference books adds considerably to the value of this work.

The illustrations are all line drawings by Cutak and are effective in demonstrating his points. It

fills a long felt want for a complete culture and plant description text for indoor growing of cactus in the United States.

The dust jacket has a color photo of the beaver-tail cactus in flower and, most unfortunately, a photo of Cutak eating the flesh of a barrel cactus which he had decapitated. This picture will incite hundreds of persons to try out the food possibilities of barrel cactuses and cause the loss of these valuable plants which require sixty to one hundred years to mature. The publishers have stated that this picture will be omitted from later printings of the jacket, but the first printing will be resented in California, Nevada, and Arizona where cactus plants are protected by law. We regret this blemish in an otherwise most acceptable book.

W. Taylor Marshall

Farm Soils: Fertilization and Management.

Edmund L. Worthen & Samuel R. Aldrich.
John Wiley & Sons, Inc., New York. 1956.
vii + 439 pages. Illustrated. \$4.96. (Library).

The authors have brought forth a new book under a title almost identical with former editions. *Farm Soils* was written primarily for those who want a working knowledge of soils rather than strictly technical information. This book accomplishes its purpose in an admirable manner. A large group of readers should enjoy it.

Information is gathered from varied sources. Maps of States or regions covering the eastern half of the United States provide an excellent picture of the character of dominant soils and the quantities of major crops produced by States. Colored plates illustrate deficiency symptoms of various elements affecting different kinds of plants.

One of the chapters is entitled "How to fit, plant and cultivate." Use of the word FIT gives the Midwestern reader a feeling that his own expressive terminology is being understood. The chapter dealing with fertilizers is an excellent one. Here is a brief statement from the section entitled "MIRACLE FERTILIZER COMPOUNDS," where misleading advertising is mentioned:

"One pound of fertilizer X dissolved in 100 gallons of water makes over 800 pounds of fertilizer. It isn't hard to see that you still have only one pound of actual fertilizer, no matter how much water you use to dissolve it."

The reviewer believes that the definition of soil pH, page 80, could be improved by substituting the words *hydroxyl ions* for *base ions*. There are very few statements in the book, however, to which one should take exception.

This book is worthy of a place on the desk of every county agricultural agent; it should be appreciated also by many others interested in soils and their relation to domestic animals and man. It is timely and well written.

M. S. Anderson, U. S. Department of Agriculture, Plant Industry Station, Beltsville, Maryland.

Rhododendron & Camellia Year Book, 1956.

The Royal Horticultural Society, London.
1955. 167 pages. Illustrated. \$1.65, postpaid.
(Library).

There are several interesting and pertinent points to note in the current volume. Particularly interesting are those contributions that refer to two important plants, namely *Camellia japonica* subsp. *rusticana* and *Rhododendron kaempferi*. The

former was described first as a variety of *C. japonica*, subsequently raised to species level, and now reduced to its former status by Dr. Sealy after examination of numerous specimens. The ever-present controversy as to whether *Rhododendron obtusum* variety *kaempferi* really should be a species is discussed by Collingwood Ingram who concludes that it should be raised to species rank.

One will also find a brief note on the so-called yellow camellia which has been in a Portuguese nursery for years. This is *Camellia* 'Fortune's Yellow,' and is also known as *C. 'Jaune.'* Not really a yellow camellia but having white petals with a center of yellow petaloids. Also be sure to read the note on hardiness of camellias and their flowers.

The dust jacket also has an excellent plate of *Camellia* 'Donation' but is quite unlike the coloring on the jacket of Hume's book reviewed above.

One would have to report separately on each article to fully discuss this volume, but in addition to those of interest to the writer, there are the usual notes on shows in England and in the United States, several discussions of favorite plants of the *Rhododendron* group, and finally one or two articles on propagation and culture.

J. L. C.

The Gardener's Bug Book (2d Ed.).

Cynthia Wescott. The American Garden Guild & Doubleday and Company, Inc., Garden City, New York. 1956. 579 pages. Illustrated. \$7.50. (Library).

Insect Pests of Farm, Garden, and Orchard (Fifth Edition).

Leonard Marion Peairs & Ralph Howard Davidson. John Wiley & Sons, Inc., New York. 1956. 661 pages. Illustrated. \$8.50. (Library).

