

THE AMERICAN
Horticultural
MAGAZINE



AMERICAN HORTICULTURAL SOCIETY

*A union of the American Horticultural Society
and the American Horticultural Council*

1600 BLADENSBURG ROAD, NORTHEAST • WASHINGTON 2, D. C.



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The American Horticultural Magazine is the official publication of the American Horticultural Society and is issued four times a year during the quarters commencing with January, April, July and October. It is devoted to the dissemination of knowledge in the science and art of growing ornamental plants, fruits, vegetables, and related subjects.

Original papers increasing the historical, varietal, and cultural knowledges of plant materials of economic and aesthetic importance are welcomed and will be published as early as possible. The Chairman of the Editorial Committee should be consulted for manuscript specifications.

Reprints will be furnished in accordance with the following schedule of prices, plus postage, and should be ordered at the time the galley proof is returned by the author: One hundred copies—2 pp \$6.60; 4 pp \$12.10; 8 pp \$25.30; 12 pp \$36.30; Covers \$12.10.

Entered as second class matter in the post office at Baltimore, Maryland, 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. A subscription to *The American Horticultural Magazine* is included as a benefit of membership in the American Horticultural Society, Individual Membership dues being \$6.00 a year.

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JULY COVER ILLUSTRATION

[G. HAMPLER]

Lapageria rosea

The rosy red waxen bell-shaped flower discussed in the January Magazine.

GOTTSCHO-SCHLEISNER



Regale lily hybrids in the author's garden, Mount Kisco, New York

White Gleams In The Garden

HELEN M. FOX

Why a white garden? There have been some famous gardens planted entirely with white-flowered shrubs and perennials; generally, to be effective on moonlit nights. One was in Rhonda in Southern Spain. There the beams of the rose arbor were painted black and supported by columns of white marble, and over them were trained climbing white roses. Edith Wharton had a white garden in Stockbridge. Personally, I would not like a garden having only white flowers, but think white flowers from perennials, annuals, shrubs, and trees should always be present, for white provides the most striking of all accents. It makes the greens look darker and so gives depth to the picture. Green without white would be monotonous. In painting with water colors it is a custom to leave some of the white paper, for without it no matter how brilliant the reds, purples, and yellows, the result will be duller than if white had been present.

Just as green needs white to bring life to the picture so white with only green and without other colors—in a garden—would perhaps be too cool. Very pale yellow will accomplish almost the same effect as white and has the virtue of bringing together tones of red and blue magentas which usually set one's teeth on edge. Yet yellow unlike white is not composed of all colors and has not the same brilliance. Blue alone, recedes, merges into the horizon and is one reason it was chosen as the color for uniforms of French soldiers.

Many white flowers bloom at night and their whiteness attracts moths. Often night bloomers are also exceedingly fragrant and that virtue too may be to attract moths to come and fertilize them.

Seldom is the white in flowers untinted or unshaded for generally there

are colorful lines on the back, as in the perianth of the regal lily, and also red and yellow or orange of stamens as in roses all of which accentuate the whiteness of petals.

It would be tedious and exceedingly lengthy to describe all the white flowers that bloom in the garden from the first snowdrop in mid-March to the last water lily-like bloom on *Franklinia* in October. In this article only those white blooms have been mentioned which are notable because of their conspicuous beauty, and many have been left out for lack of space. Last spring when I was in the southwest France, the few trees present were either along the river banks or in small and isolated forests. The country was an undulating landscape, and the white of wild roses and fruit blossoms stood out dramatically against the green of perfectly tilled crops.

When white flowers are small they should be planted in fairly large clumps, such as the near white Confederate violets *Viola Priceana*, to edge a terrace or shrubbery. *Phlox nivalis* or *subulata alba* should be allowed to cover rocks and slopes and made to look like a snow drifts left behind as winter receded. In a neighbor's garden, but alas! not in mine, and in the shade, will be clumps of *Helleborus niger*, with its white, rose tinted cup shaped blossoms, the first of the buttercups to appear.

The first white flowers where I live are early bulbs native to the Mediterranean where they flower in January. With me *Galanthus nivalis*, snow drops, almost always bloom around March tenth. Sometimes their perianths show white under the snow. Other dwarf low bulbs will be *Muscari botryoides album* and white kinds of Scilla. The early bulbs look best, less lonely, when planted near evergreen shrubs such as pieris, leucothoe, or even yews. The broad leaved evergreens however, always look a bit rusty and weathered at this time of year.

A very early blooming shrub *Abelophyllum distichum* blossoms in early April before the leaves are out. It will



WALTER BEEBE WILDER

Exochorda racemosa and tulips

grow to three feet tall, belongs to the olive family and resembles its relative the forsythia. The foliage is lush and green all summer. With this shrub as with some of the early blooming magnolias there is always a chance that the delicate white flowers will be browned by early frost, but the branches are good for indoor forcing.

By mid-April, narcissi will be blooming and clumps of white will brighten the yellows. After the narcissi and sometimes with them come species tulips. A lovely white one is Kaufmanniana

Gaiety, having a large yellow centre inside as does Fosteriana. Hyacinths are like stiff cylinders until they have been in the garden, unhampered for several seasons, when they turn into a simpler form with smaller flowers on several stems. Later coming Mediterranean and Near Eastern bulbs represented now by garden forms, are double and single white tulips and followed by white Cottage Tulips. Presently, also in mid-April, polyanthus primulas will show their cheerful little faces. Among them are delightful white forms sometimes tinted



WALTER BEEBE WILDER

Ornithogalum umbellatum

pale green or pale yellow either with lines or a tiny wash. They last longer than most flowers in the garden and some stay in flower into June. In partial or even entire shade as is found under species roses, they provide a perfect ground cover.

By May the lily-of-the-valley will be showing its ladder of pendant bells. These have done so well for me in partial shade and acid soil that they have been divided and planted in the wild woods where the white blossoms of bloodroot and white trillium will have

been queening it among young fronds of ferns. At this time another deliciously fruity scent will be perceived. It comes from a low round headed tree with clustered white blossoms, usually coming before the leaves. The flower branches are red brown and the blossoms $\frac{3}{4}$ " across. *Prunus angustifolia*, Chickasaw Plum is its name. The flowers are followed by red or yellow fruits (which I have never seen) one-half to one inch across. The frothy white blooms on their dark branches remind me of a similar effect I saw one Easter morning when



GOTTSCHO-SCHLEISNER

Rosa omeiensis var. *pteracantha*

motoring from Como to Maggiore in northern Italy. The worshipers, on their way home from church carried sprays of Spanish broom, *Cytisus multiflorus*, feathery and snowy against the black of their dresses; the whole standing out in brilliant blue light of the spring day.

In later April or early May another member of the family, namely *Prunus glandulosa*, the dwarf flowering almond, coming from China and Japan and growing four-and-a-half feet high comes into

flower. It is a perfect accompaniment to species tulips, violets, and forget-me-nots, with its pink or white flowers. The white ones always have a touch of pink. In the variety *albiplena* the flowers look like plump little roses and have the same delicate texture of petals. The single flowered forms ripen into bright red fruits.

By mid-May and often later, dwarf iris such as *cristata alba*, *tectorum alba*, and white forms of *pumila* come into flower.



GOTTSCHO-SCHLEISNER

Allium tuberosum

Mine grow on a sunny slope, later covered with gray-green herbs. These are followed by handsome varieties of the bearded iris such as Winter Carnival and Gudrun. The light sparkles gaily on their white petals.

Meanwhile where I live, *Azalea indica alba* with large single white blooms heavy on the bushes is out in front of the border and flowering *Cornus florida* has whitened the hills all around. It is as if snow had fallen on the burgeoning

landscape. Altogether this—to me—is our handsomest tree. After the bracts fall, come the clusters of red seeds and the dogwood is the first tree to have its leaves color a glowing red. After the leaves are out will come *Cornus kousa* with pointed slightly cream colored bracts. In the autumn the seeds form pendulous scarlet balls that hang from the branches.

Under the shade of *Cornus florida* will be *Epimedium grandiflorum niveum*.



WALTER BEEBE WILDER

Philadelphus gloriosus

The graceful stalks twelve inches high have small pinnate leaves tinted red. The racemes of cream white flowers have a complicated structure.

About this time in late May or early June come two white flowered border plants. One *Iberis sempervirens* with the stiff dark green leaves and snowy white flowers in an elongated head. The plant is twelve inches high and is a little

rigid, but makes an effect something like a dwarf evergreen hedge of box. The other white flowered perennial *Veronica chamaedrys alba* is also about twelve inches high with white bloom thickly disposed in fluffy spires on stems clothed with broadly ovate, toothed leaves. The blossoms last a very short time and seed riotously among companion plants notably *Dianthus*, which likes sharp drain-

age and sunshine. After blooming, many of the dianthus form handsome mats of grey foliage, decorative all winter. Var. 'Albus' and also Her Majesty are handsome. The varieties having fringed petals are lacy looking. Every year the best looking forms are marked to make cuttings and provide new plants in due time, for they seldom flower freely until the second season.

The end of May or early June provides a handsome native, white flowered shrub *Aronia arbutifolia*, red chokeberry. It is somewhat elmshaped and grows to twelve feet high and should be cut back to prevent it from growing too spindly. The leaves are gray green and softly hairy below. The flowers come in loose corymbs of seven to fifteen. They are tiny but effective, and smell of hawthorn, only sweeter. The fruits that follow are bright red.

Late May is an exciting time for everyone, but especially for me because of the handsome species roses planted as a border on both sides of the long narrow garden. Most perennials are not out yet and the roses bloom over a ground cover of primulas and the dwarf European non-trailing strawberries. They are so lovely I always wish I could do something, anything, to prevent their passing so quickly, and can only resort to a philosophical state of mind and make myself realize their blooming time will come again "next year" as happens almost always with plants, but alas not with people. The bushes are severely trimmed in September to prevent their spreading out too far over the herbs in the beds. Some, such as Double Blanc de Coubert, do not respond well to the pruning and sometimes die. This rose is actually a double white-flowered rugosa with flowers three and a half inches across, followed by orange tomato-like fruits. It keeps on blooming into August and in autumn the foliage turns a warm yellow.

A rose with four instead of the usual five petals and having fern-like foliage is *Rosa omeiensis* var. *ptercantha*. The stems have many prickles which are translucent red when young. The old stems turn silvery as do their thorns. The bush can grow to twelve feet high, but stands cutting back in order to fit into a somewhat limited space. The flowers measure $\frac{3}{4}$ " to $1\frac{1}{4}$ " across. Some years

these roses come earlier as does everything else in the garden.

One year my *Rosa spinosissima altaica* (spinossissima being Burnet or Scotch rose but altaica coming from Mongolia) bloomed on May 23rd. It was given to me twenty years ago by J. Horace MacFarland who thought, mistakenly, it was a hybrid of spinosissima and Hugonis. The bush was moved to my new garden eleven years ago and went right on thriving unharmed. It is about six feet high and is pruned to keep it in shape. The graceful spreading branches are thickly covered with cream white flowers two inches across with petals slightly cupped. The thorns are of uneven lengths and there are eleven leaflets to the leaves which smell of resin. The fruits are black and glossy and resemble an ancient Greek amphora, a container for wine, because the base has a narrow pointed growth such as the Greeks used to push their vases in the ground to keep them upright.

Sometimes as early as mid-May along with the lilacs will come *Exochorda givaldi wilsoni*, according to Drs. Rehder and Wyman the handsomest of the exochordas. They are called "pearl bush" because their unopened buds are round, tinted cream and truly like pearls. Dr. Wyman does not think it deserving of a place, having only a limited number of shrubs, but, it makes a stunning burst of white among the lilacs. The flowers just opening form racemes of white, each bloom being two inches across and amid the foliage. The leaves are elliptical to ovate-oblong. Unfortunately their flowering is fleeting. If the branches are cut at the moment when the flowers are to open they will be decidedly handsome indoors. The bushes need to be thinned and cut back. They grow in the sun on a slope with me.

For white lilacs there might be Vestale for single and Madame Abel Chatenay for double.

A small tree is *Halesia monticola*, silver bell or Snowdrop tree of the Storax family. The flowers come after the leaves are out. First come decidedly rosy buds, then white campanulate and bell-like flowers followed by large winged seeds. It is native to the southern Appalachians and oddly enough entirely hardy here. Down the road from where I live three or four halesias seem to have seeded themselves.

Shortly after the roses or sometimes simultaneously, comes a small and leafy tree called *Styrax japonica* with thin, spreading and shredded branches. The leaves are alternate on short stalks with margins faintly notched and have an acute joint at the tip. They are about three inches long and placed along the upper side of the branches. On the underside are the white five petalled fragrant flowers. Though pendulous these show plainly through all the green. The corollas have spreading elliptical lobes and measure $\frac{5}{8}$ " to $1\frac{3}{8}$ " across. The tree was introduced in 1862 and comes from China and Japan. It grows wide and tall and is so handsome that when there was a choice of keeping either this or a magnolia, because of crowding, I sacrificed the magnolia.

By early June will come peonies. The single white ones their hearts filled with deep yellow stamens are very handsome.

After the lilac will be very white bushes of Philadelphus, the single Innocence and double Belle Etoile are choice. Where I live they have self sown on the margins and even into the woods. Then there are spiraeas and *Deutzia gracilis* which comes the end of May. Another attractive spring flowering bush is *Chaemonelles lagenaria nivalis* which is dwarf with cream colored blossoms, charming with the deep green glossy foliage. The flowering crabs, plums, and cherries have been left out of this story, as have so many other bushes and trees, but are, of course, desirable.

Now we are approaching summer and on its threshold is a little bush called *Indigofera incarnata alba* of the Pea Family. It grows about eighteen inches high and spreads from the roots so that one plant soon makes a colony. It likes shade and thrives for me between tall branches of fairly high shrubs such as species lilacs. Though it is a die back, by June, it will have formed clumps of snowy spires of papilionaceous flowers from auxiliary racemes which last in bloom fairly long. The leaves are odd pinnate.

Through much of the summer will bloom *Platycodon grandiflorum* var. *album*, a decidedly snowy white and also white forms of campanulas, white alliums, and white *Phlox suffruticosa*, a dainty white flowered *Lavandula officinalis* var. *compacta* and the white form of *Malva Alcea* which has a pale pink

pistil and dissected leaves. It is a weed here and very handsome, reaching two feet in height. True to its plebeian origin it seeds itself a little too freely. No matter what the weather, this snowy malva is in bloom and desirable except for the slight coarseness in the leaves.

Then there are the lilies. First of all *candidum*, gleaming and snowy and with its delicious fragrance and once established, entirely dependable. This blooms the end of June as does *Martagon album*. Both of them prefer a slight shade and sloping ground.

Here at High and Low the Regale and its hybrids epitomize summer. They are so white, tall and fragrant. They bloom from the end of June deep into July and half way through July will come Auratums growing in shade, and white speciosums on into September. All this time there will of course, be white annuals, keeping on until white Chrysanthemums bloom.

As to vines, white flowered clematis are mid-summer blooms, single Henryi and double Duchess of Edinburgh. In spring, *Hydrangea petiolaris* is mostly white, and mid-summer brings the Silver Lace Fleece vine, *Polygonum Auberti* which has a lot of green showing.

High among the lilies is a handsome small tree *Stewartia koreana* of the tea family, introduced into cultivation in 1917 which came to me in the time of Mr. Judd, when the Arnold Arboretum distributed their plants to gardeners they knew. I first saw it there years ago with its snowy bloom. It has upright branches with white flowers three inches across having five sepals and five petals. The margins are crinkly. The marking and mass of deep yellow-brown tipped stamens give the flower a creamy look. On the back it is satiny, tinted, slightly with green. After the flowers fall, the silky hairy seed pods with the pistil projecting, persist. It blooms for me early in July, hesitatingly, with a few flowers, only, each day scattered over the trees. They resemble single camellias. The leaves are alternate, short petioled, remotely serrated and turn orange or orange red in the autumn.

Lastly but not least, comes the famous tree *Franklinia alatamaha*. It is always annoying to me that the British call our tree named after Benjamin Franklin, *Gordonia*. They are undoubtedly cor-

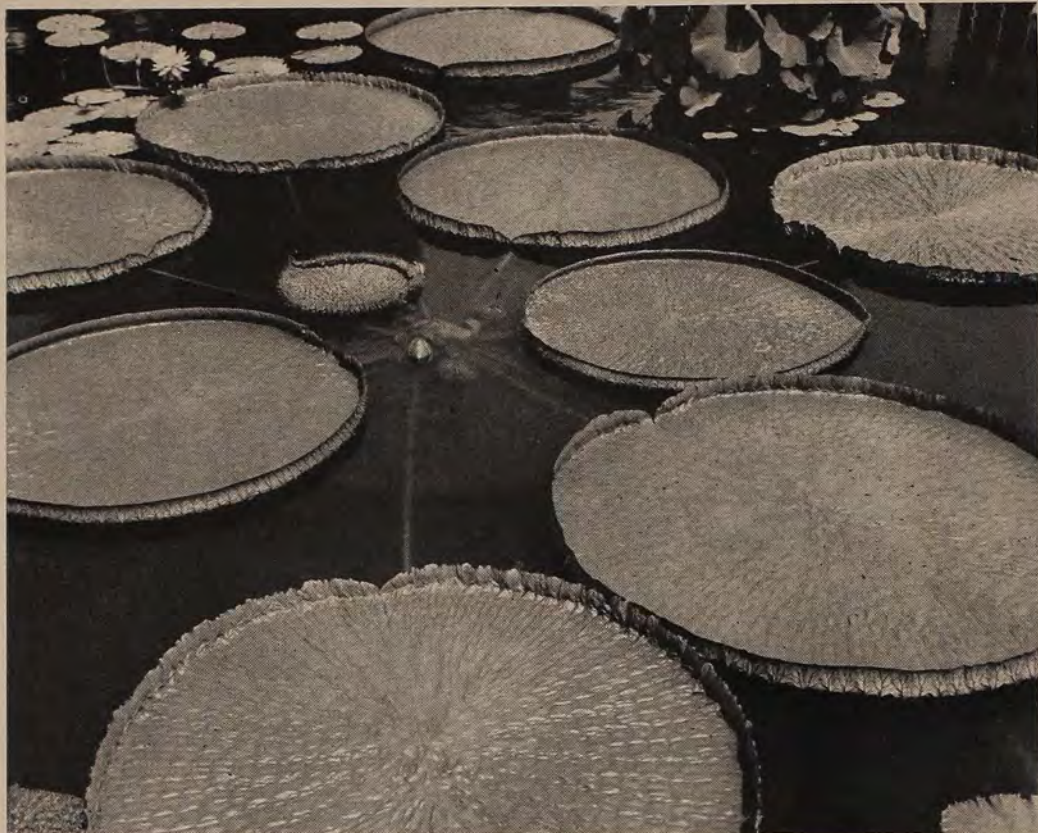


WALTER BEEBE WILDER

Campanula White Star

rect because the description labelled "Gordonia" was published before the one called Franklinia, but I am happy to note both Drs. Rehder and Wyman use "Franklinia." It is odd that this tree found only once and on the border between Georgia and Florida is entirely hardy as far north as into Zone V. It likes sun and good drainage and blooms into mid October, beginning in late September. Thus the fragrant white flowers continue along with scarlet leaves. These leaves grow in clusters, are wide about the center and terminate in a point, and

are finely serrate along the margins and five or more inches long. They are tinted brown over their green, are dull below and have a silky sheen above. The flowers two inches across, have short stalks, and are placed below the leaf clusters. They have five overlapping petals that are crinkled and cream white and rounded. The outermost petal is the smallest, bulges into a cup and is tinted green and rose. The outside of petals is silky and inside are the yellow and orange stigmas. The whole roughly resembles a water lily.