The nearly simultaneous appearance of new editions of two well known books dealing with insects from the standpoint of the plant grower might well invoke consternation among this (mostly) notorious group of animals. Or would it only excite their vanity that so much scholarly attention must be devoted to them and their ways of life? In each of these guide books to the insect world as it confronts the farmer and gardener there is presented first the general facts as to the kinds and the habits of insects (and certain related organisms), next descriptions of the manifold products that man has devised to combat them, and finally a copiously annotated account of pests and pest control in relation to particular groups of plants. As might be expected (and urgently needed!) the most notable feature of these new editions of already favorably known books is the exposition of modern insecticides which they present. In both, the treatment of this subject is thorough and fully up-to-date.

The Westcott text is presented in the easy conversational style which has made the author's earlier books so appealing to gardeners. This, together with the 36 color plates illustrating life histories and characteristics effects of some 100 representative insect pests, make this essentially a layman's book—and a useful one indeed.

Dr. Davidson's revision of the work on which he and the late Professor Peairs have long collaborated is intended as a college textbook in applied entomology, and a reference book for teachers, agricultural advisers, and pest control operators. The wealth of illustrations is noteworthy.

F. A. W.

The Gardeners' Pocketbook



Treatment of Freeze Damage on Azalea Plants

A drop in temperature of fifty degrees to a low of seventeen degrees following a very unusually early spring in 1955 caused the basal bark damage to the Azalea plant illustrated at left.

The treatment of such damage was given in detail in the January issue of this magazine and the illustration should have accompanied the article.

The article was prepared by Fred G. Galle and Benjamin H. Pace, Ida Cason Callaway Gardens, Chipley, Georgia. Unfortunately, the authorship line was not printed with the article.

Berzelia lanuginosa

In the July 1955 issue of *The National Horticultural Magazine*, Page 179, Mrs. Lester Rowntree authored an article on *Berzelia lanuginosa*. An illustration for the article was used as the frontispiece in that issue. The spelling of the specific epithet was *lanuginosa* in both places. Shortly after its publication, Member Mabel Symmes sent a correction to this office accompanied by additional information Mrs. Rowntree sought. These data are recorded here:

A Botanist in Southern Africa by John Hutchinson relates: "Family of Bruniaceae *** endemic in South Africa and is very nearly confined to the Cape Peninsula. *** On the west side it is represented as far north as the Olephants River mountains in Clanwilliam, its maximum development is in Calidon (11 genera, 25 species) and it extends eastward as far as Pandoland and Natal (1 species of *Raspalia*). With the exception of the latter and of *Berzelia intermedia* *** the family is confined to the Cape Region. On the Cape Peninsula eleven species occur, representing five genera.

*** On Table Mountain, *Berzelia lanuginosa* forms dense impenetrable thickets and it is plentiful near streams and in swampy localities on the Cape Peninsula and eastward to Calidon, sometimes forming a conspicuous feature in the landscape.

*** (at eight miles east of George) *Berzelia lanuginosa* with small ericoid leaves and small balls of pale cream flowers, collected. *** Collected also on the shores of False Bay." Mr. Hutchinson mentions five different *Berzelias* he collected.

Wild Flowers of the Cape of Good Hope by Elsie G. Rice and Robert H. Compton contains a plate captioned *Berzelia lanuginosa* Kolkol and relates: "*** erect shrub to seven feet. Abundant in dense masses on hillsides in good rainfall and on damp slopes and near water. Flowers all the year *** to 4,000 feet elevation.

The Society thanks Mrs. Rowntree ("This is, I hope, a lasting lesson to me: My first name-slip, I believe, in almost forty years of horticultural writing."), Miss Symmes.



An overall view of the two holly trees grown together to indicate one tree. The left tree in the smaller illustration was heavily covered with fruit while the male tree to the right, appearing as half of the total to the casual visitor, was, of course, conspicuously bare. The enlarged portion of the trees reveals the fruit-bearing tree.



Holly Hedges

ROBERT B. FISHER¹

During George Washington's periods of residence at Mount Vernon he busied himself with the many tasks which occupied his people on the five farms comprising the plantation. For amusement he undertook the development of his "Home House" or "Mansion House Farm."

He enjoyed this project and carried with him mentally wherever he travelled the plans and progress reports for the embellishment of his "country seat." Most of his work was accomplished between January, 1785, and the middle of the year 1787 when the affairs of the nation again beckoned him away from "beneath his Vine and Fig tree."

One particular planting which he attempted was that of enclosing the lawn to the west of the mansion with semicircles of holly planted in hedge rows. These hedges were planted to form the far boundaries of wildernesses which were contemplated along the serpentine walks. The initial planting was made with seeds during the spring of 1785, as General Washington's diaries record the event:

April 6—"Sowed the semicircle North of the front gate with Holly berries sent me by my Brother John—three drills of them: The middle one of Berries which had been got about Christmas and put in Sand, the other two of Berries which had been got earlier in the year, gently dried and packed in Shavings."

April 7—"Sowed the South Semicircle—rather half of it, for the lower part was too wet—with Holly berries in the same manner I did the No. one, with this difference, that the middle drill was sowed with berries which had been dried and were packed in Shavings, and the outer drills of the other sort."

April 22—"Sowed the remainder of the circle which (on acct. of wet) was left

unfinished on the Seventh instant, put both kind of the Holly berries together, mixing them well."

(The Diaries of George Washington, 1748-1799, edited by John C. Fitzpatrick, A.M. Houghton, Mifflin Co., 1925, for the Mount Vernon Ladies' Association of the Union. Vol. II:357-8, 367. Original diary in the Library of Congress.)

The records of subsequent plantings in these wildernesses indicate that General Washington was not fully satisfied with the results of his endeavor. The holly berries did not germinate for some time and the garden books of that day advised the grower to expect a delay of a year or so before germination. The subsequent plantings were spaced away from the ridges in which the holly berries were sown as these ridges are clearly discernible today. The hedges were not mentioned again in the diaries and this omission may be construed as a firm establishment of the hedges else the replanting would have been noted or the change in plans might be recorded.

Portions of the hedge planting have been restored and there are two large surviving trees spaced some distance apart. One of these trees was apparently two seedlings germinated close together, a male and a female. The trunks have now fused near the ground and the foliage is that of one tree, half bearing berries and the other half barren.

Many of the other surviving holly plantings are multiple-stemmed trees, usually two, a male and a female. There are no plantings of two males although there is one holly clump, planted on March 30, 1786, with small hollies sent by Colonel Lee of Stratford, Westmoreland County, Virginia. This clump in the north shrubbery contains five trees apparently all male as no berries have been observed on them.

¹Horticulturist, Mount Vernon, December 30, 1955.

Narcissus Notes for the Gulf Coast

Basing experience on a short time, it would seem that most of the groups of narcissus on which one depends in the North for general effect, and a minimum of garden effort, are either useless here or will require a very considerable time for becoming adapted to the new conditions. The sorts that seem most likely of immediate usefulness fall into the Tazetta and Jonquil groups. Old gardens are full of several Tazetta varieties mostly unnamed, and many true jonquils.

In the garden here, Paper White is dependable for Christmas out of doors. Chinese Sacred Narcissus, which begins its growth about the same time, is less dependable unless one can plant it where it will have some shelter from evergreen shrubs. Its double form, of which we have only a couple of bulbs, has been kept in the cold greenhouse as yet. Soliel d'Or comes a little later and is as common and useful as any in the North. There are several unnamed local sorts that are also almost weeds, but a variety that may prove to be Grand Monarque comes a little later and, like Chinese Sacred Narcissus, the sort that figured in the frontispiece as a minor detail in last month's issue, needs a little more shelter. The still later Grand Primo is safe and excellent. The hybrid, Silver Chimes, that carries also triandrus blood, is latest of all, and superb.

Except for old Laurnes Koster, all of the Poetaz sorts are variable in performance through these their first years. Scarlet Gem is far from scarlet, but blooms well. Cragford was a little irregular in appearing and may or may not settle down properly, but its flowers are all they are in the North. Saint Agnes was excellent, and some bulbs of Martha Washington came up to the mark. Most of the others did not, although there is no reason to despair as yet.

All the forms of *N. odorus*, including the charming double, did very well indeed, and *N. jonquilla* itself set seed free-

ly as if it intended to take over. It will be a happy day when it does. The local unnamed sort, of course, is a weed, but it fits no description that has been found to date. An old clump of the probably forgotten jonquil hybrid Solleret continues to increase and bloom regularly.