Entire plant of Victoria amazonica

Entire plant of Victoria cruziana





Growth habit of Victoria hybrid (V. cruziana × V. amazonica)

The Victoria Waterlilies

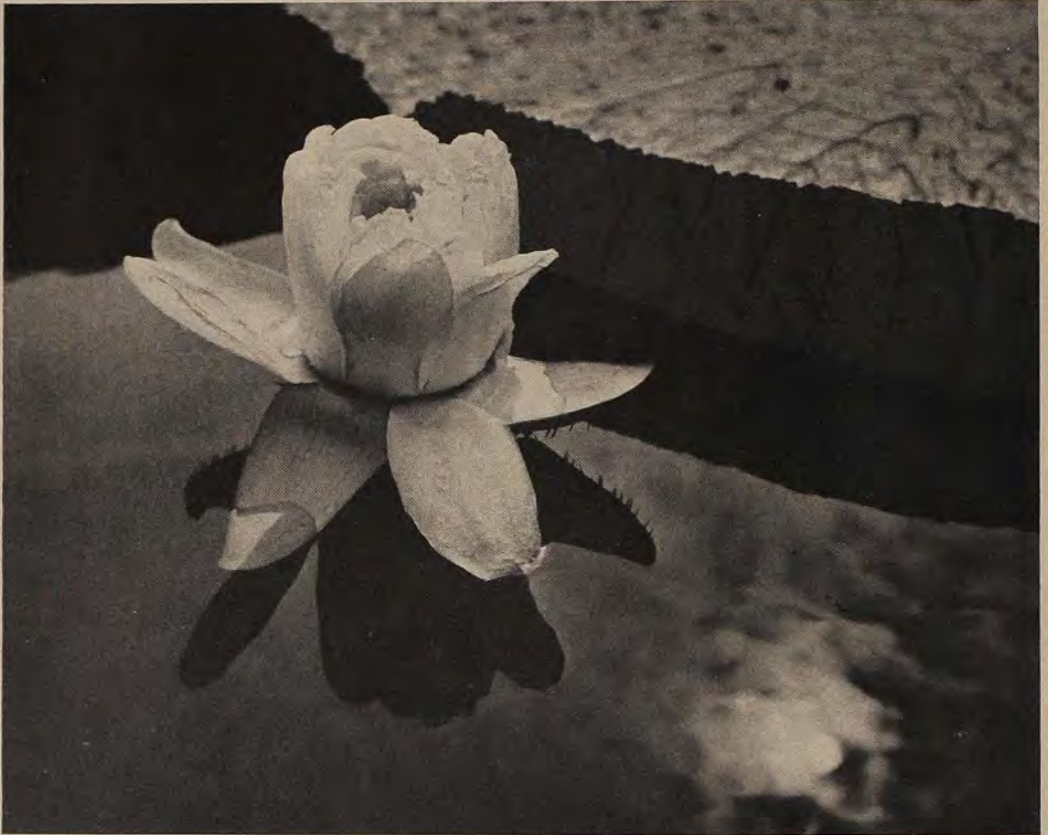
PATRICK A. NUTT*

Haenke, the European botanist, was accredited with having first discovered the Giant Water-Platter, as waterlilies of the genus *Victoria* are commonly called. He found a plant growing in the backwaters of the Mamoré River, one of the tributaries of the Amazon. This was in 1801. In 1819 Bonpland also saw this plant near Corrientes, Argentina. In 1836, Sir Robert Schomburg found it again, growing in the Berbice River in British Guiana. He sent specimens to London where Dr. Lindley established the genus *Victoria*, for the British Queen

reigning at that time, and named the species *V. regia*. It was later found that the plant was first named (in 1832) *Euryale amazonica*, by Edward F. Poeppig, a German botanist. Thus, according to the International Rules of Botanical Nomenclature, the correct name must be *Victoria amazonica*, since *amazonica* is the first specific epithet to be applied to this plant. The species found further south, in Paraguay, Bolivia, and Argentina, was named *V. cruziana* after General Santa Cruz.

Numerous unsuccessful attempts were made to introduce this plant into cultivation, but it was not until 1849 that this was finally accomplished. From seeds sent by two physicians, Dr. Rodie

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G. HAMPFLER, LONGWOOD GARDENS

First-night flower of the Victoria hybrid

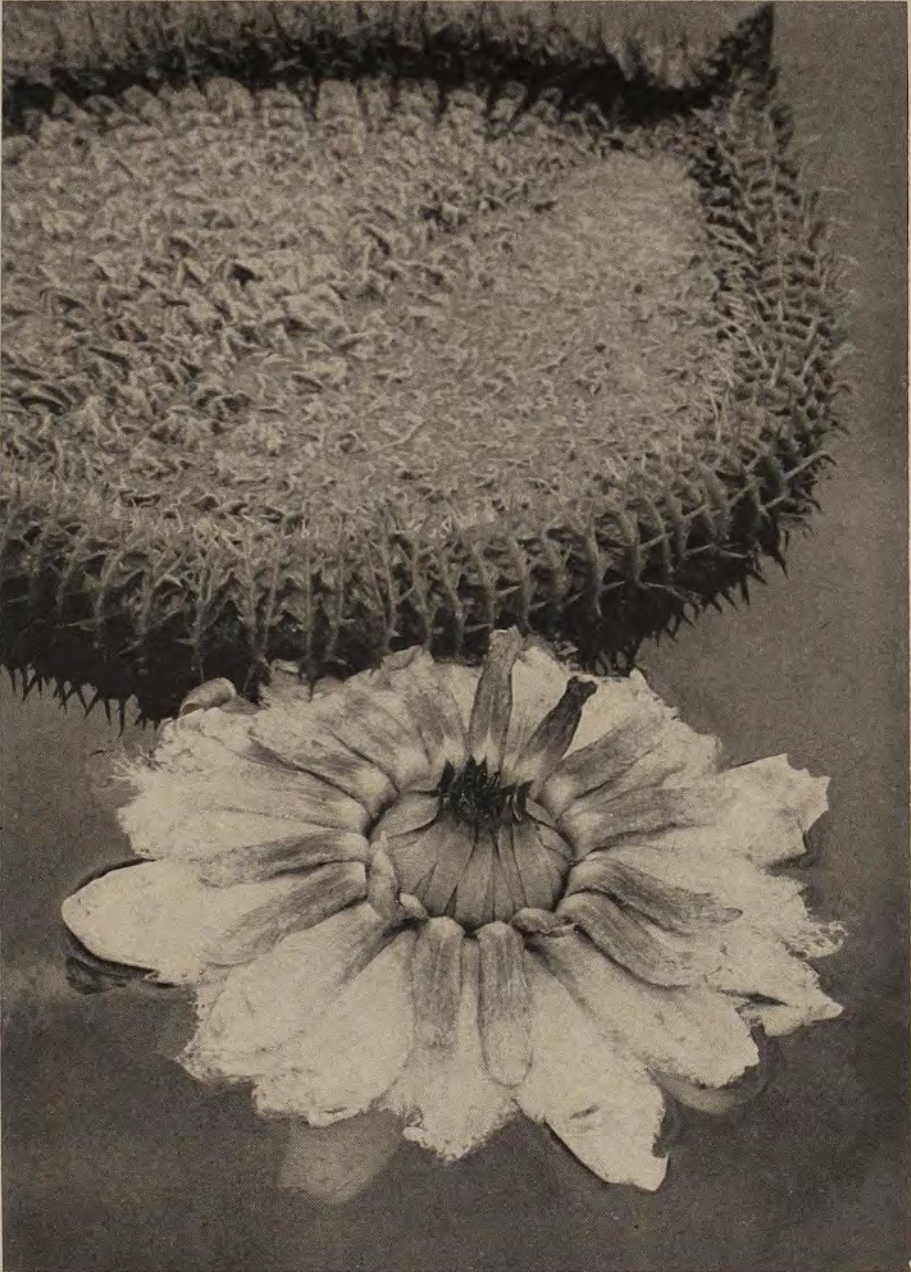
and Mr. Luckie, a plant was grown in a specially built glasshouse at Chatsworth, the estate of the Duke of Devonshire. The first flower was appropriately presented to Queen Victoria. Therefore, in 1851 the *Victoria* was introduced into the United States, Caleb Cope of Philadelphia, being the first to have a plant in his garden. In 1886 *Victoria amazonica* var. *randii* was introduced from Brazil, this variety differing in having undulate leaf margins.

The two species can be readily distinguished, even in the seedling stage. The young leaves of *V. cruziana* are orbicular, those of *V. amazonica* are slightly ovate. The undersides of *V. cruziana* leaves are of a violet blue color, those of *V. amazonica* are purplish red. The upturned leaf margins of *V. cruziana* commence to form much earlier and are higher in the mature plant. The sepals of *V. cruziana* have spines only at their bases, whereas those of *V. amazonica* bear spines to the tips. The spines of the latter are also

longer and more needle-like. The seed, too, is distinct: those of *V. cruziana* being globose with a prominent raphe, while the seed of *V. amazonica* is elliptic-globose with a rather indistinct raphe.

Victoria amazonica is the larger of the two species, but due to its hardiness *V. cruziana* is more adaptable to outdoor culture, particularly in the northern states. One well-grown plant of *V. amazonica* attained remarkable proportions last season in the Galveston, Texas, area, this despite the coolest summer for many years. The water heating system facilitates the cultivation of the more tender of the Victorias here at Longwood Gardens.

The seeds should be sown about March 1, depending upon the locality. The seeds are sown about twice their depth in shallow pans and are spaced about one inch apart. The compost consists of one part screened loam and one part sand. The pans are then submerged in the tank with the water level from two



G. HAMPLER, LONGWOOD GARDENS

Second-night flower of Victoria amazonica

to three inches above the tops of the pans. The minimum water temperature for *V. cruziana* is 75° F; *V. amazonica* requires a minimum temperature of 85° F. The tanks at Longwood are heated electrically and are thermostatically controlled.

Germination takes from three to four weeks. *V. cruziana* does not germinate uniformly, some seeds taking up to eight weeks. The light intensity is a most important factor; if dull, cloudy weather is experienced, germination will be delayed.

It has not been found necessary to file or otherwise scarify the hard seed coats, as recommended in several books. Tests have shown that this treatment actually results in poorer germination for many seeds decay. The seedlings grow quite rapidly and when they possess two floating leaves they should be potted singly into three inch pots, using a compost of three parts loam and one part sand. Before the seedlings become pot bound they should be potted on into eight inch pans, using a somewhat richer compost which includes one ounce of a 4-8-5 fertilizer for each pan. This should take care of the plants' needs until they are planted out-of-doors. A layer of moss should be placed over the drainage hole to prevent the compost from washing out, and a one-fourth inch layer of sand should be spread on top of the compost to prevent organic matter from floating in the tanks. Both species can be grown in the same tank at this time, providing that the minimum water temperature does not fall below 82° F.

The soil preparation is important, for Victorias are gross feeders and respond to generous treatment. An ideal compost for planting consists of three parts fibrous loam and one part well decayed cow manure. For best results, the mixture should be stacked several months before using to allow for mellowing. Four ounces of a 4-8-5 or similar fertilizer should be thoroughly mixed with each bushel of compost when filling the planting containers which are topped off with a two inch layer of clean sand. The containers at the Gardens hold one and a half cubic yards of compost due to the size of the pools, but satisfactory results can be obtained using smaller receptacles. One local grower grows his Victorias in a four by four foot wooden box. For pools with a natural bottom, deep spading and the addition of the manure and fertilizer will suffice.

Victorias should not be planted out-of-doors until the minimum water temperature is 75° F; for *V. amazonica* a minimum of 82° F. is necessary. If the young plants are checked at this stage they are slow to recover, so this period is somewhat critical. The depth of water should be from twelve to twenty inches above the crown of the plant. In the Philadelphia area it is usually safe to plant outside around June 7, but, of course, this depends upon the weather and varies from year to year.

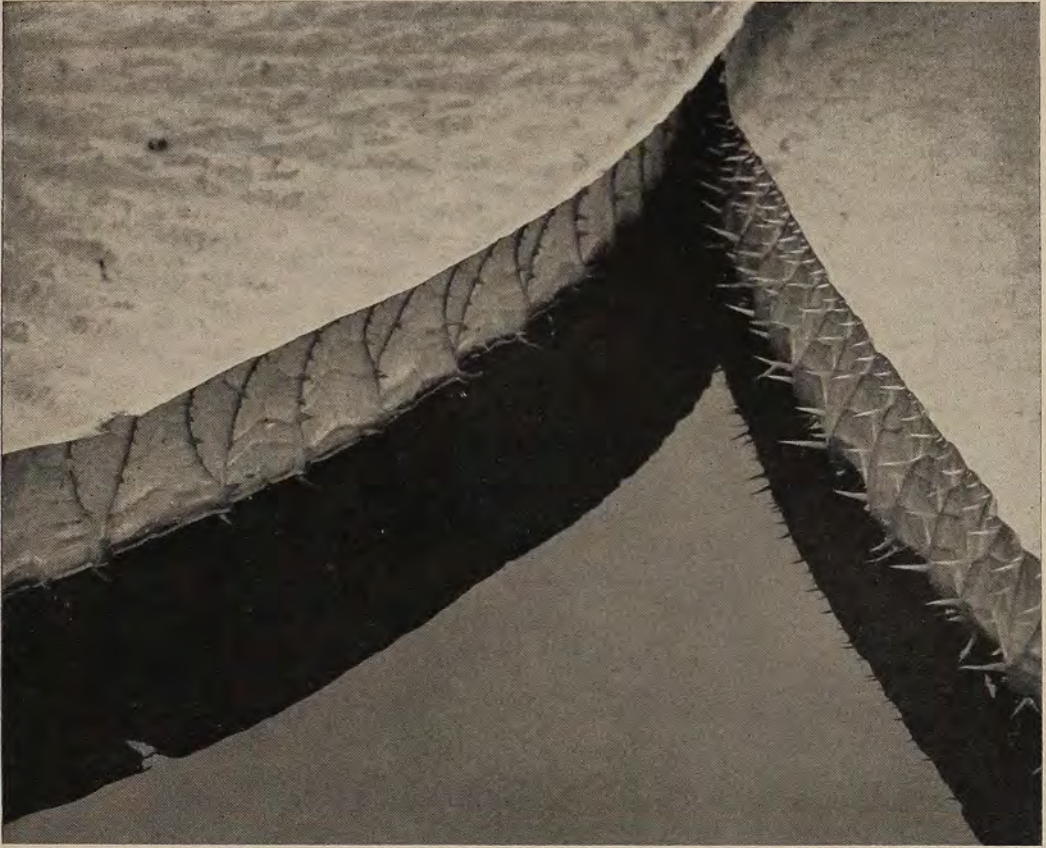
Once the young Victorias are established they grow rapidly and the leaves increase in size. In order to keep the leaves in place and to prevent damage during periods of high wind, they are best anchored. Strong wire hoops over the petioles have proven suitable for this purpose. A well-developed plant will support from eight to ten leaves.

Both species commence to flower around the beginning of August. The flower opens at dusk for two successive nights. On the first night it is pure white and very fragrant; on the second night the pinkish red innermost petals appear. During the cooler weather in late September it is possible for the flowers to open on three nights. A well-grown plant should produce around thirty-five flowers in a season.

The older, yellowing leaves should be removed periodically to make room for the new leaves which are constantly being produced. If crowding occurs, malformation and increased wind damage result. Strong gloves should be worn as both the petioles and the undersides of the leaves are covered with very sharp spines.

During August and September supplemental feeding of the Victorias can be carried out to keep the plants growing as rapidly as possible. Fertilizer can be placed in a cheesecloth bag and pushed down into the soil, three feet or so from the center of the plant, twelve ounces being given to each plant in three separate "vitamin pills" every ten days. One of the readily soluble 20-20-20 fertilizers has proven most satisfactory at Longwood Gardens.

Victorias will set seed, especially if more than one plant is growing in the pool. To guarantee seed for the following year, hand pollination can be carried out. Victorias are protogynous so the pollen should be obtained from a flower during its second night and lightly distributed over the stigmatic surface of a first-night flower using a small camel's hair brush. If fertilization has taken place, the seed pod will commence to swell rapidly within ten to fourteen days. The pod should be covered with a cheesecloth bag. Only the very earliest pods dehisce in the pools in this area so, before sharp frosts occur, the seed pods should be removed from the decaying peduncles and placed in containers of water. When the pods dehisce the seeds will float for several days as they are



G. HAMPFLER, LONGWOOD GARDENS

Upturned leaf margins—Victoria cruziana (left) and V. amazonica (right)

covered with a gelatinous aril. The water should be changed frequently to eliminate all products of the putrifaction of the arils.

The ripening period for *Victoria* seed is most important since seed will not germinate unless fully ripened. The results of experiments at the Missouri Botanical Garden have shown that the ripening period can be reduced and better germination obtained by separating the seed from the pulp and storing them in containers of moist sand kept at 60° F. for eight weeks. For *V. amazonica*, 70° F. has been found more satisfactory. When the seeds are removed from the pans, the seed coats will have attained a dark brownish black color, usually associated with full ripeness. Care should be taken to prevent mice from gaining access to seeds for they will soon consume the farinaceous seeds. After ripening seeds can be cleaned and refrigerated in jars of water at 44° F. until sowing time.

Victorias unfortunately suffer from the depredations of several insect pests, but if control measures are taken early, no serious damage should result.

The larvae of midges (*Chironomus* sp.) can be quite troublesome in the early part of the season. These small, translucent larvae feed on the undersides of the leaves, commencing at the margins and working inwards. The only insecticide found effective is Systox. Last summer very encouraging results were obtained from a much safer Methylcarbamate systemic material which should be available before long. Japanese beetles will feed upon the upturned leaf margins and flower buds. Sevin has proved most effective against this pest. This last named insecticide will also control the leaf beetles which are active in numerous States. The water-lily aphid (*Rhopalosiphium nymphaea*) can be a persistent pest. Malathion at half the recommended strength will take care of them,

several sprayings being necessary as the life cycle is very short. During the last three years larvae of the Noctuid Moth have been appearing during the latter part of the season. These yellow-and-black-striped caterpillars have voracious appetites and can soon disfigure the leaves. Malathion at half strength is very effective, especially if applied soon after the eggs hatch. This will also control the larvae of the Delta Moth (*Hydrocampa proprialis*) which cut triangular portions of the leaves, fasten themselves to a couple of pieces with a web, and float around the pool.

All spraying should be carried out during the evening as all these insecticides will cause leaf scorch if applied in strong sunlight. All of these materials have proven safe for fish in the pools if used judiciously. Copper sulphate, Phygon, Permanganate of Potash and several other algae controls should never be used in pools containing Victorias, for severe damage may result.

Victoria Longwood Hybrid (*V. cruziana* × *V. amazonica*)

In 1961 a hybrid Victoria was raised at Longwood Gardens. Reciprocal pollinations had been carried out the previous summer and seed was obtained from both crosses, but only one lot germinated—those from *V. Cruziana* as the pistillate parent. The one plant of this hybrid planted in the pools exhibited a marked degree of hybrid vigor. Once established, it grew at a prodigious rate and soon surpassed the two parent

species growing in the same pool. The largest leaf measured was 79 inches in diameter as compared with 68 inches for *V. amazonica* and 60 inches for *V. cruziana*. The largest leaf on record for an outdoor grown plant in the United States appears to be 90 inches. This plant, *V. amazonica*, was grown at the Bartholdi Basin Garden in Washington, D. C., in 1891.

The hybrid differed from its pistillate parent in having much darker green leaves and sepals with spines to their tips. The upturned leaf margins were higher than those of its staminate parent, but the leaf color, size and type of spines were very similar. This hybrid plant produced more and larger flowers than either parent type. It proved just as hardy as *V. cruziana* and stood up well to adverse weather, far surpassing its more tender parent species.

Description

Leaves 5 to 6 feet in diameter; *upper sides* RHS Spinach Green 960/1 with conspicuous, crimson veins which fade with age; *under sides of leaves* RHS Aconite Purple 937/1, spiny; *upturned margins* 4 to 5 inches high, RHS Dahlia Purple 931/1 beneath.

Flowers 12 to 15 inches in diameter, white first night, innermost petals turning to RHS Indian Lake 826/1-826/3 on second night; *sepals* prickly or nearly so the tips with needle-like spines about 1/4 inch long; *ovaries* with spines 5/8 inch long; *seed* nearly globose, 1/3 inch long with prominent raphe.

Ornamental Deciduous Flowering Viburnums

DONALD R. EGOLF*

Few of the major ornamental genera of plants provide such a diverse array of select ornamentals as does the genus *Viburnum*. Plants of this versatile group of shrubs have interesting flowers in the spring; most have textured ornamental foliage; some have foliage that colors brilliantly in the autumn; others have neutral autumn coloration, or are evergreen; many have colorful fruits in the late summer or fall, and those on some persist into the winter; and representatives have growth habit forms suitable for distinct landscape effects. The ornamental characteristics of viburnums are evident throughout the year. Probably less than two dozen of the numerable species are extensively grown by nurserymen and utilized by landscape architects. Gardeners from different geographical areas may be familiar with such forms as the old-fashioned snowball, or guelder rose, the black-haw, the pembina of the mid-west, the crampbark of the south, and probably the much publicized Koreanspice *Viburnum*, or its hybrids. The merits of the frequently cultivated, as well as the less common ornamental viburnums, will be emphasized in several articles—Ornamental Deciduous Flowering Viburnums, being discussed in this issue. Ornamental Fruiting and Autumn Foliage Viburnums, Evergreen Viburnums, and a Checklist of *Viburnum* Cultivars, will be published in future issues of the magazine.