Of the newer sorts, new to this area, Topaz and Golden Perfection were the last to flower, with a few stray flowers also on Sweet Pepper. Topaz looks much like a good Leedsii (old style), but Golden Perfection shows its jonquil blood clearly. Sweet Pepper is valuable as its cup is tinged with red, a nice break among the many that show no great color range, except in the old Orange Queen which is distinctly orange yellow. Earlier, Trevithian and Lanarth gave as excellent performances as ever in the North. All of these make distinct additions to the jonquils known in these parts. Trim bloomed freely but needs another year to show.

Happily all the triandrus hybrids tried have been successful and, while all belong to the group that show the influence of the Leedsii parent rather than a predominance of triandrus blood, the flowers are given freely and abundantly. Silver Fleece and Pearly Queen have been here for some years and have increased regularly and well. It is especially good that we have Pearly Queen, that has rather gone out of fashion in some quarters, as it has a very delightful and distinct scent. Niveth is too new yet to show how it will continue, but as it is a great favorite one hopes for the best. The few bulbs bought as *N. triandrus concolor* bloomed this year after happy increase, and proved to be not that plant at all but a charming small-flowered, yellow *bulbocodium*. This, too, set seed, which usually is a happy sign of acceptance.

If one reads the discussions in A. Fernandez "Sur la phylogenie des especes du genre *Narcissus* L.," there are some puzzling factors to be considered, but a desire to hybridize further among these species, forms and varieties tempts one greatly. From the gardener's point of

view, the white-flowered forms are particularly valuable here, as the strong yellows conflict seriously with the many azaleas that bloom through the same period. Nevertheless, it will be a nice project for some southern plantsman to study these plants and come up with a race or races that will in time approximate in variety and range of bloom the grand plants more commonly known in northern gardens.

Lavandula stoechas

It is not often that a land is called after a plant but it is said the Stoechades Island off the southern coast of France was named after *Lavandula stoechas*. Gustave Hegi in *Illustrierte Flora von Mittel Europa* says it was used more than *L. latifolia*, or *L. officinalis*. After being dried, it was carried over the Alps and used as a medicine as late as the middle of the eighteenth century. It was called Stickadore in those days. In the Middle Ages it was one of the ingredients of the Vinegar of the Four Thieves, an historically known antidote against plagues.

The plant is native to the Mediterranean and I have seen it growing wild in Portugal. An English traveler reports in the *Gardener's Chronicle* of seeing fine forms of it with immense violet plumes in Crete. With me in southern New York, though it is a sturdy sub-shrub, it is not hardy, so I bring it indoors every winter. Also, it grows to eighteen inches or so high, but elsewhere it is said to reach a height of three feet. The leaves arch upward and are slender, downy and terminate in a point. The calyx is green and furry and so is the bract subtending it. It is reported that the calyx is occasionally white, pink or copper pink. The minute, dark purple, almost trumpet-shaped flowers grow in close heads an inch or more long.



Gottscho-Schleisner

Lavandula stoechas

Out of the top of the flowering spike grows a tuft of narrow purple bracts with wavy margins. These bracts look like a bunch of bright feathers. The plant smells a little of turpentine and yet flowery. This plant can be grown from seed and increased very easily by cuttings. It blooms over a long time from middle to late summer.

Helen M. Fox, Mount Kisco, New York.

What's New in Plant Propagation?

KARL SAX¹

"Notwithstanding the ignorance and inaccuracy which their statements betray the Romans were aware of all of our common, and some of the uncommon practices; they propagated plants as we do; pruned and thinned, watered, forced, and retarded fruit and blossoms, and even made incisions and ringed trees to induce fruitfulness." So wrote J. C. Loudon in his "Encyclopedia of Gardening" in 1822.

A similar comparison could be made between the work of the English horticulturists of the 17th, 18th and early 19th century with that done in recent decades by the experimental horticulturists of England and America. The old-timers sometimes let their imaginations run wild as did the early Romans. In a book on "Grafting and Inoculation," published in 1780, the author tells how the grape can be induced to ripen earlier: "If a vine be grafted on a common cherry, the grapes which it produces will be so remarkably forward as to be ripe in the season of the cherries. But it is very difficult to graft a vine well on a cherry stock, so as to make it thrive and flourish. The following method has, however, been generally successful.