Botanical Discussion

The genus *Viburnum* belongs to the family CAPRIFOLIACEAE, which includes, among other genera: *Lonicera*, *Sambucus*, *Weigela*, *Kolkwitzia*, *Abelia*, and *Symphoricarpos*. The flower arrangement of viburnums most closely resembles that of *Sambucus*, but is dissimilar in leaf, stem, and fruit. Botanically the viburnums are deciduous or evergreen, with naked or scaly buds, simple and oppo-

sitely arranged leaves. The white, pale pink, or more commonly creamy white flowers are usually very small, borne in terminal, flat, rounded or pyramidal clusters. Although the five-parted flowers are individually small, they become conspicuous when borne many together in a cluster—cyme, corymb, or panicle. Some species have two types of flowers: comparatively inconspicuous, fertile flowers and larger, more conspicuous, sterile flowers. The fruit is a fleshy one-seeded drupe that varies in diameter from $\frac{3}{8}$ to $\frac{3}{4}$ inch and is red, yellow, blue, or black. The species range from low procumbent shrubs, medium shrub of four to five feet, to a small single- or multiple-stemmed tree of thirty feet.

The viburnums, originating as they do in so many parts of the world, are restricted principally to the northern temperate zone, embracing the whole of North America from Alaska to the tropics, northern South America, Europe, North Africa, rather sparsely in western Asia but becoming abundant in eastern Asia; China, Korea, and Japan. The 227 known species are distributed as follows: North America 19, Mexico 21, Central America 24, South America 33, Europe and North Africa 5, and Asia 125. Additional plant exploration and detailed botanical study of the more remote geographical areas will undoubtedly uncover additional species and will alter our knowledge of the known distribution pattern. The Central American and eastern Asia zones appear to be the two centers of diversity of the genus. Gardeners are indebted to the endeavors of such great botanists and collectors as Robert Fortune, Armand David, Augustine Henry, Ernest H. Wilson, Charles S. Sargent, George Forrest, Reginald Farrer, Joseph J. Rock, and Frank Kingdom-Ward for the collection and introduction of the Asiatic species, which constitute the majority of the species extensively cultivated. Although eastern and central Asia have contributed many

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***Viburnum* species are widely distributed in both the eastern and western hemispheres with Asia and Central America being the areas of greatest diversity**

of the best ornamental forms to be found in the private gardens and parks, the handsome natives of the United States possess exceptional growth habit, foliage, flower, and fruit which are always dependable, and do well under adverse growing conditions. Only a few of the Central and South American species have ever been introduced and are now unknown in cultivation. Whenever conditions permit further plant exploration additional species and superior forms of the species now cultivated can be found in the native habitat and await introduction.

Although the viburnums originate in a wide range of ecological conditions, they cannot all be expected to thrive and be hardy throughout the United States. Many of the species from northern Asia, or those from high elevation in the Himalayas, have proved hardy in northern United States but other species from subtropical or tropical zones may only be hardy in the mildest regions of the United States.

The diploid (2n) chromosome numbers range from 16 to 72, which comprise a polyploid series with the basic numbers (n) of 8 and 9. The chromosome counts have been reported for seventy-seven species, sixty-one varieties

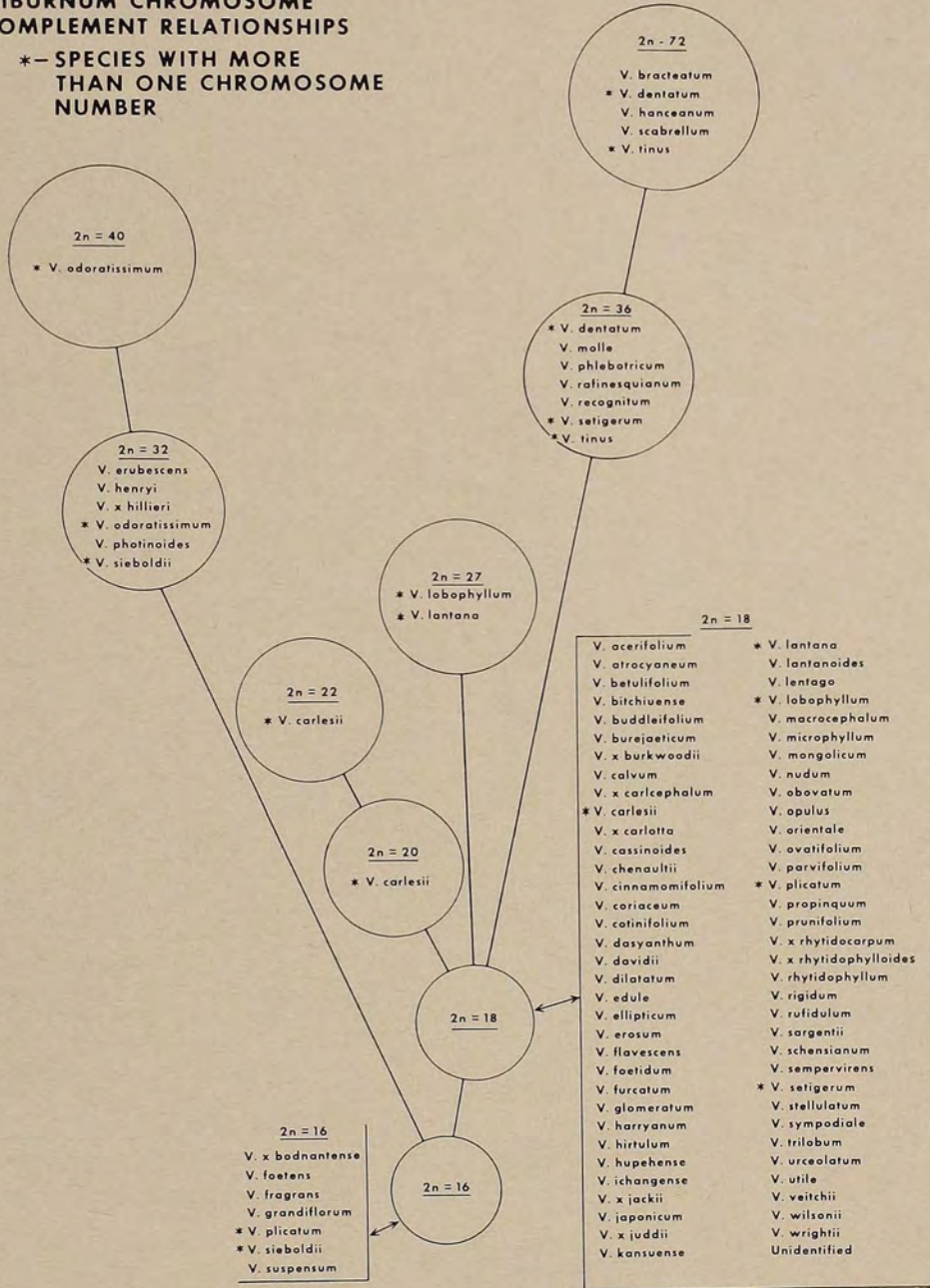
and forms, and thirteen hybrids, presently species from Europe, Asia Minor, and the United States, but none from Mexico, Central America, or South America. The greatest number of species studied, including those native to the United States, were found to belong to the basic number 9 with a diploid number of 18 or multiples thereof, and are distributed over a wide geographic area. The species with a basic number of 8 and a diploid number of 16, or higher polyploids, are restricted to Asia and are characterized by having a panicle inflorescence like that found in *V. fragrans* and *V. sieboldii*. The diploid species are distributed as follows: fifty species from Asia Minor, four from Europe, and twelve from North America. The polyploids are distributed as follows: eight from Asia Minor, one from Europe, and six from North America.

Landscape Adaptability

The gardener and landscape architect may choose from an array of growth forms, such as the picturesque, gnarled branches and trunk of *V. sieboldii*, the architecturally horizontal tier branches of *V. plicatum* f. *tomentosum* and *V. prunifolium*; the globose, compact

**VIBURNUM CHROMOSOME
COMPLEMENT RELATIONSHIPS**

*— SPECIES WITH MORE
THAN ONE CHROMOSOME
NUMBER



DONALD R. EGOLF

*The diploid (2n) chromosome counts arranged
in a schematic phylogenetic tree*

(Reprinted from Journal Arnold Arboretum)



DONALD R. EGOLF

The panicles of fragrant, pink flowers of Viburnum fragrans, the Fragrant Viburnum, borne on spur growth

shrubs of *V. carlesii* and *V. dilatatum* or the dwarf cushion forms of *V. opulus* var. *nanum* and *V. fragrans* var. *nanum*. Viburnums have many characteristics which make them adaptable for use as specimens, as trimmed or informal hedges, for mass plantings, or as small trees with single or multiple stems. Along roadsides, streams, and woodlands the native species are particularly appro-

priate to provide a transition planting between garden, meadow, and forest. Whether it be the twenty-foot *V. lentago* for a background screen, the medium-height *V. fragrans* in the shrub border, the evergreen *V. rhytidophyllum* for foliage accent, the fine-textured *V. × chenaultii* for softening the harsh foundation lines of buildings, or the fall and winter fruit display of *V. trilobum* to

accentuate the winter landscape, the plasticity of form combined with flower, fruit, and foliage characteristics exemplifies the significance of viburnums for the gardener, the landscape architect, and the nurseryman.

The odor of the mature foliage of some viburnums in late summer and after the leaves have fallen in the autumn is noticeably objectionable to some, but apparently many cannot perceive this particular scent. When the leaves are crushed, or when fruit or leaves are decaying, the odor is most prevalent. Normally the pungent odor is not observed, but on rainy or humid days it can become obnoxious. The reasons for the greater prevalence on rainy days is probably increased decomposition and less air circulation. The odor is chiefly noticeable on such forms as *V. sieboldii*, *V. rufidulum*, *V. cassinoides*, *V. dentatum*, and *V. lantana*. The odor is seldom detectable for more than a few days of the year, however, and is little reason to relegate choice ornamentals to the discard list. If the odor is offensive these plants should be avoided near residences and used in borders and naturalized areas where there is free air circulation.

Deciduous Species and Varieties

A distinctive species group of the Himalayas, and one species from Japan, have panicles comprised of salverform (tubular) flowers with rotate-campanulate, reflexed-corolla lobes. A number of flowers, $\frac{3}{8}$ to $\frac{1}{2}$ an inch long, clustered in a compact or loose terminal panicle, become ornamental. Except *V. sieboldii*, the fruit is insignificant and the ornamental value depends on flower, foliage, and growth habit.

Viburnum fragrans (5b)**, the Fragrant Viburnum, was introduced from Kansu, China by Reginald Farrer in 1914. Farrer's details in his *On the Eaves of the World*, relates his first encounter with this species:

"The next stage, of April 16, is an important date in botanical history, as marking the first discovery of *Viburnum fragrans* as a wild plant. The weather was dark and dull. We wound along a dull ascent between approaching mountains. Only

the increasing ruggedness of the valleys cheered me, and the beauty of the wild plums and apricots in shades of white and pink making nebulous blurs of colour on the serene hillsides. Shallow scrub and coppice descended here to the track-side and here we came on the Viburnum, at first isolated and suspicious, but soon in such quantity and such situations that one could no longer doubt that here this most glorious of flowering shrubs is genuinely indigenous. Its place of origin had long been in doubt, though all over North China it is probably the best-loved and most universal of garden plants; so that there was real satisfaction in thus having traced it to its home, in the wild hills immediately to the south of Shihor and probably elsewhere in this narrow belt, though after this day we never set eyes on it again in nature. In gardens, indeed, it accompanied us wherever we went, and my last dim fear that it might be tender, or at all events require drastic summer ripening, were finally dissipated when in my second season I saw it in full glory at the very feet of the Da Tung Alps, in the cottage gardens of Weston-of-the-Pass, so high and cold a situation of that cold bleak region that even corn will not ripen here, except, perhaps, in one season out of three. In cultivation I dare to foretell it will give no trouble, then, either as to aspect or treatment in any nutritious loam. May it soon yield us the secular glory of the superb bushes that it makes in the yards of the Prince of Jo-ni or the great Green Temple at Lanchow—gracious arching masses, ten feet high and more across, whose naked boughs in spring before the foliage become one blaze of soft pink lilac-spikelets, breathing an intense fragrance of heliotrope. The white form, indeed, is pure and lovely as the best of forced white lilac, but my own heart goes out yet more specially perhaps to the commoner pink type, whose blushing stars glisten as if built of crystals, after the pleasant fashion of so many spring flowers, which is shared only, among summer ones, by the gross fleshiness of Begonias. Nor, when the flowers are gone and the delicate foliage developed, is the work of Viburnum finished. For now appear the glowing glossy scarlet fruits, hanging all over the bush in pendent clusters of jewel-work; these you eat with avidity and good result, so long as you remember to throw away the unwholesome kernel."

Often the plant produces abundant underground sucker shoots which develop into a clump with many stems. The forcing of the blush pink, sweetly scented flowers after a few mild days in late February or March enlightens the gloom of winter and indicates the approach of spring. In mild climates the flower buds, which were initiated the previous July or August, continue development without any bud dormancy and flower in the autumn and intermittently during the winter. The pink flower panicles appear as pendulous bells, $1\frac{1}{2}$ to 2 inches long, suspended from dormant spur tips before the leaves have developed. Although the flower display cannot equal that of the later flowering viburnums, it is a cherished plant for the home garden because with good

**The numbers in parentheses after the species in the text refer to the hardiness zone according to the *Plant Hardiness Zone Map*, U.S. Dept. Agr. Misc. Publ. 814 (See *The Amer. Hort. Mag.*, Oct. 1960) The suffix b with the hardiness zone indicates that the plant is hardy only in the warmer parts of the zone.

weather, the flowers appear before *Forsythia*, *Cornus mas*, and other early flowering shrubs. The obovate to oval leaves, 2 to 3 inches long, are nearly glabrous and strongly toothed, and usually have a bronze coloring during the summer, and assume a dull maroon in the autumn. In early summer the fruits are brilliantly colored when maturing from red to black, but are not spectacularly ornamental as they are sparsely produced among the dense foliage and are soon eaten by birds. According to Farrer the fruits are eaten in China; this appears to be an exaggeration, however, since the 1/2-inch long fruit consists of a large stone surrounded by little fleshy exocarp and not very palatable.

The cultivars referred to as 'Roseum' and 'Bowles' are select pink flowered forms. Variety *album* (5b) has slightly larger, pure white flowers that are more susceptible to winter injury. The foliage of this variety lacks the bronze summer coloration and is a medium yellowish green. A white flowered plant among several pink flowered plants provides a fine accent, as well as extends the ornamental attractiveness of a mass planting since variety *album* tends to flower a few days earlier than the species. The low-growing variety *nanum* (5b), a dwarf seedling selection, seldom exceeds 2 feet in height and is a choice foreground or hedge plant.

Almost invariably the *V. fragrans* flower clusters will be damaged by a freeze and the early blooms obliterated. Many seasons a flower display can be assured on plants in a sheltered, sunny location in central New York, but after a severe winter few or no flowers open in the spring. South of Philadelphia the plant is a noteworthy addition to the winter garden. Young plants are often sparse flowering, but with maturity the abundant spur growth will produce a profusion of bloom. The comment is frequently made that the plant is difficult to transplant. From experience the difficult-to-transplant argument cannot be substantiated as mature specimens have a fibrous root system that holds a compact ball and encourages quick re-establishment after transplantation. *V. fragrans* is one of the most neglected viburnums and one that warrants more extensive cultivation. Because the cultivated species includes many variable forms, care needs to be exercised to select

the compact, abundant flower forms for propagation.

Another Himalayan species, *Viburnum grandiflorum* (6), was raised in England from seed collected in 1914 by R. E. Cooper in the conifer and rhododendron forests of Bhutan at an elevation above 11,000 feet. It grows in the Himalayas at elevations of 6,000 to 12,000 feet. In cultivation this rather stiff upright large shrub seldom attains a height and breadth that exceeds 10 feet. An exceptionally fine specimen that is nearer to 15 feet in height and breadth will occasionally be seen. It is cultivated in many English gardens, but is seldom grown in the United States.

As the *V. grandiflorum* flower and leaf buds expand the silvery downy bud scales become conspicuous but are soon suppressed by the emergence of the satiny red flower buds. In mid-March and early April the flowers are contracted into a cluster on the tips of leafless terminal spur growths. The flowers are usually less freely borne and endure less frost than those of *V. fragrans*. The pendulous trumpet flowers range in color from pale pink to deep rose, but many inferior types frequently are cultivated. An exceptionally fine dark flowered, compact form was raised from Cooper's seed at the Edinburgh Botanic Garden. Young plants which tend to be leggy will benefit by pinching the tips to induce branching and spur growth. The firm, deeply veined leaves, 3 to 4 inches long, are dull green with abundant silvery tomentum when immature.

The hybridization of *V. fragrans* and *V. grandiflorum* by Charles Lamont in 1933 at the Edinburgh Botanic Garden and by Charles Puddle in 1934 at Bodnant Gardens, Tal-y-Cafn, North Wales, produced *V. × bodnantense* (5b). The flowers of this 10-foot hybrid comprise a loose cluster, deep rose in bud but later almost white. This hybrid blooms from November onward in mild climates, but in more northern areas flowers in March or April. The hybrid is hardier than *V. grandiflorum*, but cannot be safely recommended north of Zone 5b. The growth habit, leaf, and flower are intermediate between those characteristics of the parents.

A seedling from Bodnant Gardens, which had *V. fragrans* as the female parent, was given the Award of Merit, 1947, and the Award of Garden Merit, 1960,

by the Royal Horticultural Society, and has been christened with the cultivar name 'Dawn' (5b). The plants raised by Lamont had as the female parent *V. grandiflorum*, or the reciprocal of the cross made by Puddle. Since Lamont considered none of the seedlings superior to the parents, they were never introduced; however, one of the seedlings has larger flowers and larger flower trusses that display many of maternal characteristics of *V. grandiflorum*. The introduction in the not too distant future of the select cultivar 'Charles Lamont' will enhance the beauty of many gardens. A chance seedling, cultivar 'Deben,' has been introduced by R. C. Notcutt, Ltd., Woodbridge, England. The cultivar 'Deben' was first exhibited at a Royal Horticultural Society show in 1959.

From the Himalayas and Central China, *Viburnum erubescens* (6), a shrub, or small tree, 15 feet tall, was introduced in 1910. The fragrant white to pinkish flowers borne in 3 to 4 inch pendulous panicles open in early June. The elliptic or ovate to oblong leaves, 3 to 4 inches long, have crimson petioles and veins that contrast sharply with the glabrous green leaves. The fruit matures from green to red and finally black before it is eaten by birds. *V. erubescens* var. *gracilipes* (6) has a more pendulous inflorescence. The species is often seriously damaged by winter freezing. In the areas where it can be grown, it is an attractive border background shrub that yields a pleasing floral display in early summer.

The name of *Viburnum foetens* (7) is derived from the odor of the crushed or decaying leaves. It is native to Kashmir and the Himalayas and thrives there at an altitude in excess of 7000 feet. Although the plant comes from a relatively high elevation in the rugged Himalayas, it is not suitable for cultivation in the north. The 5-foot shrub will survive in zones colder than Zone 7, but the sweetly scented, white waxy flowers in rather lax panicles will be frozen as they open during early and late winter. Normally this is a January to March winter-flowering species that adds interest to a sheltered garden corner. The 2-inch long flower clusters are not produced in sufficient numbers to provide a mass display and could hardly be rated a first class ornamental.

In select English gardens a plant mas-

querades under the name *V. foetens* 'Korean Form'. The particular plant was supposedly raised from seeds collected in Korea about 1934. The individual flowers and trusses are larger and pinker than the commonly known Himalayan form. The original plant now in the Edinburgh Botanic Garden is 12 feet or more in height and in growth habit more closely resembles *V. grandiflorum* than *V. foetens*. The leaves are heavier textured and larger than *V. foetens*. Until the plant 'Korean Form' has been critically studied, the plant cannot be properly designated, but from all indications the plant is a distinct form, and it is a first rate ornamental for any collector's garden.

Viburnum sieboldii (5), the Siebold Viburnum, was named after Philipp F. von Siebold, collector and naturalist. It was introduced from Japan by the Arnold Arboretum in 1880. A specimen with multiple stems or trained to a single trunk contributes a picturesque ornamental for the garden that may grow to a 30-foot tree, but more often is grown as a 15 to 18-foot large shrub. The numerous creamy white flowers on terminal panicles, 3 to 6 inches long, envelop the open branch framework in mid-May at the time the leaves are unfolding. The small individual flowers have corollas that are rotate-campanulate to salverform and less showy than those of the other paniculate-flowered species. By the time the few days' floral display has withered, the dark glossy green, elliptic to oblong-obovate, deeply rugose leaves, 6 inches long, give the plant distinctive character. The open branching habit and the large rugose leaves create a shadowy-textured pattern that is spectacular throughout the season. The maturing red fruits on red pedicels are displayed above the foliage to advantage until the ripe black fruits are devoured by birds; however, the red pedicels remain for several weeks to prolong the contrast with the dark green leaves. The autumn foliage assumes a purplish hue.

Because the Siebold Viburnum is a large shrub of vigorous habit, it is adaptable for large estates or public parks, but is hardly fitting in the small home garden. The foliage may have an objectionable odor when crushed or for a few days after falling from the plant in the autumn. If the plants are located in the open with free air circulation, the pun-



J. P. ROCHE

The picturesque Viburnum sieboldii, the Siebold Viburnum, is covered with 3-to-6-inch inflorescences of fertile flowers in late May

gent odor may go undetected during the few days of the year it might be noticeable. In addition to being attractive when in flower, foliage, and fruit during the summer, it has distinctive gnarled framework during the dormant season. When space permits the planting of a

large specimen, this species is always an excellent choice.

A number of the plants of the lantana type have tubular (salverform) fragrant flowers similar to those of *V. fragrans*. Rather than being arranged in panicles, the flowers are borne in flat, disk-like

cymes, 2 inches or more in diameter. The ovate leaves of the lantana type species are often densely pubescent. The naked flower buds are initiated in late summer, remaining as miniature dormant flower trusses during the winter and expanding to full bloom as the leaves begin to develop in the spring.

Viburnum carlesii (5b), the Fragrant or Koreanspice Viburnum, is probably the most popular medium sized garden viburnum. The Koreanspice Viburnum was found in Korea by William R. Carles in 1885. According to E. H. Wilson it is a maritime Korean plant found on Dagelet Island, Kanghwa Island, and some small neighboring islands of western Korea. The firm of L. Boehmer and Co., Yokohama, Japan, obtained seed from Korea in 1885 and forwarded a plant to Kew Gardens in 1902. In the ensuing years, however, *V. bitchiuense* was identified as the same species and was substituted for *V. carlesii* plants exported from Japan to England. Because of this improper identification, *V. carlesii* and *V. bitchiuense* are confused by many nurserymen and horticulturists.

The waxen pink to rose flower buds on a 5-foot plant open in late April or early May into well formed pale pink, tubular flowers, $\frac{1}{2}$ inch long, but soon fade to white. The terminal cymose inflorescence, 2 to 3 inches in diameter, has a delightful clove like fragrance. The broadly obovate leaves, 2 to 3 inches long, are irregularly toothed, dull green above and grayish beneath, with tomentum. The jet black fruit is inconspicuously hidden by the foliage. The autumn foliage becomes a reddish purple that is ornamental, but not outstandingly so. It is a select plant for foundation planting, or for locations near walks or passageways, where the fragrant flower aroma will be fully appreciated. As the plant is frequently propagated by grafting it is subject to understock suckering and graft blight. A recently introduced dwarf form 'Compacta' (5b), should prove adaptable to the modern small landscape garden.

From the western Japanese province of Bitchiu came *Viburnum bitchiuense* (6), the Bitchiu, or Yeddo, Viburnum. A mature 10-foot specimen will be more open than *V. carlesii* and may have even greater breadth. The smaller, more slender branches tend to produce a more open and straggling shrub. The cluster of sweetly fragrant, flesh pink to white,

tubular flowers of early May are much less compact than on *V. carlesii*. In the autumn the bluish green leaves turn dull red. The Bitchiu Viburnum is often considered a poor form and inferior plant of the Koreanspice Viburnum, but the select forms can be recommended as replacements for it and merit extensive cultivation. The fine pink flowered *V. bitchiuense* selection can rival any *V. carlesii* in flower.

In 1920 William H. Judd, propagator at the Arnold Arboretum, raised *Viburnum* \times *juddii* (6), (*V. carlesii* \times *V. bitchiuense*) the Judd Viburnum, from seed collected from *V. carlesii*. The hybrid has better foliage and is more bushy and spreading than *V. carlesii*. The individual flowers are pink in bud but soon fade to white upon opening. It is intermediate between the parents in flower, foliage, and growth habit. The hybrid is a superior plant that should be more often substituted for *V. carlesii*.

Two seedlings, *Viburnum* \times *burkwoodii* (5b), the Burkwood Viburnum, and *V. \times burkwoodii* 'Park Farm Hybrid' (5b) were raised from the cross *V. carlesii* \times *V. utile* by Albert Burkwood and Geoffrey Skipwith in 1914. The hybrid was introduced in 1924. *V. \times burkwoodii* will develop a 6 to 8-foot plant while the cultivar 'Park Farm Hybrid' will grow 4 feet high and is as much as 7 feet in breadth. The glossy, semi-persistent, rich dark green foliage characteristics are inherited from the evergreen *V. utile*. In temperate climates the foliage is often evergreen. The older leaves become orange or crimson before being defoliated. The fragrant white flowers, which open in early May, differ little in form from those of *V. carlesii*. The flower truss of the cultivar 'Park Farm Hybrid' is slightly larger than that of *V. \times burkwoodii*. In France another plant was produced from the same cross, *V. \times chenaultii* (5), which is much like *V. \times burkwoodii* but has finer textured leaves and a more compact growth habit.

Viburnum \times 'Carlotta', *V. \times* 'Anne Russell', and *V. \times* 'Fulbrook' are seedlings of *V. \times burkwoodii* that have minor distinctive characteristics but probably are not significantly different from the parents. The seedling 'Carlotta' introduced by W. B. Clarke and Co., San Jose, California, is described as an improved *V. carlesii*; the cultivar, however, is no longer propagated by that nursery. 'Anne Russell' was a seedling



J. P. ROCHE

***Viburnum carlesii*, the Koreanspice Viburnum, produces pale-pink, fragrant, arbutus-like flowers in late April**

selected from a cross of *V. × burkwoodii* and *V. carlesii* made in 1951 at L. R. Russell, Ltd., Windlesham, Surrey, England. The growth of this cultivar is upright and the flowers open several weeks before those of 'Fulbrook'; the latter was selected from the cross be-

tween *V. × burkwoodii* and *V. carlesii* in the gardens of Fulbrook House, Elstead, Surrey, England. The flower trusses are slightly larger and less compact and appear a few weeks later than those of 'Anne Russell'. Both 'Anne Russell' and 'Fulbrook' were awarded the

Royal Horticultural Society's Award of Merit in 1957.

Because of comprehensive promotion the name *Viburnum* × *carlcephalum* (5b) is familiar to many gardeners. It is a cross between *V. carlesii* and *V. macrocephalum* f. *keteleeri*. This is another of the ornamentals hybridized by Albert Burkwood. The plant was given the Award of Merit by the Royal Horticultural Society in 1946, although it cannot be compared with either of its parents for beauty. The open-branched, robust 6-foot plant of somewhat coarse growth habit probably does not merit the significance it has achieved since introduction into this country about 10 years ago. The large clusters of clove scented, white flowers in late April and early May are not as refined or as fragrant as those of *V. carlesii*, *V. bithiuense*, or *V. × juddii*. The individual 4 to 5-inch flat to globose flower clusters are larger than those of *V. carlesii*, but are often too sparse to contribute a mass display in the shrub border. The leaves are more resistant to leaf spot, but are also larger and coarser. The plant is more adapted to the areas south of Philadelphia, but in more northern areas will grow and flower many seasons without serious winter injury.

A unique feature of several viburnum species is an inflorescence composed of both fertile and sterile flowers in a Queen Anne's Lace pattern. The numerous small fertile flowers clustered in the center of the inflorescence would be insignificant without the radial single row of enlarged $\frac{3}{4}$ inch, or larger, sterile flowers. The sterile flowers produce no seed but probably function to attract insects to pollinate the fertile flowers. Several of the superior ornamental viburnums are among the species with mixed flowered inflorescences.

The native *Viburnum alnifolium* (4), the Hobblebush, Witchhopple, Trip-toe, or Shinhopple Viburnum, has arching branches that root at the tip and thus form loops which trip the unwary traveller in the woods. The native range extends from New Brunswick and Canada, southward through the Appalachian Mountains to North Carolina. It is a shrub, reaching occasionally to a height of 12 to 15 feet, with the central branches erect and the lower ones spreading outward, often procumbent on the ground. The sympodial growth yields short stems

rather bare of branchlets and the first season covered with scurfy pubescence. The orbicular-ovate, densely scurfy leaves are confined to the branchlet tips. The white flowers, in 6-inch flat cymes, with enlarged marginal flowers, often age to a pale to medium pink. In August the fruit is briefly red before ripening to black. The broadly ovate, 4 to 8-inch brick red leaves accent the autumn woodland. The Hobblebush Viburnum requires a moist, cool, shady situation with an acid soil. This loose, open growing plant is difficult to transplant unless the soil conditions are precisely correct. When successfully naturalized in the woodland, it will surpass many of the ornamental Asiatic species.

The 10-foot *Viburnum furcatum* (6), which was introduced from Japan in 1892, is similar to *V. alnifolium* but is more upright and sparingly branched. The large naked winter buds are clothed with yellow stellate tomentum. The late May inflorescence of fertile and sterile flowers is followed by fruits that ripen in August. The bold foliage turns a bright red or crimson purple in the autumn. This species requires the same soil conditions as *V. alnifolium*. *Viburnum sympodiale* (6) from Central China is a loosely branched shrub allied to *V. furcatum* but is distinguished by stipulate petioles and smaller ovate finely serrate leaves.

A plant contending for the top of any select viburnum list is *V. plicatum* f. *tomentosum* (5), the Doublefile Viburnum. This plant, also known as *V. tomentosum*, from China and Japan has been cultivated since about 1865, and at present is much confused because of taxonomical terminology. The correct species name is *V. plicatum*, the plant with all sterile flowers in a globose cluster, and the form with sterile and fertile flowers in a Queen Anne's Lace inflorescence, *V. plicatum* f. *tomentosum*. Undoubtedly many catalogues and lists will incorrectly continue to designate the Doublefile Viburnum "Viburnum tomentosum" and the snowball form "V. tomentosum sterile."

Often an 8 to 10-foot Doublefile Viburnum will have the superimposed tiered horizontal branches extended to 15 feet or more and finally making a spectacular pyramid shaped shrub. The 3 to 6-inch ovate leaves are dull green with scattered stellate hairs beneath. In



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Viburnum plicatum f. tomentosum, the Doublefile Viburnum, detailed photograph showing the Queen-Anne's Lace type flower composed of fertile flowers surrounded by enlarged sterile radial flowers

late May the sterile, creamy white enlarged flowers surrounding the fertile flowers are orientated in twin rows along the horizontal branches so that they make a lace-like pattern. The attractive green foliage is the background for the bright red, upright fruit clusters for 2 weeks in July. Even after the fruit has ripened to black and been eaten by birds, the red pedicels that held the fruit remain colorful for some time. The autumn foliage is dull purplish red.

The cultivars 'Lanarth' (5) and 'St. Keverne' (5) were raised at Lanarth, St. Keverne, Cornwall, England. The cultivar 'Mariesii' (5), selected in the nursery of James Veitch and Sons, was named for the firm's foreman, Charles Maries. The differences between 'Lanarth', 'Mariesii', and 'St. Keverne' are minor, but 'Mariesii' has larger sterile flowers and is possibly the superior ornamental. The cultivar 'Rowallane' (5) was raised at Rowallane Gardens, Saintfield, Ireland, the exquisite landscape plantings developed by the late Sir Armatage-Moore. 'Rowallane' is a fine textured specimen that has smaller leaves, flowers freely, and fruits abundantly. *V. plicatum* f. *tomentosum* 'Roseum' (5), originated at the Brooklyn Botanic Garden. The flowering is variable from year to year, depending on climatic conditions. When grown on slightly acid soil and during a cool season a pale pink color will develop as the sterile flowers age. The plant is less hardy than the other Doublefile Viburnum cultivars.

V. plicatum f. *tomentosum* is hardier than *V. plicatum*, but may be damaged during a severe winter in Zone 5. The Doublefile Viburnum will grow best in a heavy slightly acid soil. The horizontal lines of the tiered Doublefile Viburnum branches are effectively displayed when planted on a slope so that they are viewed from above. From a distance, the horizontal lines of the flowers closely resemble those of dogwood and the plant can be effectively combined with a dogwood planting to extend the landscape floral display.

The inflorescence formation and ornamental flower attributes of *Viburnum opulus* (3b), the European Cranberry-bush Viburnum, *V. trilobum* (2), the American Cranberrybush Viburnum, and *V. sargentii* (5), the Sargent Viburnum, are much alike so that only their general flowering characteristics will be briefly

noted in this article. The detailed discussion of these highly esteemed ornamental fruiting species and cultivars will be delayed until the future article on fruiting viburnums. The flowers on these three deeply lobed leaved species open as the leaves expand in late May. By this date the other species with mixed inflorescences of sterile and fertile flowers have already flowered. The inflorescences are scattered on the branch tips and thus cannot compete with the luminous horizontal lines of the Doublefile Viburnum. The overall landscape can be enhanced by a specimen or a mass planting of *V. opulus*, *V. sargentii*, or *V. trilobum*, when in full bloom. The week's floral display may not be as spectacular as on other species; but when combined with foliage, fruit, and growth habit, the ornamental merit rating of these three species exceeds that of many other species.

The old-fashioned snowball with pale green to white flowers in globular clusters was introduced into America during colonial days. The snowball, the lilac, and the cabbage rose are often the only surviving landmarks of a colonial homestead. It is misleading to interpret the snowball as representing only one species, as different plants with the globular, hydrangea-like clusters are known from Europe, Japan, China, and the Himalayas. The enlarged sterile flowers may be $\frac{3}{4}$ to more than an inch in diameter and are the sole ornamental merit since no fruit is produced. The merits of each of the snowballs will be independently discussed.

Since *Viburnum opulus* f. *roseum* (3b), the European Snowball Viburnum, was introduced earliest and probably had the widest distribution in America, it will be the first considered. The globose 2 to 3-inch inflorescences develop in mid-May, first appear lime green but gradually expand in size and assume a cream white color. A mature 12-foot specimen covered with the "snowballs" can be a splendid sight. The European Snowball is the hardiest, but is the least desirable for it is one most susceptible to severe aphid infestations, which inflict grotesque contortions on the flowers, leaves, and stems. This form is often forced for conservatory display or cut sprays for florist use in Europe. A pink form of the European Snowball has been reported, but no distinct pink



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Viburnum sargentii, the Sargent Viburnum,
showing the cymose inflorescence of fertile and sterile flowers
and the leaf with the elongated central lobe

flowered plant has been observed. The aging flower inflorescence on certain plants becomes faintly tinted pink.

Viburnum plicatum (5b), ("V. tomentosum sterile") the Japanese Snowball Viburnum, is one of the most adaptable ornamentals, but it will not withstand severe winters. The plant was introduced by Robert Fortune in 1844. The Japanese Snowball is a graceful shaped, 9-foot specimen with tiers of wide spreading horizontal branches on the upper side of which the 2 to 3-inch globose flower clusters are arranged in fish-bone rows in late May. A mature plant will be as wide as high. It is not subject to aphid infestations and is a recommended substitute for the older European Snowball for Zone 5b or milder regions. The cultivar 'Rosace', selected and introduced by Wyoming Nurseries, Cincinnati, Ohio, has a medium pink flower and bronze tinted foliage. The cultivar 'Grandiflorum' differs primarily by having slightly larger inflorescences. The ovate 3 to

5-inch long leaves, which are tapered to a point, rounded at the base, and conspicuously toothed, are dull green with stellate tomentum beneath. The autumn foliage is red to purplish bronze. In Europe *V. plicatum* is a popular shrub for hot house forcing.

Robert Fortune found *Viburnum macrocephalum* (7), the Chinese Snowball, growing in the gardens of the rich Chinese. He introduced the plant for the Royal Horticultural Society in 1844. A 12-foot specimen grown in the open or trained against a protected wall is the ultimate of the snowballs. In colder areas the plant will be deciduous, but in the milder regions, or in protected locations, it will be semi-evergreen. The Chinese Snowball does not survive much north of Philadelphia. The ovate-oblong leaves, 2 to 4 inches long, are dull green with scattered hairs above and covered with stellate tomentum beneath. In mid-May the massive 6 to 8-inch globular trusses of sterile flowers are first apple



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Viburnum macrocephalum, the Chinese Snowball Viburnum,
espaliered on a Kew Gardens wall

green, maturing to snowy white. *Viburnum macrocephalum* f. *keteleeri* (7), is not known to be in cultivation in North America. This variety was introduced into Europe sometime previous to 1860 and probably is not to be found in any European garden today. The large, flat, terminal cymes are 4 to 6 inches across. The central cluster of fertile flowers is surrounded by a single row of large creamy white, sterile flowers. The form *keteleeri* is reported hardier than the species and should be a shrub worthy of reintroduction.

The last of the snowballs to be mentioned is not known in cultivation in the western hemisphere and is consequently unknown to horticulturists. *Viburnum cordifolium* (6?), which might be called the Himalayan Snowball, is native to the Himalayas and Western China. The sympodial branching habit is similar to that of our native *V. lantanooides*. *V. cordifolium* is a loosely branching 10-foot shrub or small tree.

The rows of globose flowers appear in April before the leaves from the naked winter buds. The fruit matures from red to black. Possibly before too many years lapse the Himalayan Snowball will be a woodland garden subject in the western hemisphere.

The greatest number of species have numerous, fertile, campanulate, small white to cream white flowers clustered in a disk-like, cymose inflorescence. Rather than insert at this point a detailed account of the numerous species with small fertile flowers and ornamental fruit, this discussion will be included in the future article on fruiting viburnums. Minimizing the space allocated to these species, does not imply that they are unworthy of garden cultivation for the floral display. A plant combining average flower characteristics, good foliage, compact growth habit, and abundant fruit is a more serviceable and select ornamental than one that yields a profusion of bloom for a few days to a week in the spring.

The fertile flower inflorescence types will be emphasized for several species, but the same ornamental characteristics will be evident on many of the desirable fruiting viburnums.

The mass display of cream white flowers in cymose clusters on a 10-foot *Viburnum lantana*, (4) the Wayfaring-tree Viburnum, may be neutral in appearance, but adds contrast and interest to the shrub border. The individual campanulate flowers, with protruding lemon anthers, are not more than $\frac{1}{3}$ of an inch in diameter. When a hundred or more of the small flowers are massed in one cluster they gain ornamental significance. *V. lantana* and the allied species are dense rounded shrubs. The variety *aureum* (4) has golden green foliage in the summer. The form *variegatum* (4) has peculiarly variegated leaves, which could hardly be called ornamental. The variety *rugosum* (4) produces abundant flower clusters and consequently is a choice fruiting shrub. The Wayfaringtree Viburnum will tolerate dry situations where other species would fail. *Viburnum cotinifolium* (5b), the Indian Wayfaringtree Viburnum, which is much like *V. lantana* but has larger leaves and greater stature, has flower buds that are pink before expanding to cream white.

The red-fruited Asiatic species include some of the choicest shrubs. *Viburnum dilatatum* (5b), the Linden Viburnum, and *V. wrightii* (5b), the Wright Viburnum, exemplify the floral display of these vivid autumnal fruiting shrubs. A flowering 6 to 10-foot mound shrub of

one of these species is a globose mass of creamy white flowers. On a sunny day, a plant in full bloom will be alive with bees collecting nectar and pollinating the $\frac{1}{4}$ -inch diameter flowers.

The North American species may not be the most ornamental, but such species as *Viburnum prunifolium* (4), the Black-haw Viburnum, *V. lentago* (3), the Nannyberry Viburnum, and *V. cassinoides* (4), the Withe-rod Viburnum, contribute interest to the landscape for a few days in May. The inflorescences, 3 to 4 inches in diameter, are borne in abundance on the spur tips. Whether it is the low-growing, 4-foot *V. cassinoides* or the taller *V. lentago*, or *V. prunifolium*, the flowers are complemented by the emerging yellow green leaves. The horizontal lines of *V. prunifolium* grown as a single trunk specimen are particularly noteworthy.

The flowering season anti-climax is achieved by *Viburnum dentatum* (3), the Arrowwood Viburnum, and *V. rafinesquianum* (3), the Downy Arrowwood Viburnum, which are two worthy natives of the Northeast. The June white flower display of these species is worth consideration since they are produced when few shrubs are in bloom. As *V. dentatum* tolerates shade and moisture it is adaptable to naturalistic planting. Dry roadside slate banks approach the native habitat conditions of *V. rafinesquianum*. The red orange autumn foliage of the Arrowwood Viburnum and the Downy Arrowwood Viburnum accentuate the naturalistic landscape.