First bore a hole with an augur in the trunk of a cherry tree; in this hole insert the scion of the vine, and let it grow there till it has filled the hole of the augur, and is closely jointed to the cherry tree. Then cut off the vine branch from the vine, after which it will draw all its nourishment from the cherry tree, whose sap will hasten the formation and maturity of the grapes, which will be ripe near *two months* sooner than ordinary."

Although some of the old-timers in-

dulged in such flights of fancy, many of them showed great originality in horticultural techniques and considerable knowledge of plant physiology.

The ringing of the bark of grape vines to induce earlier maturity has long been a standard practice in some areas. A description of the technique, time of girdling and the effect on fruiting of grape varieties in California was recently published in a technical horticultural journal.

Essentially the same methods and results were described by John Williams in 1808. In the Transactions of the Horticultural Society of London 1820, the following description appears: "At the end of July and the beginning of August, I took annular excisions of bark from the trunks of several of my vines, and that the exposed alburnum might be again covered with new bark by the end of autumn, the removed circles were made rather less than a quarter of an inch in width . . . In every case in which circles of bark were removed, I invariably found that the fruit not only ripened earlier, but the berries were considerably larger than usual, and more highly flavored."

The use of dwarfing interstocks instead of dwarfing root-stocks to produce dwarf apple trees has been described in English and American horticultural journals in recent years. It was found that Malling IX, or other dwarfing stocks, when used as interstocks between the seedling rootstock and the scion, curtailed the growth of apple trees and induced earlier fruiting. The use of dwarfing interstocks is a common practice in this country, because of the time and expense of propagating the clonal dwarfing rootstocks.

¹Arnold Arboretum, Jamaica Plain, Mass.

The use of dwarfing interstocks was described nearly 300 years ago by John Rea in *Flora*. He had become impatient with the slow growth of Paradise apple layers which were used as a dwarfing rootstock. In 1665 he wrote: "I have found out another expedient to help them forward, that is by grafting the Cyen of the Paradise apple in the Crab, or other Apple-Stock, close to the ground, with one graft, and when that is grown to the bigness of a finger, graft thereon about eight inches higher, the fruit desired, which will stop the luxurious growth of the Tree, almost as well as if it had been immediately grafted on the forementioned layers, and will cause the Trees to bear sooner, more and better fruits."

At the Bussey Institution we have been using peach interstocks as a compatibility bridge so that apricots can be grown on *Prunus tomentosa* dwarfing rootstocks. The apricot varieties we have used do not take when budded on *P. tomentosa*, which is an excellent dwarfing stock for many peach varieties. In order to dwarf apricot trees we first bud *P. tomentosa* seedlings with a compatible peach variety and the following year bud the peach, about six inches above the graft union, with apricot.

The use of an interstock as a compatibility bridge was first described by John Parkinson in his *Paradise in Sole Paradise Terrestris*, published in 1629, as follows: "the greene and the yellow Nectorin will thrive best to be grafted immediately on a plumme stock; but the other two sorts of red Nectorins must not be immediately grafted on the plumme stock, but upon a branch of Apricocke that hath been formerly grafted on a plumme stock, the nature of these Nectorins being found by experience to be so contrary to the plumme stocks that it will starve it, and both dye within a year, two or three at most."

The use of leaf-bud cuttings as a means of propagating certain plants has been described in a number of horticultural

journals in recent years. The leaves, when well developed, are removed from the stem by cutting out a chip of wood at the base of the petiole. The stem portion is then inserted in the soil, or other rooting medium, with the petiole and leaf exposed to moist air. The bud at the base of the petiole produces a new plant.

Essentially the same technique was described by Thomas Barnes in 1759 in a pamphlet, "A New Method of Propagating Fruit Trees and Flowering Shrubs." He wrote: "November the third 1757, I took off four dozen leaves of the common Laurel, with the bud entire in the bosom of each leaf . . . I cut the wounded part smooth, wiped it dry, and covered it with some of the dressing. I planted them in four pretty large pots . . . The mould in these pots was made extremely fine, and I planted them by making very small openings and letting in the base of the leaf just so far that the top of the bud might not be excluded from the benefit of the air. I examined them January the fourth. Every bud in the pot which was in the stove had formed a good plant two inches high, and with sufficient roots. . . . Thus I found that as many plants might be obtained as there were buds upon the branch."