Recommended deciduous flowering viburnums for the landscape planting

bitchiuense (6)
 × *bodnantense* 'Dawn' (5b)
 × *burkwoodii* (5b)
carlesii (5b)
cassinoides (4)
 × *chenaultii* (5)
dilatatum (5b)
fragrans (5b)
fragrans var. *album* (5b)
grandiflorum (6)
juddii (6)

lantana (4)
macrocephalum (7)
plicatum (5b)
plicatum f. *tomentosum* 'Mariesii' (5)
plicatum f. *tomentosum* 'Rowallane' (5)
prunifolium (4)
rafinesquianum (3)
sieboldii (5)
trilobum (2)
wrightii (5b)



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*Individual cymose inflorescences of all fertile flowers
on Viburnum prunifolium, the Black-haw Viburnum*



Figure 1. Effect of Beta-hydroxyethyl hydrazine on the growth of *Vriesea geniculata*. Left to right: control, 60 mg. of chemical sprayed on foliage

New Discoveries In Plant Growth

HENRY M. CATHEY

When we know enough about the chemistry of the plant, we will add a particular chemical, and so many days or weeks later observe a desired change in the pattern of growth. A vriesia, which is a Bromeliad collected from the tropics, is an example of this. It will hold water and is often used as a vase plant. When one empties the water out and fills it with a pale amber solution, the plant is in flower six months later (Figure 1). This is the future of growth control.

The chemical used on the Bromeliad is B-hydroxyethyl hydrazine (4). [See references concluding this paper.] In Hawaii it is used to flower pineapples,

another kind of bromeliad, year-round. It is also used as an additive in mink food to prevent cancer and is added to liquid oxygen to make rocket fuel. The first action of the chemical on plants is to slow up growth, then flowering results.

Unfortunately this chemical is active on only a few plants but other chemicals are doing the same thing, retarding growth and in some cases promoting flowering. Such chemicals as a class are called growth-retardants. They are useful in production and maintenance of plants of smaller size than those typical of the species or the cultivar. They also make it possible to use some species not now available for pot use and allow all plants to be fertilized and watered as frequently as necessary.

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The leaves of all plants treated with growth-retarding chemicals are much darker green than those of untreated plants. This color is related more to the action of the growth regulator than to mineral nutrition.

Three chemicals have been extensively tested on many kinds of plants (2). These are Amo-1618 (4-hydroxy-5-isopropyl-2-methylphenyl trimethyl ammonium chloride, 1-piperidine carboxylate), phosfon (tributyl,2,4-dichlorobenzyl phosphonium chloride), and CCC (2-chloroethyltrimethyl ammonium chloride). The growth of most plants may be controlled by the proper selection of one of these chemicals. None of the three is active on all plants (Figure 2). Few plants respond to applications of Amo-1618; details are available elsewhere (3). The dosages for phosfon were 0.16 to 4 gm. of the technical material and for CCC, 4 to 20 gm. per cubic foot of potting soil. The list* which follows shows the growth-retarding activity of two chemicals on potentially useful plants.

Common Name	Response to Phosfon	Applications of CCC
Apple	Inactive	Active
Azalea	Active	Active
Camellia	Active	Active
Chrysanthemum	Active	Active
Dogwood	Active	Active
Euonymus	Active	Active
Fatsyhedera	Stimulates	Active
Holly	Active	Active
Hydrangea	Inactive	Active
Lily—Easter	Active	Active
Maple, Red	Active	Active
Oak, Red	Active	Active
Pear	Inactive	Active
Petunia	Active	Inactive
Philodendron	Inactive	Inactive
Poinsettia	Stunts	Active
Privet	Inactive	Active
Rhododendron	Active	Active
Sycamore	Stimulates	Active

The basic concept of using growth-retarding chemicals is being tried extensively on many kinds of plants. Most foliage plants, such as *Dieffenbachia*, *Peperomia* and *Philodendron*, grow without apparent responses to applications of phosfon and CCC. High dosages (100 to 500 times the dosages used on chrysanthemums) frequently stunt

growth and result in a reduction of leaf size, drying of the margins of the leaves, and the development of few or no lateral shoots. Plants of chrysanthemums, coleus, and *Schefflera actinophylla* respond to applications of both chemicals by continuing to form leaves at the same rate as untreated plants but the distance between leaves decreases with increasing dosages.

Woody plants as a group are not particularly adapted to the immediate utilization of growth-retarding chemicals because they grow for only a few weeks during the year and the root system tends to be extensive. Preliminary testing is being conducted with plants growing in clay pots on long days. Plants of several holly species, euonymus, ligustrum, rhododendron, and oak respond to applications of phosfon and CCC. Plants which grow in flushes such as oak and holly respond only to much higher dosages than does chrysanthemum. The time from one period of growth (flush) to another is delayed slightly and the number of nodes per flush is smaller than on untreated plants. The actual internode distance on these plants may be unaltered but the number of nodes is smaller than on untreated plants.

Plants from many different families such as chrysanthemum, rhododendron, hydrangea, and mimosa, respond to applications of CCC at dosages of 10 gm./cu. ft. of composted soil. In contrast, the optimum concentration for growth retardation by phosfon varies from 0.16 cm./cu. ft. of potting soil for chrysanthemum to 4 gm./cu. ft. for rhododendron.

The results from applications of growth retardants to monocots have generally been disappointing. Although wheat responds markedly to CCC, the other grains have responded only at fairly high dosages or not at all (7). Tillering was promoted on treated plants and occurred earlier than on untreated plants. The tendency of the plants to lodge was also reduced.

These points are vital in the use of growth-retarding chemicals: Prepare soil plant regulator mixtures of varying dosages by dissolving the required amount of chemical in water, pouring it on a known volume of composted soil, and mixing thoroughly to distribute the chemical throughout.

* [Mention of commercial products herein does not constitute their endorsement. Phosfon is registered for use on chrysanthemums by commercial florists. CCC is still in the experimental stage of development and is not generally available. Results reported herein for phosfon and CCC are given as research results only and do not constitute official clearance or recommended use.]



Figure 2. Effect of soil treatment on growth of *Ballerina petunia* (top) and *Barbara Ecke Supreme poinsettia* (bottom), left to right: Phosfon 4 gm/cu. ft. of potting soil, control, CCC, 20 gm/cu. ft.





Figure 3. Effect of soil drench on growth of Purity zinnia. Left to right: Phosfon 0.8 gm/cu. ft. of potting soil, phosfon 4 gm/cu. ft., control, CCC 4 gm/cu. ft., CCC 20 gm/cu. ft.

Plants already established in soil may be drenched with the chemical at rates similar to those used in the soil amendment procedure. The latter procedure is preferred for treating at a specific stage of growth. Plants sprayed with aqueous solutions of phosfon develop yellow spots on the leaves. At high dosages, the veins are cleared of chlorophyll and the leaves develop marginal browning which persists throughout the life of the plant. Other plants sprayed with aqueous solutions of CCC develop yellow tips. Eventually the leaves regain their green color. The margin of safety between retardation without injury and with injury from growth retardants applied as foliar sprays is very small and should not be considered for general use as a method of applying them at the present time.

Amo-1618 and phosfon persist in the soil for more than one crop of plants whereas CCC did not persist for the growth of one crop. Amo-1618 was slightly more active in summer, phosfon much more active in summer, and CCC much less active in summer than in winter in retarding growth of plants.

All varieties of a given plant species are not equally sensitive to growth-retarding substances (3).

All plants treated with growth retardants appear more resistant to heat and drought stresses (2) and even to over-fertilization with inorganic fertilizers (5).

Plants of *fatshedera* and *zinnia* (Figure 3) are stimulated to grow more rapidly following application of certain dosages of phosfon. Higher levels of application result in browning of leaf margins and stunted growth. Application of CCC retards the growth of these plants.

In most instances the growth retardants exert relatively little influence on flower initiation of herbaceous plants. Treatment beyond that necessary for moderate reduction of stem length usually delays flowering. Treatment of vegetative azalea, camellia, and rhododendron with phosfon and CCC, however, results in less stem elongation and earlier flower-bud initiation (3, 6).

The photoperiod in which holly, petunia and chrysanthemum plants grow determines their flowering and growth



Figure 4. Shasta chrysanthemum plants were grown on 8-hour photoperiods and during the middle of the night incandescent light at 20 footcandles was applied as follows: (left to right) untreated, 4 hours from 10 p.m. to 2 a.m., 12 minutes at midnight. After one month of treatment all plants were transferred to 8-hour photoperiods. Photographed after 6 weeks.

habits (2). Treating the soil with growth retardants does not alter the response to photoperiod, light quality, or night temperature. Therefore, the action of the retarding substances is different from that imposed by short days. Short days continue to be essential for flowering chrysanthemums and long days for stem elongation of holly and petunia. Primarily, internode extension of responsive species is retarded by a wide range of concentrations of phosfon. The action of growth retardants to shorten internodes is independent of the other environmental factors, and is specific in activity on internodes since the other parts of the plant are not noticeably affected. Few formative effects on leaves, stems, and flowers are observed.

The use of artificial light in delaying flowering of short-day plants and in promoting the growth and flowering of long-day plants now depends upon application of light for a 3- to 8-hour period near the middle of the night. Frequently light at other times of night was only partially effective in controlling growth. Appreciable reduction in the

amount of light by decrease in its duration or its intensity was unsafe. The use of artificial light to interrupt the night is now limited to a few high-valued crops.

Intermittent-lighting is as effective as continuous lighting, but utilizes 1/5 or even less light without loss of effectiveness by simply turning it on and off intermittently during the 3- to 8-hour period in the middle of the night. It is based on the discovery that the action of phytochrome, the photoresponsive pigment, continues for a time after the light goes out. The basic principles of intermittent lighting were established using chrysanthemum plants. The cultural procedures were described in an earlier paper (1).

Nine lots of Shasta chrysanthemums were placed on 8-hour photoperiods in an experiment to determine the effects of 12 minutes of light of 20 footcandle intensity from incandescent-filament lamps distributed in various regular sequences throughout the middle 4 hours of the night.

A short-day control received no addi-



Figure 5. Effects of 12 minutes of light applied in the middle of the night on flowering of rooted cuttings of *Shasta chrysanthemum*, grown on long photoperiods prior to a 4-week period of treatments, and then subjected to 8-hour photoperiods until flowers appeared. Plants from left to right received 1, 12 minutes of light at midnight, and 2 to 6, 12 minutes of light given in cycles of light and dark of various lengths during a 4-hour period in the middle of each night: 2, 240 minutes; 3, 80 minutes; 4, 60 minutes; 5, 30 minutes; and 6, 1-minute cycles. Photographed after 6 weeks.



Figure 6. Red maple seedlings grown on natural days from August 1 to October 1. During the middle of the night, 20 footcandles of incandescent light was applied (from the left) as follows: no additional light, 2.4 minutes every 24 minutes for 2 hours, 2.4 minutes every 24 minutes for 4 hours, 2.4 minutes every 24 minutes for 8 hours, 4.8 minutes light every 24 minutes for 4 hours.

tional light during the long night, and a long-day control received 4 hours of light from 10 p.m. to 2 a.m. Each of the remaining lots received 12 minutes of light either in one light break at midnight or as 2, 3, 5, 9, 24, or 240 light breaks spread regularly through a period of 4 hours from 10 p.m. to 2 a.m. (as shown in Figures 4 and 5).

Light-dark cycles shorter than 60 minutes, consisting of incandescent light at 20 footcandles for 5 per cent of the time (examples — three seconds every minute (8), 30 seconds every 10 minutes or 90 seconds every 30 minutes for 4 hours), each with a total of 4 footcandle hours, were as inhibitory to flowering as continuous light for 4 hours (Figure 5). The 12 minutes of light in a single period each night did not prevent flowering. The only other treatments that did not prevent flowering (examples — 2.4 minutes every 60 minutes, 3 minutes every 80 minutes, or 4 minutes every 120 minutes) were those in which each intervening dark period during the 4-hour period exceeded an hour. The inhibitory action of light thus failed to carry through a period of darkness greater than an hour.

In several of the chrysanthemum experiments, plants of various long-day species, such as spinach, barley, hyoscyamus, dogwood, red maple (Figure 6), petunia, and short-day species such as salvia and celosia, were also subjected to cyclic lighting treatments. Results from these plants are not yet complete, but preliminary observations show that growth and flowering of photoperiodic

plants are responsive to cyclic lighting and that the amount of light needed to control growth is markedly reduced when such a lighting regime is followed (Figure 4).

Eventually it will be possible to consider, for the first time, using photoperiodic control of many kinds of plants to establish the pattern of growth. Cost of lighting in relation to the unit value of the crop will be greatly reduced by using cyclic lighting. The size of the plant would then be scaled for any purpose by the use of growth retardants.

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A Book or Two

Rhododendrons of the World and How to Grow Them

David G. Leach. Charles Scribner's Sons, Publishers, 597 Fifth Avenue, New York 17, New York. 1961. 544 pages, Illustrated. \$25.00. (Library). (AHS Members' Price \$21.25)

This volume not only merits the epithet "comprehensive," accorded it by the publisher's dust jacket, but also "voluminous" and "compendious." It brings together nearly all the information that is available today regarding the "true" rhododendrons and is useful to the gardener interested in them. At the same time the text is clearly and pleasantly written. It has the virtue of presenting many new ideas and not merely rehashing the literature to date, although the author doubtless found much help in Clement G. Bowers predecessor work, *Rhododendrons and Azaleas*, recently revised. If there is any warning that should be given the reader, it is that many of the new views expressed by the author carry the implication that they are based on extensive, recognized scientific research, even though this is not necessarily so in all instances and contrary views are not always presented.

Leach is an amateur horticulturist who has furthered and maintained his interest in rhododendrons by extensive travel and observation of living plants, with much resulting gain to his book. The book also reflects the author's special interests in its discussion of breeding and taxonomy, and particularly in its outstanding discussion of the species concept as applied to rhododendrons.

Rhododendrons of the World is especially suited to the serious amateur gardener, the professional gardener, and the commercial grower. The beginning amateur can find in it what he needs to know but not in the elementary authoritarian, uncritical fashion that he usually prefers. The volume deals only with the "true" rhododendrons, that is, it excludes azaleas even though the majority of taxonomists today include them in the genus *Rhododendron*.

About 150 of the better known and more valuable species of rhododendrons are described at length in terms understandable to the gardener. In doing so the author has made some "corrections" in prior taxonomic descriptions and boundaries for species and in their assignment to the various series into which the genus is broken down. The appendices include a listing of all species, including the little known mainly tropical species as recognized by Sleumer in his recent classification.

There is also an extensive listing of hybrid groups and clones with British and American quality and hardiness ratings, origin, and color.

This list, but not the ratings and not the few recent British and American introductions included, appears to be taken largely from the *International Rhododendron Register* published in 1958.

Garden uses, culture, insects and diseases, hardiness, propagation, and other horticultural topics are extensively and ably discussed. One minor matter: the listing of obsolete and invalid species names would be far less confusing if the botanical authorities for those names were also included.

Notwithstanding the heartbreaking price of \$25, acquisition of a copy is recommended to all those having a serious horticultural interest in the true rhododendrons. Horticultural works of the calibre of *Rhododendrons of the World* are all too rare.

FREDERIC P. LEE

Mushrooms and Other Fungi Their Form and Colour

H. Kleijn. Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1962. 144 pages. Illustrated. \$10.50. (Library).

This beautifully prepared volume (small quarto) is an attempt to utilize the art of color photography as a medium of recording natural color in some common mushrooms and other related fungi of forest and field. Only accolades of highest praise seem appropriate in accessing the virtues of this book. This is not a scientist's monograph on the fungi but a book designed for the lay public who have an inquisitive interest in this group of plants. The author, H. Kleijn, is president of the Royal Society of Natural History in Amsterdam, The Netherlands. The superb color photographs are by G. D. Swaenburgh de Veye. The original Dutch edition has since gone through a French edition and now one in English.

In all phases of natural history the use of color photography is one of the important developments of the modern age. That the author indicates it has been possible to record many kinds of fungi "in their natural surroundings for the first time" is a very modest understatement of what the reader finds in the pages that follow. The book includes 94 color photographs of mushrooms, morels, and related kinds of fungi that are common both in the United States and in Europe. For this reason the book should realize a brisk sale in this country. The color photographs are first class and represent outstanding examples of what color photography in plants can be at its best.

This book is not only beautiful to look at, it is also a useful reference piece for the layman or student, and it should not be overlooked by the mycologist who would find the book useful

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

in identifying certain kinds of the fleshy fungi inasmuch as color plays an important role in their identification. The prose of the book is clearly presented in non-technical language. Each fungus is described with the common name first, followed by the scientific name in Latin with accent marks for pronunciation. The text begins with a brief historical account of the fungi—concepts the Romans and Greeks had about poisonous mushrooms and the advancement of our knowledge about fungi up to the present. Other chapters cover "Fairy Rings," "Things Worth Knowing about Fungi," "Hints for the Collector," "Edible and Poisonous Species," and a glossary.

Because of its exceedingly attractive format, the book is a collector's item. The book begins with an attractive cloth cover, and the printing is on special heavy weight paper. In short, this is the kind of book we would like to see authors to publish more often. A book of this caliber should be on every reading list of children learning about the natural environment in which they live. A book of this stature makes the subject of fungi an exciting experience from the outset. How else are we going to encourage young biologists into the fold?

F. G. MEYER

New Techniques with Dried Flowers

Sarah Whitlock and Martha Rankin. Hearthside Press, Inc., 118 East 28th Street, New York 16, New York. 1962. 32 pages. Illustrated. \$2.50. (Library).

This little volume deals with the new process of drying flowers using Silica Gel. The authors tell you frankly that this material is expensive to use, they do give you rather detailed directions for its use, and also review the methods used heretofore. Paragraph headings are listed in the table of contents and a good index is provided. There is not very much given on arrangement techniques, but there are thirteen color plates of arrangements made with dried flowers that will give you some idea of how to use these dried plant materials.

G. P. W.

Seed Identification Manual

Alexander C. Martin and William D. Barkley. University of California Press, Berkeley 4, California. 1961. 221 pages. 824 plates. 288 figures. \$10.00. (Library).

This manual is an important and valuable contribution to the identification of seeds, especially seeds of weeds and crop plants; it is designed for use by both laymen and professional plantmen.

Seed photographs make up a little more than half of the book, and the 83-page text, Identification Clues, contains 288 excellent text figures. The plates are in three groups: Farmlands, Wetlands, and Woodlands, each of which has two or more subdivisions based on the general types of plants. These are arranged systematically in each group, except that about two-thirds of the seeds in the subdivision Weeds, Farmlands group, are regrouped in a second subdivision on the basis of conspicuous structural characters, as a special aid to quick identification. Another subdivision in this group illustrates seeds of

eighteen of the more important crop plants.

The Woodlands group has two subdivisions, woody and non-woody plants, and among the woody plants are a few introduced species that have become widely naturalized.

Most of the greatly enlarged photographs are very good, but unfortunately a few are so poorly reproduced that important surface characters are indistinguishable. Furthermore, after examining the excellent illustrations in the second half of the book, I believe that good drawings would be superior to even the best photographs for showing the most important diagnostic seed characters. There might be some cases, however, where both drawings and photographs would be desirable. One nomenclatural error is the use of *Cotoneaster pyracantha* for the firethorn, which should be *Pyracantha coccinea*.

This manual is a good step in the right direction. It is to be hoped that additional works of the same quality, covering many additional species will be forthcoming soon.

PAUL G. RUSSELL

The Art of Training Plants

Ernesta Drinker Ballard. Harper & Brothers, 49 East 33rd Street, New York 16, New York. 1962. 128 pages. Illustrated. \$4.75. (Library).

Mrs. Ballard apparently has long been concerned with the growing of plants in pots for use in the house and on the terrace. Her earlier book, to which rather constant reference is made in this volume, was titled *Garden in Your House*.

The sub-title of the present book is: Extending the Oriental Art of Bonsai to Western Conditions and with Decorative Plants.

That in itself gives the proper idea of what this volume contains. The range of plants discussed and the precise and accurate description of the care needed are encyclopedic, and lucidly presented so that no one can possibly misunderstand. It is very important that all readers should start with a careful reading of the Introduction, as that brief section outlines what Mrs. Ballard intends doing in the book and her reasons therefor.

There is little in the book that comes intimately close to traditional Japanese bonsai, except the specimens illustrated to show that art in splendid examples. There is much that is a proper extension of that art.

If one likes to grow plants in pots, and is willing to make it almost his lifework, here is the guide. Read it, embrace the ideas, and be lost forever. There will be no time for heedless vacations, no day without additional routines of care, and deservedly, no day without its own rewards.

B. Y. M.

California Desert Wildflowers

Philip A. Munz. University of California Press, Berkeley 4, California. 1962. 122 pages. Illustrated. Paperbound, \$2.95. Clothbound, \$4.75. (Library).

Dr. Munz's most recent wildflower book (his second) fills a great need for this kind of book at the popular level. In 1961 he published *California Spring Wildflowers*, his first book in

this field of botanical writing. These popular floras arose out of Munz's earlier technical work, *A California Flora* (in collaboration with David D. Keck) published in 1959.

The present work on desert flowers follows much the same format as the first book, namely that the plants are grouped by flower color and identification is on this basis. Both volumes are exactly the same in size and contain 122 pages each. The 172 line drawings of plants are good and should be adequate for the identification of the plants listed; but some indication as to scale might have helped the user, since size relationship bears considerable importance in plant identification. The book includes 268 kinds of desert plants, which admittedly represents only a small percentage of what might have been included. Choosing the material for such a book, as one might suspect, poses a practical problem for the author. The 96 portraits of plants in color are good and point up once again the desirability of illustrating plants in this modern medium of illustrating. Attracted to the color plates first, readers probably will wish that all the illustrations could have been in this medium. The topographic map might better have been placed at the beginning of the book and not at the end. This map might have been more meaningful, too, if only desert areas of California had been indicated without adjacent areas being labeled. The present map seems a bit confusing.

If we are going to build a tradition of field naturalists in this country (and we ought to), such as we find widespread in Europe a very good method of accomplishing this is to publish little volumes such as Dr. Munz is doing. We encourage him to new heights in this venture and hope he won't delay long the publication of his contemplated California Mountain Wildflowers. But why should he stop there? Why not bring out others about the fascinating coastal flora of California or the interesting flora of the redwood belt or of the fabulous Siskyou mountains. The phytogeographic areas of California are so varied, one could go on producing regional floras of the state for popular use *ad infinitum*. California as a center of a population explosion is needful of someone to spread the gospel about conservation of the wild plants. Dr. Munz has a golden opportunity of doing just this in what we hope might become a publishing venture of classic proportions.

The University of California press is to be congratulated for the splendid job of producing the book in a field in which they have developed some preeminence.

F. G. M.

History of English Holly

(*Ilex aquifolium*) in Oregon and the Northwest

John S. Wieman. Published by the author, 10819 S.W. Capital Highway, Portland 19, Oregon. 1961. 39 pages. Paperback. \$1.00. (Library)

A collection of notes and items on the introduction of English Holly into the northwest. It tells of people who were interested in its introduction and later in planting holly as a commercial orchard plant. Scattered through are notes and observations from many sources on the

English Holly in the Northwest. These include comments on its culture, propagation, hardiness, varieties, pests, marketing, and on holly uses.

C. B. L.

Michigan Wildflowers

Helen V. Smith. Cranbrook Institute of Science [Bloomfield Hills, Michigan] Bulletin 42, distributed by University Publishers, Inc., 239 Park Avenue, South, New York 3, New York. 1961. xii + 465 pages. Illustrated (by Ruth Powell Brede). 231 halftone plates, 17 color plates, 5 plates of figures. \$5.00. (Library).

We have been long in need of a guide to the wildflowers of Michigan, a state having a greatly diversified flora of more than usual interest because of its origin and its present distribution-pattern, but the appearance of a book of the excellence of the present work more than compensates for any delay in reaching the goal.

The usefulness of a popular account of the native plants, such as this, hinges upon the adequacy of the illustrations, and the exceptionally accurate and lifelike drawings and paintings by Ruth Powell Brede for all of the nearly 500 species described in this handbook fulfill their purpose admirably. Nor does the selection of species, intended to include "almost every wildflower which attracts attention through charm, abundance or rarity" leave anything to be desired. To the taxonomist, it is a relief to see a wildflower-guide arranged according to natural relationships instead of some artificial basis such as flower color.

The text, as would be expected from the author's scientific training, is thoroughly reliable and shows a sense of balance none too frequent among the current rash of books in the field of descriptive natural history. A brief introduction takes up such subjects as the importance of wildflower conservation, growing wildflowers, the naming of plants, the parts of a plant, and the use of botanical keys. It is concluded by a general key to the families and some of the more readily differentiated genera and species. Many users of the book will probably find the illustrations a sufficient means of naming their plants but if they have any doubts identification is readily confirmed by means of this general key (when the family is in question) plus the keys to species under each family and, if necessary, the help of the five plates illustrating the parts of plants, and the ample glossary at the end of the volume. The originality and simplicity of the keys is another praiseworthy feature of the book. The numerous species of the rather difficult Parsely Family (Umbelliferae), for example, have been so generally keyed out upon highly technical and more or less microscopic characters of the fruit that Dr. Smith's key based upon readily apparent vegetative differences is a real achievement.

In the text a brief but adequate description is given for each species, followed by notes on habitat and time of flowering. Miscellaneous notes of interest on such subjects as uses of the plant, related wild and garden species, and sometimes the distribution of the plant in the state, follow most of the descriptions. The reviewer's only criticism of the text is the comparative infrequency of such indications of

geographic range. For instance, it might help the user of the book to know that he cannot expect to find Calypso, Clintonia, Streptopus or Pine-drops in most of southern Michigan; that the May-apple, Puttyroot, Groundnut, Rue Anemone and False Rue Anemone, on the other hand, are confined to the southern and central parts of the state and not to be expected in the north; that *Ranunculus fascicularis*, so common southward, is a rarity in the Upper Peninsula, and that if he thinks he's found *Ranunculus flabellaris* there, he'd better have another look. It seems unfortunate that there is no indication in the text that these plants, and many others of restricted distribution, do not occur throughout the state. It is hoped that it has been sufficiently stressed, however, that the many advantages of the book greatly outweigh this one minor shortcoming, if shortcoming it be in a handbook of this nature. Few states can boast of so thoroughly helpful a guide to their wildflowers as this, which should be almost equally useful for other areas adjacent to the Great Lakes. Dr. Robert T. Hatt and his associates at the Cranbrook Institute are to be congratulated not only for conceiving such a handbook and securing its publication in such worthy format, but for finding so competent an author and artist for the purpose.

The surprisingly modest price of the book is an additional incentive to ownership. Such a price would not have been possible for a book of this size, with so many halftones and color plates, had it not been heavily subsidized by the Cranbrook Institute.

F. J. HERMANN

Curator, Forest Service Herbarium
U.S. Department of Agriculture
Washington, D.C.

How to Control Plant Diseases in Home and Garden.

Malcolm C. Shurtleff. The Iowa State University Press, Ames, Iowa. 1962. viii + 520 pages. Illustrated. \$4.95. (Library).

This book is a catalogue of diseases of plants from Aarons-rod to Zygopetalum. Symptoms are described and control measures recommended. Illustrations are black and white. There is a chapter about fungicides and equipment used in applying them. Seed treatments for disease control are discussed. The glossary is helpful. Discussion of diseases of ornamentals is often brief and one is referred from one plant to another as for example from peony to delphinium or from sweet gum to witch hazel. The book covers much territory in a limited space. Dr. Shurtleff is Professor of Plant Pathology and Extension Pathologist at the University of Illinois.

M

Plant Pruning in Pictures

Montague Free. Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1961. 288 pages. Illustrated. \$4.95. (Library)

Mr. Free has included a remarkably broad coverage in this book on pruning. It ranges

from lopping trees down to pinching annuals and even includes house plants. Although it is based largely on photographs and line drawings, obviously text instructions are both necessary and included.

One might complain that many of the plates show operations of pruning under conditions of the botanic garden or estate, but I suppose a plant is the same anywhere. The contribution that this book makes is the great number of plants covered, and while it is obvious that with some there is little that can be said other than the time of year to do the cutting, mention is made of this point.

There is a good section on pruning fruits, but then this area is usually well explained because of the extensive studies which have been made on this aspect of fruit culture at various horticultural research centers. Roses are also discussed in a thorough manner, as are deciduous trees and evergreens. The only critical point one might make is that many of the photographs of ornamental plants do not directly relate to pruning, but rather are what I would call habit photographs.

J. L. C.

The Dried-Flower Book

A Guide to Methods and Arrangements

Nita Cox Carico and Jane Calvert Guynn. Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1962. 128 pages. Illustrated. \$4.95. (Library).

A very complete volume on this subject—it has sixty photographs, twelve of them in color, and eight sketches. It is divided into two parts—Drying Plant Material and Arranging Dried Plant Material. This latter part includes caring for the finished arrangement. This book was probably prepared before the fad of using Silica Gel became prevalent; since the authors give their recommendations for using the medium they have found most successful, if you wished to try the Silica Gel you could still find this work useful as the technique would be the same.

The section on making arrangements with dried flowers should prove helpful to you who have not worked with dried material, as mechanics are quite different from those used with fresh plant material.

The Complete List of Plant Materials for Drying is given on the inside front cover and duplicated on the inside back cover. It is in alphabetical order and keyed to the method to be used in drying each plant.

G. P. W.

Trees of South Africa

Eve Palmer and Norah Pitman. A. A. Balkema, Amsterdam & Cape Town. 350 pages, 31 color plates, 148 half-page photographs, many line drawings. \$19.50 (Available in U.S. from the reviewer at Stuart, Florida)

Palmer the Writer and Photographer, and Pitman the Artist, have united their talents and love of trees in an excellent book about the 170

principal indigenous trees of South Africa. It is the first book to be published for this area as a whole, and although botanically correct, it was written for the layman. Emphasis is on recognition of the trees, their conservation, their names in Latin, English and native languages, their usefulness both aesthetically and practically, their ease or difficulty of propagation, their likes and dislikes, and so on.

Two things about this book are unique:

Many persons, including most foresters, agree that the way to know trees is to observe them growing, not by examining their remains in a herbarium. These authors devote 53 pages in the front of their book to E. E. M. Look's key, in summarized form, to the trees of the Knysna forests. In effect this serves as an identification guide to all South African trees. Look is senior Forest Research Officer at Pretoria.

In the back of the book is a map of the indigenous high forests of South Africa, compiled by E. K. Marsh and F. S. Laughton. The exact location of these 65 forests is given by latitude and longitude, from the Cape to the baobab country along the Limpopo River.

For a comprehensive understanding of South Africa's trees, call on Palmer & Pitman.

EDWIN A. MENNINGER

An Easy Guide to African Violets, Revised

William L. Meachem. Hearthsides Press, Inc., 118 East 28th Street, New York 16, New York. 66 pages. Illustrated. \$2.50. (Library).

This little book is excellent for the beginning hobbyist. It covers adequately most phases of the culture of this popular plant. It falls short on varieties and their descriptions; also, on the all important art of "growing for showing"—but these subjects could well be the basis for two more books.

G. P. W.

American Daffodil Yearbook, 1962

Edited by Gertrude S. Wister. Published by American Daffodil Society, 112 pages. 12 illustrations. Supplied to members by the American Daffodil Society. Dues \$3.00. Available to non-members at \$3.00 from Mrs. Glover F. Roennfeldt, 7426 Lynn Avenue, St. Louis 30, Missouri.

The American Daffodil Yearbook matures and improves year by year as the American Daffodil Society grows. Under its new editor, Gertrude S. Wister, there are further improvements in content, format, and freedom from errors. Better illustrations and a hard cover no doubt will appear as Society income improves.

Among the nineteen articles are two of a scientific character, Hannibal's The Tazettas—A Forgotten Race, and King's interesting experiments on production of bulblets, elimination of virus infected bulbs and immediate replanting versus curing before replanting. Two novelties are Watrous' Daffodils on Postage Stamps and Betty Larus' daffodil crossword puzzle. The annual American Daffodil Symposium by Tugwell

and annual American Miniature Daffodil Symposium by Scorgie continue. There are also articles on ferns to hide and replace fading daffodil foliage.

Louise Horton has Notes on the Founding of the American Daffodil Society. This tells of the organization activities around 1954. The Society and its Yearbook, however, have origins that go back to the mid-30's. These were described in the April 1958 issue of the National Horticultural Magazine in a review of the American Daffodil Yearbook, 1957-58. The present reviewer is so brash as to suggest that a reprint of this material in a future American Daffodil Yearbook might complete the record and be of interest to members.

FREDERIC P. LEE

Makers of North American Botany

Harry Baker Humphrey. The Ronald Press Company, 15 East 26th Street, New York 10, New York. 1961. xii-266 pages. No illustrations. \$6.00. (Library).

No. 21 in the Chronica Botanica, An International Biological and Agricultural Series, Consulting Editor Frans Verdoorn.

A collection of short biographies of 122 men who made important contributions to botany in North America. This gives a quick review of important personal information of each and highlights of their botanical work and influence. Considered as an entire book, it helps to give a story of botany from colonial times to the present.

C. B. L.

Green Days in Garden and Landscape

Desmond Muirhead. Miramar Publishing Company, 1300 West 24th Street, Los Angeles 7, California. 1961. 272 pages. Illustrated. \$7.95. (Library).

A look at landscape architecture as it was, as it is, and the probable direction it should take in the future. The author has provided a commentary on all phases of this field, from consideration of such details of planning as the use of the flower border through modern concepts of design to broader aspects of landscaping which include urban planning and the need for preservation of open space. Of necessity, the individual subjects are treated briefly but the overall picture is clearly presented. Pleasant reading, generously illustrated. A book for the landscape shelf of both the layman and the professional.

CARL N. JOHNSON

The Lily Yearbook of the North American Lily Society, Number Fourteen, 1961

George L. Slate, Editor, North American Lily Society, Geneva, New York. 1961. 212 pages. Illustrated. \$5.00. (Library).

A yearbook of lilies containing articles on the history and development of several hybrids, on hybridization of lilies, and experiences of growers in North America as well as in other parts of the world. Reports of lily shows and society affairs are also included.

Floras of the World—Part II

S. F. Blake. United States Government Printing Office, Washington 25, D. C. 1961. 742 pages. \$2.75.

The amateur occasionally wishes to know what plants are native to various countries and areas of the world and what plants, native and exotic, are cultivated in those countries and areas, together with descriptions of the plants. *Flora of the World* gives this information by listing, with extensive descriptive annotations, floras and floristic works for such countries and areas. Part II lists 6,841 publications for areas in Europe, excluding Germany, Greece, and the Iron Curtain countries. Part I, published in 1942, listed 3,025 publications for countries and areas in Africa, Australia, North and South America, and the islands of the Atlantic, Pacific and Indian Oceans. The author, a senior botanist of the United States Department of Agriculture, completed Part II before his death on December 31, 1959. There yet remains to be prepared a geographic guide to the floras of eastern Europe and of Asia.

FREDERIC P. LEE

Report on The G. Weidman Groff Collection

Henry S. Brunner, John Hsueh-Ming Chen, and Marvin H. Runner. The Pennsylvania State University, University Park, Pennsylvania. 1961. 510 pages. (Library).

This is a report, both historical and horticultural, on the recorded observations by Professor Groff in China from 1907 to 1947. Professor Brunner, in asking the Society to review the book, stated—"You will find introductory and explanatory chapters in the report itself. There is no point, therefore, in taking time and space for any lengthy explanations of the work in this letter. Our purpose here is to ask your help in letting other scientists and students know about the Groff materials as a source of information about sub-tropical plants. The Library of the Pennsylvania State University will be prepared to respond to inquiries and make the usual arrangements for interlibrary loans."

G. Weidman Groff among his many other interests in China, devoted considerable attention to the plants of China and the exchange of plants between countries. He was greatly responsible for the introduction of the Lychee and wrote on its culture, as well as that of many other valuable plants particularly suited for Florida.

One of his painstaking efforts was to build up (but not completed) a card index system of all Chinese plant names as a means of recording reference to plant life in China. These contain, for each card entry, such facts as the scientific name, distribution in China, use (medicine, vegetable, fruit, etc.) references used by Groff, and even U.S.D.A. Plant Introduction numbers of material introduced into the U. S. An important aspect of the Groff index cards is the reference to both modern and classical Chinese the proper selection of plants. About 1000 plants are briefly discussed including bulbs, perennials and woody plants. These are identified by common and scientific name with a brief comment on each—such as suggested uses, care or location where it should be grown or special features

literature which treat useful plants and plant products.

An index to Professor Groff's cataloging system is contained in the report, as well as an interpretation of his manuscript notes on higher plants. There is a thesis on "Plant Exchange Between America and China" by Professor Groff's young successor in China, Richard E. Pride (deceased) and an account of the lives of Groff and others who were intimately involved in the Penn-State-In-China story.

The student of Chinese plants and those who have been intrigued by the introduction of plants will find this compilation of great interest for it contains many of Professor Groff's personal observations on Chinese plants including a draft preface to a contemplated plant manual. I think it a fine contribution to horticulture to bring together the personal observations and records of our outstanding workers. So many of them pass on and the accumulation of their life's work and intimacies with plants remain unknown.

A copy of this report is in the Society's Library.
J.L.C.

Propagating House Plants

For Amateur and Commercial Use

Arno and Irene Nehrling. Hearthside Press, Inc., 118 East 28th Street, New York 16, New York. 1962. 282 pages. Illustrated. \$4.95. (Library).

This book is chiefly a manual on plant propagation. It is divided into eight parts which unfortunately are highly repetitious. The reviewer judges that the audience is the novice for most of the material is either known to the plantsman or can be located in several earlier propagation books. If the age-old art of propagating plants had improved drastically, a new book at this level would serve a purpose but as it stands this is just another in the sequence of books on a thoroughly examined subject.

The line drawings are good and save reading much of the text. A section is devoted to a dictionary of house plants which gives more cultural information than details of propagation for the individual entry. It would seem to the reviewer that the authors missed the point here for one of our needs in an up-to-date dictionary of propagation with details for specific plants, especially the harder-to-propagate kinds.

If you do not have a book on propagation this one is acceptable, but readers with ample information on propagation will not find this book too exciting.

J.L.C.

The Saturday Morning Gardener

A Guide to Easy Maintenance

Donald Wyman, The Macmillan Company, 60 Fifth Avenue, New York 11, New York. 1962. viii + 236 pages. Illustrated. \$7.50. (Library).

An easily read guide with many suggestions for the easier maintenance of the home grounds. Suggestions are first made on the landscape planning of the yard, not necessarily how to do it but rather what should or should not be included. A major group of topics on maintenance are next discussed such as mulching, weed control, fertilizers, pruning, and lawn "substitutes." One of the main points made by the author is

that garden maintenance can be kept down by the proper selection of plants. About 1000 plants are briefly discussed, including bulbs, perennials and woody plants. These are identified by common and scientific names with a brief comment on each—such as suggested uses, care or location where it should be grown or special features such as flower or fruit effect. This book is a convenient and useful source of information for a home gardener.

CONRAD B. LINK

Other Books Added to the Library

The Kitchen Garden Book

Stringfellow Barr and Stella Standard. Dolphin Books, Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1961. 480 pages. No illustrations. \$1.45. (Library)

Fungicides in Agriculture and Horticulture

G. L. Baldit and E. E. Turtle (Chairmen, Pesticides Group), Society of Chemical Industry). (Society of Chemical Industry Monograph No. 15.) Gordon and Breach Science Publishers, 150 Fifth Avenue, New York 11, New York. 1961. iv + 146 pages. Illustrated. \$5.50. (Library).

Concise Garden Encyclopedia

Bernard W. Bishop. Philosophical Library, 15 East 40th Street, New York 16, New York. 1961. 190 pages. Illustrated. \$4.75. (Library)

Plant Taxonomy

Methods and Principles

Lyman Benson. The Ronald Press Company, 15 East 26th Street, New York 10, New York. 1962. x + 494 pages. Illustrated. \$11.50. (Library).

Soil Management for Conservation and Production

R. L. Cook. John Wiley and Sons, Inc., 440 Park Avenue, South, New York 16, New York. 1962. xii + 527 pages. Illustrated. \$9.95. (Library)

Greenhouse Gardening as a Hobby

James Underwood Crockett. Doubleday and Company, Incorporated, 575 Madison Avenue, New York 22, New York. 1961. 288 pages. Illustrated. \$4.95. (Library).

Historical Background

Arts, Skills and Needs of Ancient and Modern Farming

Frank Norton Decker. Privately published by the author, 113 Rugby Road, Syracuse 6, New York. 1961. 47 pages. (Paperback). Illustrated. (Library).

Advances in Horticultural Science and Their Applications. Volume I

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Phlox alyssifolia

The Gardeners' Pocketbook

Phlox alyssifolia

Fortunate have I been to live within the range of a number of western creeping Phloxes. Wisely instructed have I been in appreciation of fine form and distinctive coloring. The insistent spur over many years to seek out "different" and more perfect types by the inveterate collector of native flowers, Mrs. J. Norman Henry, has augmented an inborn tendency to explore, to see what grows upon the next hill, to pry into Nature's fastnesses where lavish planting has been, supposedly, planned to blush unseen.