The use of sphagnum moss for growing plants and cuttings has become popular in recent years. Nutrients can be added in liquid form as needed, the plants make good growth, transportation is much cheaper than if the plants have to be balled and burlaped, and the plants are easily transplanted when grown in cans of sphagnum.

The "Cultivation of Plants in Moss" was described in 1826 by John Street in the *Transactions of the Horticultural Society of London*: "If plants require manure I give it in a liquid state . . . In sending plants to a distance those which are rooted in Mosses travel admirably, they turn well out of the pots, and the roots are so mixed with the Mosses that they do not separate from

them, as they would from mould; and besides this safety to the plants the Mosses are so light that the package is conveyed with comparative ease."

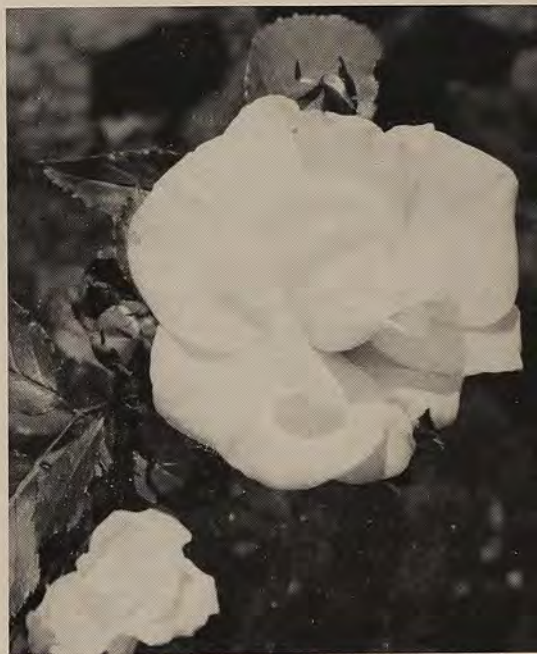
During recent decades physiologists have found that by ringing the bark of an apple branch, or by using a dwarfing rootstock, the concentration of sugars and carbohydrates is greatly increased in the leaves and spurs. With the aid of radioactive tracers it has been shown that the organic nutrients may pass from the bark into the xylem and be carried upward in the transpiration stream. At the Bussey Institution we have found, with the aid of radioactive tracers, that the downward flow of nutrients in apple trees is checked by a dwarfing interstock, or by inverting a ring of bark on the trunk of the young apple tree.

In 1820 Thomas Andrew Knight made the following observation on the effect of girdling the stem, which was published in the Transactions of the Horticultural Society of London: "The true sap of trees is wholly generated in the leaves, from which it descends through their bark to the extremities of the roots, depositing in its course the matter which is successively added to the tree, whilst whatever portion of such sap is not thus expended sinks into the alburnum, and joins the ascending current, to which it communicates powers not possessed by the recently absorbed fluid. When the course of the descending sap is intercepted, that necessarily stagnates, and accumulates above the decorticated space; whence it is repulsed, and carried upwards, to be expended in an increased production of blossoms, and of fruit."

In 1822 Knight (Trans. Hort. Soc. London), in discussing the growth of peaches budded on plum rootstocks, concluded that the dwarfing effect "appears to arise from the obstruction, which the descending sap of the Peach tree meets with in the bark of the Plum stock; for the effects produced, both upon the growth and produce of the tree, are similar to those which occur when the de-

scent of the sap is impeded by a ligature, or by the destruction of a circle of bark." —Knight also attributed the dwarfing effect of Paradise apple rootstocks to the retardation of the downward flow of the nutrient sap.

Great advances have been made in horticulture in recent decades by the development of new fertilizers, insecticides, fungicides, herbicides and plant hormones, but the old-time horticulturists knew most of the techniques of propagation used today, and some of them had considerable knowledge of the physiological mechanisms involved.



Jackson & Perkins

'White Bouquet'

Two Spectacular Roses Win All-America Rose Selections Award for 1957

'White Bouquet' is an enchanting white Floribunda with sparkling four- to five-inch flowers and contrasting lustrous dark green foliage. The flowers are gardenia-like and open fully with petals spreading to form opulent white blooms with a sweet spicy fragrance.