The rewards in *Phlox alyssifolia* have been multiple. Sometimes the prize has been a single tuft, a close cluster of blossom wider lobed, the better displaying an unusual intensity of color. Sometimes it has been a vista of a quarter of a mile of pinkish glow under a warm June sun.

The first little plant of *P. alyssifolia* was brought from the Black Hills to my prairie garden all of forty years ago. Its rich lavender-pink, inch-wide florets and delightful fragrance had taken my fancy. It was, perhaps, a reward of pure affection that my choice was a plantlet with young adaptable roots and the narrow spadeful of earth amply deep. The little plant grew and in time spread in perfect

mat formation from stolons of some depth. Advancing plantlets stood out a bit from the mat and filling in was accomplished as the new plants enlarged to maturity. All under four inches or less of height. How wide the mat would have grown over the years is conjectural. It has been kept to three or four feet.

The leaves of *P. alyssifolia* are half an inch to an inch long, wider than the needle leaved kinds and white margined at maturity. Not shrubby in the sense of true woodiness, the stems are persistent and usually in winter a tiny bit of green may be found at the tips. Leaves are put out along the newer stems and quickly enlarge with the warmth of spring. In no time, it seems, buds are set. Flowering begins in May, to last a good month or more, varying with different plants and exposures.

Either in the common form or the large flowered form which Dr. E. T. Wherry in his monograph of the genus has named *P. a.* var. *abdita*, the color of *alyssifolia* is most often a light tone of pink with some lavender and the petals not notably wide. Flowers of both good shape and color may require some hours of hunting. A favorite field is the narrow outcrop of Greenhorn

limestone bordering the Black Hills. From it have come to my garden an almost moon-faced very pale one, a creamy albino and a number of the best rich toned pinks. From farther within the Hills in limy footing a lovely one of definite salmon cast. Elsewhere individuals that hint of red but tend toward magenta or even blue have been observed and I know where grows a pure white albino with fine flowers. White, however, is well provided in the garden by several other local species, *P. andicola* with large flowers and the lesser ones, *P. andicola parvula*, *hoodii*, *diffusa scleranthifolia*, *muscoides*, and *bryoides* and a willing import, *P. longifolia*.

In its choice of habitat *P. alyssifolia* shows a taste for lime. Haunts of the large flowered *abdita* appear confined to the major limestone strata of the Black Hills and outwash formations on the prairies to the east. Otherwise the species dips into Nebraska and North Dakota, spreads across northeastern Wyoming, covers much of prairie Montana and brief bits of Saskatchewan and Alberta.

Offset plants with a year or two of age of any of the local species are readily transplanted bare rooted. A branched root of six or eight inches is best. They are safely moved in flower if plenty of water is provided until a good rain comes. These hard foliaged phloxes seem more dependent on light and air and moisture content than most plants. Dried out foliage and stems do not recover, so in times of extreme air dryness complete cover is resorted to, such as tin cans. But give all possible light and air in the cool parts of the day and at night. Transplanting is safest in late fall and early spring. Large plants with old woody roots are found impossible to move.

Clay, abundance of fine or coarse stone and a light supply of humus compose *P. alyssifolia*'s soil. Drainage is always excellent. Half to full high shade for mid-day coolness or to compensate for high humidity is permissible. However, several hours of sun, early or late, are needed for heavy bloom.

Phlox hunting continues a happy pastime. Somewhere, perhaps, there are flowers with "real knockout pink."—CLAUDE A. BARR, *Smithwick, South Dakota*.

Metalphoto—A Promising New Plant Labeling Method

The search for economical, weather resistant, and shock-proof materials for making display labels has been going on as long as display gardens have been in existence. All the materials currently in use have one or more faults, such as brittleness, loss of legibility within a few years, or high cost. Low resistance to weathering and brittleness are the reasons why the U.S. National Arboretum has sought an effective substitute for its mahogany-grain, laminated plastic labels.

In an attempt to solve the weathering problem, which made our plastic labels illegible within 3 to 5 years, a small-scale testing program in which plastic labels were coated with acrylic and epoxy resins was initiated. These resins were ineffective. Inquiries about new materials and methods to other Federal agencies and institutions with similar weathering problems led us to a promising method of reproducing images on photosensitive anodized aluminum plates. Such a process is known commercially as Metalphoto (Metalphoto Corporation, 13581 South Miles Road, Cleveland 28, Ohio).* Reports from commercial, federal, and state institutions that have used this method outdoors for 2 to 10 years have been unanimous that photosensitive plates should satisfactorily solve our weathering problems.

The manufacturer describes Metalphoto as consisting of aluminum plates with photosensitive silver halides impregnated into a porous structure of aluminum oxide. In processing the plates, microscopic particles of silver are locked within the anodized layer of aluminum oxide. This physical-chemical union is claimed to produce a system not faded by sunlight exposure; resistant to temperatures up to 1000° F; impervious to salt spray, organic solvents, lubricants, scratching, cracking, and peeling; and resistant to fungi. Photosensitized aluminum may come closer to solving our label-weathering problems than any material that we have used or tested.

Basically, the procedure followed in making labels from photosensitive aluminum is very similar to that used in making any picture. All that one needs is a good negative, a dark-room, a contact printer, and the usual dark-room equipment.



U. S. DEPARTMENT OF AGRICULTURE

An example of an illustrative label on Metalphoto

[11 × 12 inches]

Visits to agencies using this method made it apparent that the printing and processing stages were fairly simple and inexpensive, but that the layout and negative work were both expensive and time consuming. Copy had to be individually lettered on paper and photographed, and finally the negative developed. Since most of our labels differ in wording, the process had to be repeated with each new label, thus limiting greatly the number of labels finished in a given period. To reduce the expense and time involved, negative-like sheets were made by lettering directly on a medium-gauge acetate plastic, using a black plastic ink and a Leroy Lettering Set*. This method worked very well, but was time consuming. To save time, we converted our Hermes engraving machine (Model 1 SX)* to do the lettering by designing a metal pen holder to replace the cutter spindle. In design, the pen holder is very much like the cutter spindle, but is made hollow to utilize a pen, supported at various levels. The pen used

was from a set (Koh-I-Noor Radiograph No. 3065-57)* with several interchangeable points that make lines of various widths.

Preliminary cost estimates indicate that it would be possible to produce a 3 by 5 inch label, as shown in the accompanying illustration, for approximately \$1.20 to \$1.50 each. Laminated plastic labels of the same size cost \$1.17 each to produce. While the initial cost of producing labels on photosensitized metal is high, the prospect that there would be little or no loss from breakage and that they would give many more years of service has been reason enough for us to make use of Metalphoto on a trial basis. ROLAND M. JEFFERSON, *Taxonomist, U. S. National Arboretum, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C.*

*Mention of a product does not constitute endorsement by the United States Department of Agriculture over similar products or a guaranty or warranty of the standard of the product.

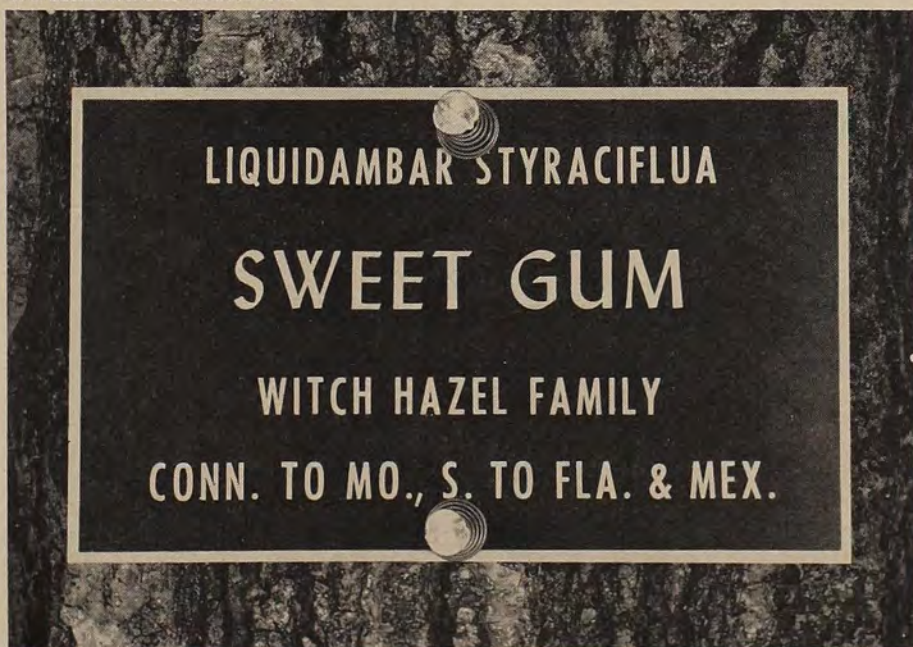


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A positive image Metalphoto label
[4 × 5 inches]

A negative image Metalphoto label
[3 × 5 inches]

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A Distribution Note on *Rhododendron japonicum*

This handsome azalea inhabits the grass and scrub-wooded moorlands of Japan, namely Kyushu, Shikoku, and Honshu. *Rhododendron japonicum* does not occur naturally on Hokkaido although plants are scattered in the hills around the city of Matsumae, near Hakodate, and are said to have escaped from cultivation.

E. H. Wilson and A. Rehder, in *A Monograph of Azaleas*, 1921, recorded that the distribution of *R. japonicum* was restricted to the main island of Honshu as far north as Mt. Hayachine. Actually, this azalea has a considerably greater distribution than Wilson was able to examine under the circumstances of travel that existed when he visited Japan. On Kyushu, *R. japonicum* occurs on low rolling hills not far from Kurume and is scattered through pastures where most other plant species have been grazed off by cattle. Except for pines and chestnuts, the azaleas pretty much dominate these hot, sunny plateaus.

At its northern limit of natural distribution, *R. japonicum* is abundant around Mt. Hakkoda, Honshu. Here, the azaleas grow around the perimeter of moist sphagnum bogs at elevations up to about 3000 feet, under such swampy conditions that one sinks into several inches of water when invading these bogs. Occasionally, *R. japonicum* can be found in lightly wooded coastal areas along the Pacific coast of Honshu, but essentially it is an upland, sun-loving plant. Under such conditions it grows to a height of 3 to 4 feet, producing stout,

erect stems from a somewhat stoloniferous base. It flowers from late April to late June, according to locality. The flowers, which appear with the leaves, vary from clear golden yellow to brilliant orange-red. These are borne at the ends of the shoots and in clusters of 6 to 12 flowers, each bloom being 2 to 3 inches across.

Despite the long history of *R. japonicum* as a cultivated plant, our information as to its flowering habit is rather incomplete. It is doubtful that there is material in cultivation that is representative of variation which can be seen in the wild in Japan. For example, the yellow-flowered plant was considered to be so rare that Wilson regarded it as a distinct form that he named *R. japonicum* f. *aureum*, based on material cultivated in the Tokyo Botanic Garden. Had he been fortunate enough to see *R. japonicum* in Kyushu, Wilson might not have considered the yellow character of such importance, for about a third of the plants on the hills around Kita-yamada have yellow flowers. The colors range from yellow through yellow-orange mixtures and pink to orange-red. It was reported to me that seed gathered from plants with yellow flowers produces populations that are almost exclusively yellow-flowered.

As one follows the distribution of *R. japonicum* northward through Honshu, the yellow-flowered type ceases to be common. At Hakkoda-san, all of the plants are uniformly orange-red, so much so that one could regard this as a distinct biotype. It is interesting to note that the greatest range of flower color is relegated to the warmer end of the distribution with more tendency toward yellow flowers. The only close relative of this azalea in the Orient is *R. molle*. That azalea comes from even warmer localities of south China and it is exclusively yellow-flowered.

Rhododendron japonicum is seldom grown in Japanese gardens except as a collector's item. This fact can be attributed to the deciduous nature of the plant, its lack of amenity to trimming, and the difficulty of transplanting seedlings from the wild. Even in western gardens, this species and the related *R. molle* is far less known than the hybrid races developed from them. If future breeding is undertaken with *R. japonicum*, the rela-

Rhododendron japonicum

... three varied habitats

found in Japan:

- [Top] dry, sunny field at
Seidagawa, Kyushu
- [Center] Upland sphagnum bogs on
Mount Hakkoda, Honshu
- [Bottom] edge of a bog pool on
Mount Hakkoda, Honshu
(Background plants: Abies,
Ilex, Pinus, evergreen
Rhododendron)

tionship of origin of the parental stock and flower color should be given greater weight than has been done in the past. Breeders attempting to develop deciduous azaleas for southern gardens might well consider the use of *R. japonicum* from Kyushu while those who are directing their efforts toward hardiness would be more interested in the type that occurs in northern Honshu.—JOHN L. CREECH, *Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.*

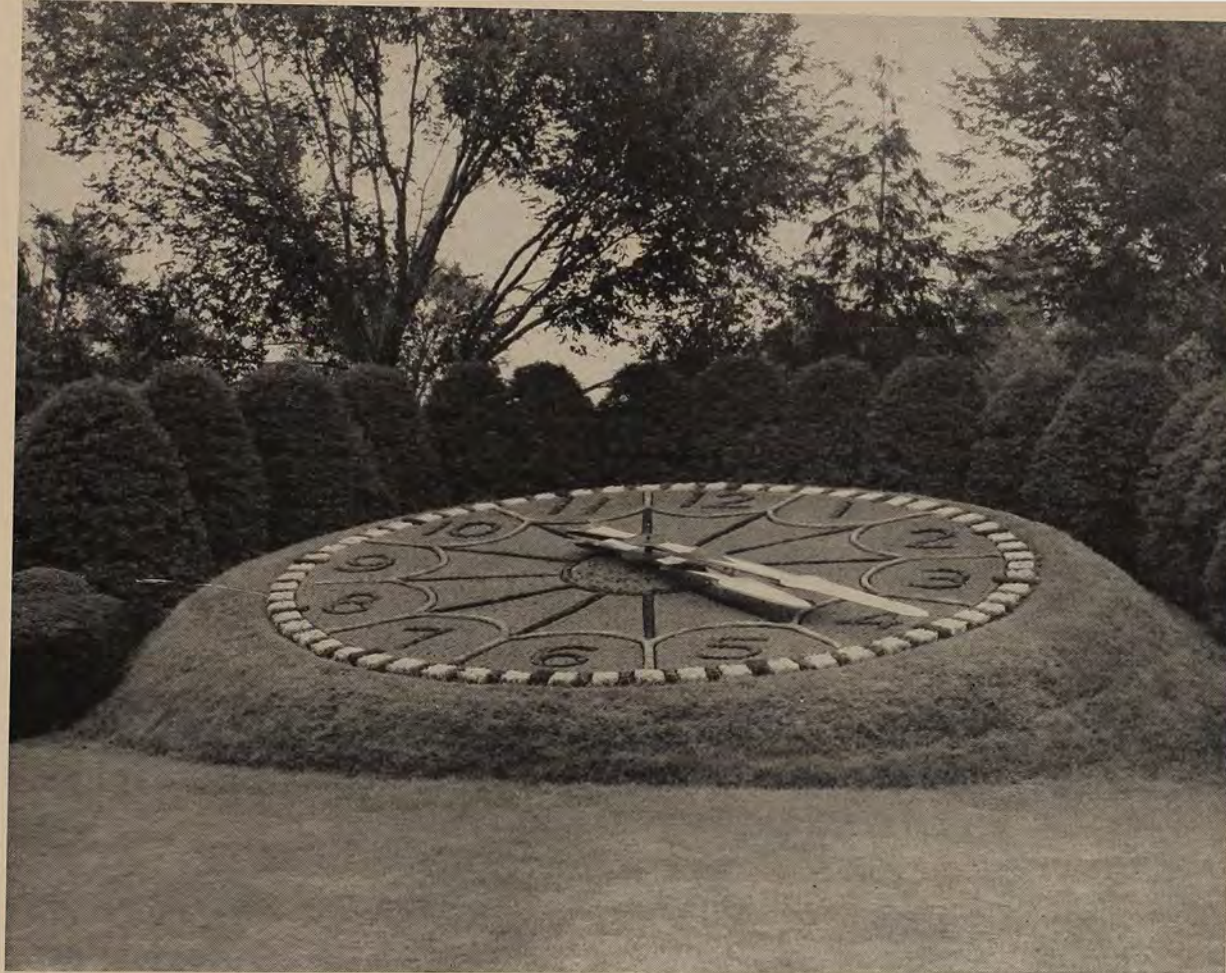
Close-up views of

Rhododendron japonicum

showing the red-flowering form at Mount Hakkoda, Honshu [top]

and the yellow-flowering form at Seidagawa, Kyushu [bottom]





A Floral Clock

About one and a half miles from the office of the American Horticultural Society, on Bladensburg Road, just across the District line in Maryland, is Fort Lincoln Cemetery. This is the site of one of the forts built to protect Washington during the Civil War and was also the site of several duels of Colonial days. The feature at the main entrance of the cemetery is a large floral clock built in 1938. The face of the clock has a diameter of 24 feet with a 2-foot border of grass. The hands are of cast aluminum; the minute hand is 16'4" long and the hour hand 12'9" long. The Seth Thomas works are housed in a large pit underneath the center of the clock face.

Planting of the clock is done about May 10 to 15 each year and maintained in this manner until the first of November. During the winter months the face of the clock is sodded and painted numerals are put in place.

Approximately 9000 plants from 3" pots are used to plant the clock as shown in the illustration. The field or

face of the clock is planted with green *Alternanthera* (6500 plants). The red *Alternanthera* (600) are used to form the small circle directly under the center of the hands, in the 48 digits representing the minutes and in the numerals one to twelve. The hour digits are marked by pink *Alternanthera* and also the ribs of the clock (450 plants). *Sedum fosterianum* (700 plants) are used to separate the hour and minute digits around the face. The lower segments of the clock ribs and the line separating the numerals are planted with *Santolina chamaecypariss* (500 plants). *Teucrium chamaedrys*, germander (300 plants) is used in the field of the small circle under the center of the clock hands.

The clock is weeded and trimmed or sheared approximately twice a month until past mid-summer and then once a month. This requires 3 to 4 days each time. Approximately 150 to 160 man-hours are required for planting.

A background planting of hemlocks, cypress, yew and holly provides a setting for this floral clock.—WILLIAM H. HATFIELD, Superintendent.

Narcissus viridiflorus

To the southerner living where the winter-blooming forms of *Narcissus tazetta* make one of the best groups for culture, the idea of autumn-flowering species is intriguing. Success with single bulbs of *N. elegans* and *N. serotinus* lead to the purchase and planting of bulbs of *N. viridiflorus* in the autumn of 1960. These did not flower, but made excellent leaf growth during the following season. Then, after the leaves had withered away, in mid-October scapes began to appear and soon, there were flowers, curious starry things with narrow perianth segments and a shallow, almost non-existent cup of deeper green. As the flowers aged, the color on the perianth became somewhat more of a gray green, but the cup continued a deep dark green. Depending on the strength of the bulb, the scape carried from one to as many as four blooms, on stems about a foot high at best, more lower than that.

Because the leaf growth had been so good a dozen more bulbs were purchased and planted in the autumn of 1961 and again no bloom, but in time fine leaf growth.

Since there has been a period of unusual cold in January 1962 examination was made to see what leaf injury there might be. Apparently all the new leaves had matured sufficiently so there was none. This was not the case for many tazetta narcissus nearby. There was no thermometer at ground level there, or elsewhere on the place, but the thermometer at the usual breast height read 10° F. on the coldest night.

No special preparation was made for the bulbs, other than routine soil preparation which here on our almost pure sand, meant old peat added and a handful of bone meal dug into the soil below the bulbs but within reach of their rooting. The location is one in which there is almost no shade all summer, and as drainage is almost instantaneous, summer rains seem to do no harm.

All the flowers set seed pods, with seed, but none was allowed to mature with the idea of letting all plant activity go into bulb formation, so it is not possible to report how many seeds might have matured. As all narcissus growers know, seeds appear sometimes to be forming and then fail.

The most unusual thing about the plant, other than the green color, is the scent, a delightful and strong scent rather like that of the tazetta commonly known as Chinese Sacred Lily. It is strongest during the warm part of the day.

For garden effect, one cannot boast of this plant making any "show" at all. Possibly, if there were far more scapes that can be had next autumn when all eighteen bulbs should flower, and again possibly if one knew what ground cover plant might be safe to use, and to furnish a contrasting color to green, one might achieve this. Gray leaved plants are rare here, and the bronzy forms of *Ajuga* which do grow well are too aggressive! They would hold too much moisture at ground level. The result, is that it can be no more than a "conversation piece" here. Possibly elsewhere, it would meet a better fate.—B. Y. MORRISON, *Pass Christian, Mississippi*.

Some Outstanding Ground Cover Plants

The value of ground cover plants, other than grasses, is likely to be more and more appreciated as the problem of garden maintenance grows more acute. There are many kinds to choose to beautify tough spots where it is difficult to maintain grass in good condition, and, at the same time, bring added interest in form and texture to the garden scene.

Those that remain evergreen are naturally the favorites. One that enjoyed a rapid rise in popularity is Japanese Spurge, *Pachysandra terminalis*. Not too many years ago it was scarcely seen outside a botanical collection. Now it is grown by the millions. Thriving in sun or shade, it is especially valuable to carpet bare ground beneath mature trees, and to clothe shaded banks. The white flowers in spring are not showy but bees love them, and the white translucent berries are sparsely produced. The silvery variegated form adds interest but is less robust. Though usually losing most of its leaves during winter in the north, a patch of Allegheny *Pachysandra*, *P. procumbens*, is interesting with its larger non-glossy leaves and spikes of purplish-pink flowers in spring.

Periwinkle, *Vinca minor*, is a real old-time favorite that appears like a native

in some states. There are many places in the garden where it may be used to advantage with its dark green glossy foliage and blue flowers in spring. A pleasing contrast may be gained by mixing in some of the white flowered form. The larger and longer flowering Bowles Variety is more clumpy in habit, but a nice addition to the blue flowers of spring.

English Ivy, *Hedera helix*, is a vigorous spreader with freely rooting stems and forms with interesting variations of leaf size and shape. Safest in shady places in the north, though less likely to burn from winter sun as a ground cover than when grown as a vine on walls.

Perhaps the toughest place in which to get a ground cover established is under Beech trees. One plant that will do it, given a good chance, is the trailing form of *Euonymus fortunei* called *coloratus*, from the purple coloring the leaves take on from fall till spring. Plants set under trees need a little extra help in getting started, especially so under such a fibrous surface rooted tree as Beech. A handful of compost for each plant as set and watered in is the least that should be given.

Bearberry, *Arctostaphylos uva-ursi*, is one plant that thrives best in poor acid sandy soil. Rather slow to get established and best from pot-grown plants, it is well worth waiting for. It makes a low dense evergreen mat that is especially attractive on a sunny slope inland or at the seashore. The small white to pinkish flowers are followed by red berries, and the leaves take on a bronzy tint in the fall. Shore Cowberry, *Vaccinium vitis-idaea*, is a closely related plant. Variety *majus* has lustrous dark green leaves on stems about eight inches high, white or pinkish flowers and dark red berries. Even a small patch is attractive.

Low Junipers grow and look well on well-drained sunny slopes and among rocky outcrops. Sargent Juniper, *Juniperus chinensis sargentii*, gives a billowy effect of bluish-gray up to eighteen inches or so. Shore Juniper, *J. conferta*, is a real sprawler to give a mat of light green even on sand dunes at the seashore. Both these are Asiatic natives. Creeping Juniper, *J. horizontalis*, is a North American species with long trailing stems. The steely-blue form known as Bar Harbor really hugs the ground and is very effective draping over low rocks. Two other handsome forms are

var. *Douglasi*, known as Waukegan Juniper, with a bluish foliage, and *Plumosa*, Andorra Juniper, with green feathery foliage. Both take on a purple tinge in the fall which is most attractive.

For roadside banks and naturalistic places, such vines as *Akebia quinata*, *Celastrus orbiculatus*, *C. scandens*, *Clematis paniculata*, *Lonicera japonica* Halliana, and *Parthenocissus quinquefolia* may be planted for bold mass effects; but keep a sharp eye on *Akebia* and Hall's Honeysuckle and have sharp shears ready to restrict them if necessary to keep them from embracing desirable shrubs or trees. A choice little evergreen plant for a shady spot is European Wild Ginger, *Asarum europaeum*, that deserves to be seen more often than it is. The brownish flowers are borne close to the ground and make no showing to speak of, but the dark green leaves make a very attractive mat. One wonders how the name Bishop's Goutweed was first applied to *Aegopodium podagraria*. Variety *Variegata* is less invasive than the green type, and must at one time have been very popular judging by the plantings seen in old settled communities. Although it is herbaceous, it is useful to brighten up dark corners. Sempervivums are not usually thought of as ground cover plants, but a picture comes to mind of a most interesting and colorful effect produced by a collection arranged on a lawn slope. Another picture in memory is that of a farmhouse front yard shaded with big Sugar maples and carpeted with *Sedum ternatum* in flower. It would appear that plants able to take over problem spots without much care have a good future in our gardens.—HENRY E. DOWNER, *Poughkeepsie, New York*.

Updating the Beach Plum Story

The first noting of the Beach Plum, *Prunus maritima* seems to have been that of the Florentine voyager, de Verazano, who observed the plant in the general area of the mouth of the Hudson River in the year 1524. The long history of Beach Plum interest and culture since that time was summarized by the present writer in the April 1944 issue of *The National Horticultural*

Magazine. The cultural aspects were reviewed a few years later in *Arnoldia*, published by the Arnold Arboretum of Harvard University.

Since then, two or three important additions have been made to the story. First, there is the work which has been done in the last fifteen years on Chappaquiddick Island, Edgartown, Massachusetts, by Russell B. Stearns. At the beginning of his venture, Mr. Stearns had in mind fruit production on marginal land. Over the years all seedling material has been discarded and the work has become exclusively that of the propagation and dissemination of clonal varieties on their own roots.

The original clonal varieties were those selected by J. Milton Batchelor and Wilfrid Wheeler prior to World War II. There were also two varieties taken from the wild by Mrs. Ina S. Snow of North Truro, Massachusetts, one by J. H. Putnam at Eastham, Massachusetts, and one from the New Jersey Agricultural Experiment Station. More recently these varieties have not been propagated but have been replaced by selections obtained from the wild on Chappaquiddick Island and on the island of Martha's Vineyard of which it is a part.

Outstanding among the Stearns selections is the variety Autumn, which is an upright grower, a fairly easy propagator and a fairly regular bearer of small, small-stoned, purple fruit which are valuable in jelly making both because of a high yield of pulp and because of taste and flavor. This variety has the ability to pollinate itself which is outstanding among Beach Plum clones. Its fruits ripen about mid-September. Later its leaves assume a dark red color, hence the name Autumn.

Another variety of Stearns introduction is called Northneck. This is suspected of being a natural hybrid between a yellow-fruited and a red- or purple-fruited variety. Its fruits, when they appear, are large and colorful. The foliage has the aspect of that of some of the yellow-fruited clones. In habit it is more spreading and seems more likely to send up sucker plants, thus making it a highly desirable plant for roadside planting.

A third Stearns variety called Squibnocket was originally dug out of a sand dune just back of an Atlantic beach.

When the digging started, the plant spread over an area eight or ten feet across and was only about a foot high. As the work progressed, it was revealed that the original root was down on the level with the beach and that tons and tons of sand had to be removed in order to reveal the structure of the plant. Since this portion of the beach has held its own against repeated hurricanes, this variety should find a useful place in seaside landscaping.

Two other Stearns varieties, one called Stearns, and the other Makonikey, appear to be good fruiterers if pollinating plants are nearby. These two varieties seem to be quite well worth while for the person interested in raising Beach Plums for fruit.

It is just as well that these selections have been made and propagated because in the few years since they were taken from the wild, storms and building have destroyed all but one of the original plants. These varieties were not selected from wild plants directly, however. What happened was that when the Stearns plantings were first made Beach Plums from all over the general area were planted in orchard lay-out. Years later an evaluation of the cultivated plants yielded the above varieties. This was not true of the older varieties which were picked out from wild plants only, chiefly on the basis of a single crop of fruit.

These varieties, chiefly Autumn, are now in own root production with the hope that Beach Plums of good quality can be available to everyone. It has been a long, expensive, and heartbreaking process of working up a few bits of wild pieces into thousands of well-rooted nursery plants. In the process a few things about the culture of Beach Plums have been learned or confirmed.

For one thing, it is essential in large plantings for fruiting purposes that clonal varieties be used so that whole rows or blocks will come into bloom at the same time, thus making spraying and other cultural practices practical. Also, because Beach Plums seem to be best able to hold their own in sandy places it was long thought that good soil and regular fertilizing programs were not essential. Current observations of plantings on good soil, far from the sea and well fed, seem to cast doubt on this belief.

It is becoming increasingly clear that the best plants are those on their own roots rather than those which are grafted on any one of half a dozen other species of *Prunus*. While the own-root plants may have difficulty in becoming established, once they are, they become just about as indestructible as plants can be. Very often a newly set plant will stand still and for a season or two add very little to the size of its top growth. If such a plant is cut to the ground during a dormant period it will throw up a vigorous, well-balanced structure of branches. From this practice has come the observation that the best way to prune a Beach Plum is to cut it right to the ground every seven or eight years. This will, of course, throw the plants out of production for a season but will prove to be the most economical and effective way of keeping the tops within bounds and with plenty of bearing wood.

One other important development, which apparently has not yet reached any conclusion, is the work on the genetics of the Beach Plum, which was started by Dr. Peter Ray some years ago while still at Harvard University. It is from such studies of existing varieties and intelligent crossings of both wild and cultivated clones that the varieties of the future will come. From such studies, too, can come a sure knowledge of which varieties to plant together to obtain ample sets of fruit.—GEORGE GRAVES, *Vineyard Haven, Massachusetts*.

Note On Florist Gardenias in Bermuda

When you speak of gardenias in Bermuda you will probably be misunderstood, for Bermudians call quite a different but similar-looking plant by this name. *Tabernaemontana coronaria* 'Plena', or more simply *Cape Jasmine*, is the Bermuda "gardenia" and is so listed in the local Garden Club's excellent publication: *The Bermuda Garden*. In fact the true gardenia, *Gardenia jasminoides*, a member of another family, is not listed at all, quite naturally, since it is not seen in the Bermuda garden.

Due to an alkaline soil derived from the weathering of the thick limestone cap, florist gardenias, when they had been tried in Bermuda, had, I was aware, done very poorly, suffering from severe

chlorosis. Yet because the warm, moist, equable climate ought to be ideal. I started to experiment a few years ago.

A Hadley Gardenia was sent along by my friend Dr. Walter H. Hodge in conjunction with an azalea experiment. Peat moss, sawdust, and composting materials, aged a bit, produced an acid soil of a sort. The gardenia grew in it but not very happily; and when we moved the Hadley it did not survive a short journey.

My search for a suitable acid growing-medium lead to the Bermuda marshes where tests showed that a surprising acreage of strongly acid muck, or peaty material exists. In particular the soil of Paget Marsh—in the drier parts a lovely acid muck for the first ten inches—seemed just right. The owner, a Government Trust, kindly gave me permission to remove some soil and to start an experimental garden in the Marsh itself.

Then from the Hadley Nurseries in Massachusetts, originator of the marvelous Hadley variety, a shipment of gardenias was obtained—no soil on the roots, of course, for Bermuda is just as particular in this respect as is the United States. Some of the plants went into a raised a built-up bed in Paget Marsh (the kind a native in the wet tropics would use for growing northern flowers or vegetables). The water level at the site chosen was commonly about a foot below the surface of the soil. The raised bed added another foot or so which it was hoped would protect roots from flooding during unusually wet periods. The site was sunny much of the day and beautifully protected from punishing winter winds.

The balance of the plants went into marsh soil in a slathouse; rendered too dark, however, by rampant vines and surrounding trees. Right from the beginning the Paget Marsh gardenias did extremely well, but those in the slathouse did badly. The best grew poorly. Despite the acid soil they showed chlorosis. Extra water and soil amendments didn't seem to help. The best grew weakly; some died. A professional horticulturist from southern United States who had been much impressed with the look of the Paget Marsh gardenias commented of those in the slathouse: "You can take a few cuttings then throw them away." And so also it seemed to me.

But instead some oak rum kegs were

bought from the famous Bermuda house of Gosling. Sawn in two and provided with drainage they make efficient and attractive tubs. Soil and plants were transferred to them. It was early summer. Fearing the full impact of the Bermuda summer sun, a part-shade location was chosen.

It was amazing after three months how well the plants looked that received the most sun. That autumn all tubs were moved to a site which provided full sun. During the cool months most of the plants filled out nicely, and May provided many fine flowers.

At the same time, in the Marsh, flowering was very heavy. Many of the blooms measured four to five inches across. Here the Hadley Gardenias seem completely happy. Some fertilizer has been used, but the plants have never needed spraying. They appear to revel in the rich soil which is always moist even in driest weather due to capillary attraction. Thoughtfully, too, low horizontal branches have layered themselves providing "for free" many new plants.—
JOHN KNOWLTON, *Warwick, Bermuda.*

The Indispensable Ivy

Ivy is so much a part of our garden tradition that every one recognizes it on sight. The most common ivy through the South is usually *Hedera helix* var. *hibernica*. It is only in recent years, however, that the myriad forms, horticultural cultivars, have been making a way into general use, many of them so strikingly distinct from the common forms of ivy, that the new gardener does not immediately recognize them.

The genus *Hedera*, has only five species, *canariensis*, *colchica*, *helix*, *nepalensis*, and *rhombea*.

The plant is of the easiest culture and its propagation presents no problem. Cuttings may be taken at any time of the year, rooted with or without the aid of new rooting powders, but are best taken from wood of one season's growth. Being a plant of the forest floor it is partial to shade but if sufficient moisture is supplied it will endure considerable sun. There is a common saying in these parts, "The first year it sleeps, the second it creeps, and the third year it leaps." This is often remarked when one wants ivy on

a wall, and it appears reluctant to start its upward clinging way. A year's patience and care will reward one.

The particular point of these notes is to draw attention to the ivies that one may have other than the most common.

The Canary Island Ivy, hardy as a ground cover to the line where zero temperatures are rare. This is a beautiful species with apple green leaves, whose new growth, in spring and again in fall, is a golden yellow, above the older green leaves. Here, this somewhat more tropical ivy is happier in full sun than the common ivy, holding its leaves well above are ground level so that one sees it as a mass when used as a ground cover, and showing a fine contrast with the level of the lawn. It is available in several variegated forms none of which is as cold hardy as the type. The commonest one is known as Canary Cream, with fine white variegations and grayish areas as well. Another form is known as Oxheart ivy, with heart shaped leaves and a faculty of showing fine purple red leaf colors in cold weather.

Next most common in the South, among the large leaved ivies is *H. colchica*, from Asia Minor, by its name reminding us of Colchis and Jason and his Golden Fleece. This of all ivies is the most easily identified, and that, by its curious scent when the leaves are crushed, a scent that recalls celery to some, and utterly distinct from that of any form of common ivy.

Its leaves are large and well formed, shining dark green and dearly beloved by some flower arrangers who use a leaf or two to hide the mechanics at the base of an arrangement, lasting longer than the rest of the composition. Its one form, var. *dentata* is less cold hardy than the type, although hardy at Philadelphia.

H. nepalensis is almost impossible to find in trade or even elsewhere. It has finger-like leaves, of a curious gray green color and its fruits are reported to be yellow, not black which is the usual color.

From Japan comes *H. rhombea*, a slow growing ivy with chunky leaves of moss green. It would seem that this may develop as an excellent ivy for South Carolina gardens.

Old *H. helix*, the common ivy of Europe is the most widely known species.

The type is less common in many parts of the country than the Irish ivy, *H. helix* var. *hibernica*, a form that is somewhat larger in all its parts and much more rapid in growth, with green veins.

The varieties that have been propagated as clonal lines are not all equally stable, and it has been reported more than once, that a choice form, rapidly left its original form, especially when it was well fed and tended. This is a warning, so that if one finds a particularly fine form with slender leaves, close internodes and slow growth, do not overfeed!

The variations have to do with several marked changes. Variegation is available both in forms with marginal white or gold, marbled patterns of white, or central blocks of color. All are approximately equal in cold hardiness and many of the forms with white variegation show charming touches of pink and rose when cold weather comes. The next group is distinguished by lobing; deep enough for names like Star, Birdfoot, to appear, or shallow with broad leaf blades toothed, rather than lobed, and varying in number from three to seven or more. In addition, some of these varieties have developed sinuate margins so that one finds fantastic names like Telecurl, Mandar's Crested, and so on. Names like Four Square indicate almost a total lack of lobing, and Gladiator suggests the long shield held in body defense. There is also a whole group, usually referred to as the Ramosa Complex because of the abun-

dant branching, often from each axil. These make ground covers very quickly, are delightful in pots where they may trail down, or planted on supports from which they cascade. By choosing the precise ivy one wants, an amazing series of contrasts can be created on any wall, as the size of the leaf, its outline, the leaf color, and the degree of branching will all contribute to the total surface effect.

In the South we do not have to consider cold hardiness as is the case in the North, but the form from Roumania sent to the Brooklyn Botanical Garden years ago and distributed as Rubaiyat, is a charming form, with pea green leaves, that turn bright red here, in cold weather.

Now that many are turning seriously to the use of ivy on forms made of wire, so that one may have a quickly contrived "pseudo-topiary object" the gardener may manage more than one type if he will pay similar attention to the choice of the variety to be trained. And if one is fortunate to have access to the mature fruiting branches, found only on old mature vines, he may use that type for his topiary as well, and have in addition to the leaf beauty, flowers of light green in late summer or early autumn, followed with good fortune by the usual black berries.

Let us repeat, the ivy is a remarkable plant and worthy of far more attention than it has had.—W. O. FREELAND, *Columbia, South Carolina*.

A Message From the President

Progress of the American Horticultural Society has been most ably summarized by Past President Dr. Donald Wyman in his report to the 17th American Horticultural Congress held in April at Norfolk, Virginia.

As your new President, I would like to tell you of plans of your Officers and Board of Directors for the coming year, of a change to be noted in our dues structure, and of areas in which you as a member can assist horticulture in this great country—through A.H.S.

The Society is fortunately in excellent financial condition due largely to the tireless volunteer efforts of our Acting Secretary-Treasurer and Director, Mrs. W. T. Wilson. But

A Message From the President, continued

this good lady cannot continue indefinitely at the pace she has set. An organization of this scope needs a paid Executive Secretary to coordinate and to promote its many programs—and that is this year's goal. But the cost must come largely from the dues of new members. Won't you help by enrolling a non-member organization you may belong to, or the interests of just one or two of your friends?

Our Editorial Committee and Editors will continue this magazine and the *Forum* on their customary high level of contribution, with your comments on either one appreciated at any time. A new peony handbook should appear shortly and one on lilies is in process. And our many other committees have plans for intensified work in their several areas. A strong membership campaign is already underway and new studies are being initiated in the field of horticultural education as well as a survey of plant quality and hardiness ratings in cooperation with several of the single plant societies. Work will continue in plant nomenclature and registration, in standards and ethics, in writing and advertising, and in the Society's seed distribution program. A new system of A.H.S. medal awards by member organizations is under study by the Committee on Awards and Citations.

Our membership should note continuation of the Speakers Bureau which has enabled several organizations to secure speakers for the cost of travel expenses only, during the past year and should watch for announcement of a splendid A.H.S.-sponsored horticultural travel tour being planned for April-May, 1963—to the great flower show in Hamburg, Germany, the Keukenhof Bulb Gardens in Holland, the Royal Horticultural Society's Rhododendron and Chelsea shows and to many seldom-seen English gardens.

In an international vein, I am pleased to record that Dr. G. H. M. Lawrence will continue to represent United States horticultural interests on the International Commission on Plant Nomenclature, and that Dr. R. J. Seibert will continue as A.H.S. representative of the Council of the International Society for Horticultural Science, while Past President Wyman will describe the activities of A.H.S. and Miss Margaret Herbst, Chairman of our Committee on Promotion and Publicity, will discuss Amateur Horticulture in America at a symposium on that subject at the forthcoming International Horticultural Congress in Brussels.

In the matter of dues and to encourage increased membership, the A.H.S. is reversing a common practice of today in holding firm on its annual rate for individuals and in reducing both organization dues and individual membership renewals. The following revised dues schedule was approved at the Plenary Session of the last Congress to be effective as of July 1, this year:

<i>Individual Members</i>		<i>Organizational Memberships</i>	
1 year	\$ 6.00	Annual for a national organization	25.00
2 years	11.00	Annual for a state organization	15.00
3 years	15.00	Annual for a local organization	8.00
Sustaining	25.00	Annual sustaining organizational	100.00
Contributing	100.00	<i>Commercial Organization</i>	
Life	500.00	Annual sustaining	25.00
		Annual contributing	100.00

May I, finally, ask you to circle, now, the dates of October 9-12, 1963, as those for the 18th American Horticultural Congress to be held in St. Louis, Missouri. The setting for this Congress could scarcely be finer, or more central, and until this time in 1963 your officers, your directors and your committees will be developing a program of broad horticultural interest and significance. It is hoped that many member organizations will participate and that all horticulturists will reserve this date.

HENRY T. SKINNER



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*Anemone—*from a pencil drawing by N. Churchman