As the flower slowly unfolds, the center petals remain upright, offering an unusually graceful appearance in every stage from unfolding tight bud through to the fully opened flower. The buds are light cream and open into pure white flowers.

When the center petals of 'White Bouquet' finally separate and open to the lush white bloom, the small circle of golden yellow stamens gives an additional note of charm. Seen against the background of the dark green foliage, the effect is one of cool freshness.

The blooms are constantly produced both in clusters and individual flowers on a plant which grows to a height of eighteen to twenty-four inches. As 'White Bouquet' grows in a bushy form with a spread equal to its height, it is wonderful for bedding. Because it is one of the medium-sized Floribundas, it is an exciting addition for modern gardens where it is ideal for border plantings and all the other versatile uses for which Floribundas are naturally adaptive.

'Golden Showers' has the unique distinction of being the first Pillar and Climbing rose in sixteen years to win the coveted national All-America Rose award. Since 1941, no other rose in this class has combined sufficient beauty, hardiness, and flowering qualities to win this award. Its large four- to five-inch, vivid deep yellow roses occur in great profusion in the early spring. Because the variety is extremely vigorous, the new canes continue to produce many flowers during the entire summer. And, the final display of exquisitely formed canary-yellow flowers in the fall is truly impressive. The deep yellow buds are long pointed and the petals have good substance. Since the flowers are on very long beautifully bronze-colored stems, rather free of thorns, they are well adapted for cut flower use.

The Pillar rose is defined as one which has canes sufficiently strong to support itself without staking or trellising. 'Gold-



Germain's

'Golden Showers'

en Showers' easily grows to a height of six to eight feet in one season. The foliage is large, leathery, glossy, and highly resistant to mildew. It abundantly clothes the plant clear to the base, even on older plants.

Depending on the treatment, the plant may be grown in three ways: 1) By allowing the canes to remain unpruned for two or three years, 'Golden Showers' may be grown as a shrub eight to ten feet high. The tops of the canes arch over gracefully and the abundance of flowers with this method of growing is breathtaking each spring. 2) By pruning away the two-year old wood canes at the base of the plant each spring and heading back the year-old canes to about five feet, a well-balanced symmetrical plant may be obtained. 3) The canes may be trained against a building or trellis as a regular climber, arching them over so as to induce the maximum number of flowers along the canes.

'Golden Showers' is very resistant to blackspot and continues to flower freely with very little reduction in vigor even when exposed to severe infection.

In Praise of Narcissus Stella Alba

By the score card, *Narcissus Stella alba* rates very low; in the affections of those who have grown it, it ranks high. Its petals are narrow and far apart, somewhat fluted, sometimes lightly twisted, thin, without much substance; but these narrow, irregular petals give it its starry look, and, when grown in mass in the field, with a little tilt of its head, it has the sprightly grace and joy of a wild thing.

In Bailey's article on *Narcissus* in his *Cyclopedia of Horticulture*, the fine print at the end states: "Stella, one of the starnarcissi of the *N. incomparabilis* group, now represented by *Stella Superba*, about twice the size, with long white spreading segments and cup clear yellow." This modest *Stella alba* can not be *Superba* nor even the *Stella* of old catalogs, also described as "pure white with yellow cup," for this opens a soft Empire Yellow with a slightly deeper crown, and the petals fade to a thin papery white, which must have been the excuse for its name. Our bulbs were bought under the name of *Stella alba* more than forty years ago, but just when and from whom is now lost to memory. Although it must have been well known long ago, no description that fits it has been found in recent book or catalog.

Although after separation they take a little time to colonize, they naturalize easily. Often they appear, quite inexplicably, in distant parts of the garden where they have not been planted. Paper White and *Barrii conspicuus*, planted at the same time under similar conditions, on the other hand, have not increased greatly.

The summer sun bakes the adobe where they grow, but with the first warm spring rains their green points begin to show above ground. Sometimes the heaviest of the wild grasses are pulled to

let the field come through more evenly, which is the extent of their care. They thrive in shade if it is not dense, yet in the San Francisco Bay region they prefer sun. A few hot days in February or March, however, may shorten their blooming period. They keep surprisingly well when picked and scent a room with their delicate perfume.

Brodiaea laxa and the white Mariposa lily, *Calochortus venustus*, both native locally, are also naturalizing themselves into these fields and give a later bloom over the old *Narcissus* foliage.

Stella alba should be kept apart from the newer, more formal, and very beautifully perfect daffodils, for it is in such a very different class it can not be compared with them. Its appeal lies in its unpretentious simplicity and grace.

MABEL SYMMES

Further Notes on Lycoris

Again, in 1955 as in former years, *Lycoris* has shown the same variations in flowering dates. Among blooming bulbs of plants bought as *Lycoris radiata*, there are four distinct blooming periods with slight overlap between two lots. A fifth lot already established on the place is even now still below ground. The earliest as before is the self-fertile clone already mentioned several times in this journal.

The bulbs bought as *L. radiata alba* from several sources show two distinct plants, neither white. The self-colored clone is a very pale yellow, (paler than Baryta Yellow of Ridgway) and might be mistaken for white at a distance. Its fellow clone is pale yellow lightly tinted with pale pink from the base of the segments (Ridgway, Cartridge Buff flushed Pale Congo Pink). In the purchase of one dozen bulbs, eleven were this latter type and one the pale-colored form.

The collection as yet has no representatives of the clones offered as *L. albiflora*, a fault that will be remedied this season.

After years apparently devoted entirely to multiplication, *L. Sprengeri* has at last flowered, the earliest of all save the self-fertile *radiata* clone. To all purposes it is a deeply colored *L. squamigera*. It differs, here, only in having red-flushed foliage and deep rose-red flower buds that are darkened by shadings of deep blue (Ridgway, Tyrian Rose touched Phenyl Blue). The flower opens to Mallow Pink and the blue shadings that spread more and more as the flower ages are between Squill Blue and Yale Blue (Ridgway).

As before, the several purchases of *L. aurea* have been consistent in flowering times and types.

Bulbs from three sources have bloomed with the foregoing, but bulbs from a Florida source show no signs of activity though they are in excellent health.

This last clone, if it is a clone, has much narrower and somewhat more pointed segments than those now flowering. In color it is a little paler. The August-flowering bulbs are Light Cadmium, shaded with Cadmium Yellow from the base. This is the pure yellow that one sees in daffodils and daylilies.

L. incarnata has not flowered this year, but its bloom as recorded last year is more like that of *L. squamigera* with narrower segments, white, with a dull rose-pink flush, almost a line, through the center of each.

The ruffled edges of all segments are apparently characteristic chiefly of *L. radiata* in all its clones here, and do not appear in the forms bought as *L. radiata alba* to any marked degree, which is regrettable.

No location has been found in the garden that seems to suit *L. squamigera* though the plants appear to be vigorous in their leafy stages. Possibly it needs more lime in its diet than is easy to maintain in this porous but acid soil.

Small purchases of *Lycoris* from every possible source continue as it seems quite likely that other minor, but interesting, variations may appear in any lot, no matter what it may be called. And seedlings are being raised to see if further variations may appear. The seed should be planted as soon as ripe, even if germination does not always follow immediately. The first year one gets but a solitary leaf and as yet no report can be given on how many years must pass before flowering.

Pass Christian, Miss.



A List of Organizations Affiliated With The American Horticultural Society

- American Association of Nurserymen
- American Begonia Society
- American Begonia Society, San Francisco Branch
- American Begonia Society, Santa Barbara Branch
- American Camellia Society
- American Gesneria Society
- American Gloxinia Society
- American Iris Society
- American Peony Society
- American Rhododendron Society
- American Rhododendron Society, Middle Atlantic Chapter
- American Rose Society
- Bel-Air Garden Club, Inc. (California)
- Bethesda Community Garden Club (Maryland)
- Birmingham Horticultural Society
- California Horticultural Society
- 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 Indiana
- Garden Club of Virginia
- Garden Library of Michigan
- Georgetown Garden Club (D. C.)
- Hemerocallis Society
- Herb Society of America
- Holly Society of America
- Houston Horticultural Society
- Hunting Creek (Alexandria, Virginia) Garden Club
- International Geranium Society
- Iowa State Horticultural Society
- 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)
- North American Lily Society
- Northern Nut Growers' Association, Inc.
- Ohio Association of Garden Clubs
- 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