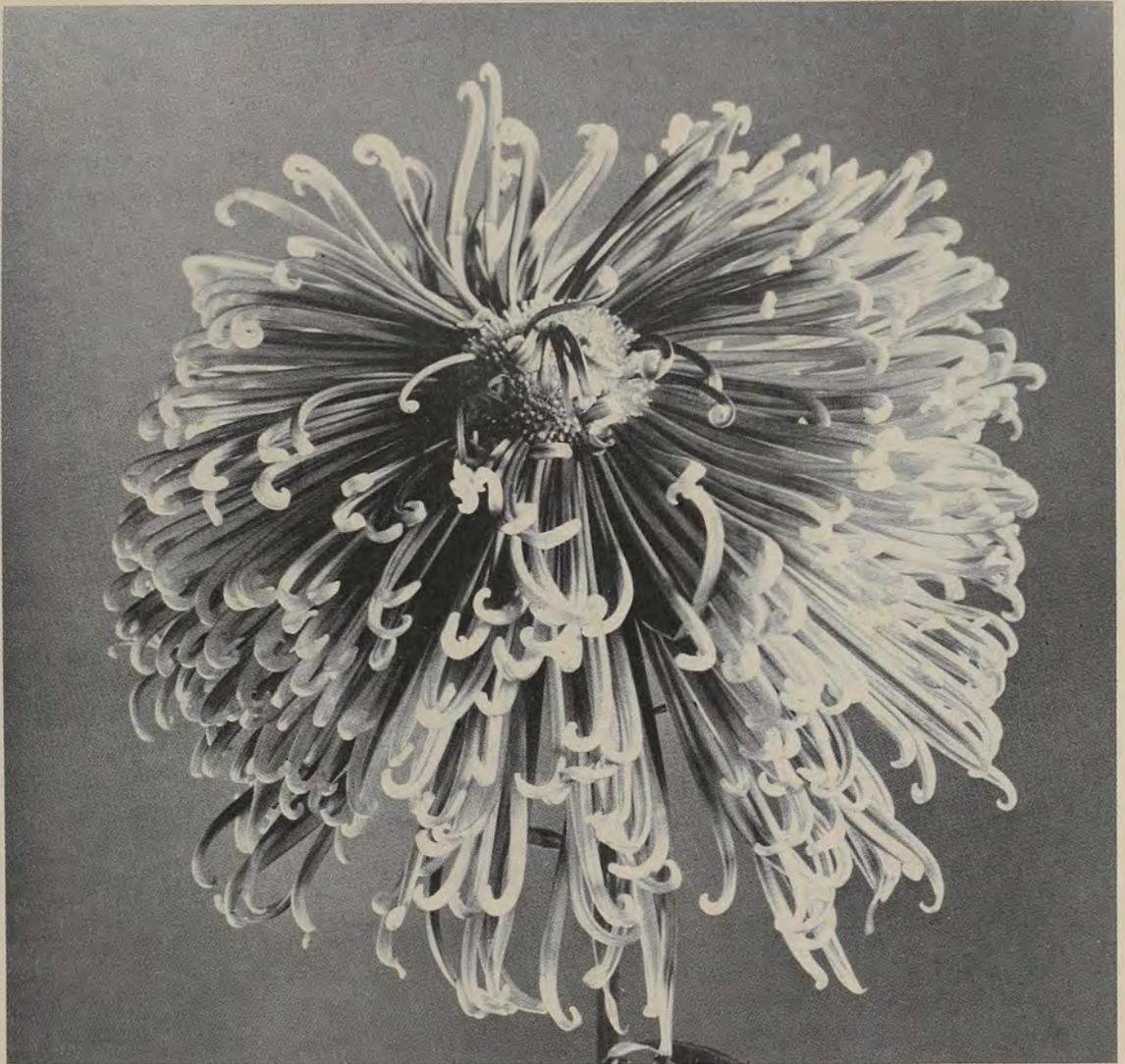


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New Plant Introduction (PI 235906)
Japanese Chrysanthemum 'Seikokinsei'

See Page 164



Hypericum patulum

Hypericum androsaemum



*Dr. Robert L. Plaisted is Assistant Professor of Plant Breeding, Cornell University, Ithaca, New York. He is responsible for breeding of potatoes and ornamentals. In addition to the *Hypericum* breeding project, he is trying to obtain rust resistant hollyhocks. Richard W. Lighty is a graduate student at Cornell University. Besides working on the ornamental breeding projects, Lighty is making a phylogenetic study of the genus *Lilium*.

The Ornamental *Hypericum*s

R. L. PLAISTED AND R. W. LIGHTY*

Hypericum, a genus of some 200 species of herbs and shrubs, in terms of its variety of forms is a most striking group of plants. The flower color of the St. Johnsworts, as they are popularly called, ranges from a cream yellow through brilliant gold. Some have red buds which open to produce a flower with a yellow face and a red back. The petals are obliquely margined as a pinwheel with a sinus at the apex in many cases, and convolute in the bud. The stamens are usually numerous and either free or arranged in groups of three or five bundles opposite the petals. The ovary is superior with one, three, or five cells. The number of styles is three or five, usually reflecting the number of locules in the ovary. The flowers are borne solitarily, or in cymes ranging from three to seven flowers in the bushes, to hundreds of flowers in the compoundly cymose heads of some herbaceous species. Often the flowers, bracts, and inflorescences are covered with black glands which secrete a purple dye. The fruit ranges from a dry dehiscent capsule to a soft red or purple berry.

The leaves are opposite, either sessile or with short petioles. Most species have leaves with entire margins, but one group

has striking serrate leaf margins. The blade is often covered with pellucid or opaque dots. The leaves vary in size, form, and color. Some species such as *H. coris* have needle like leaves, while others like *H. androsaemum* have leaves that are broad and leathery. Most of the hardier *Hypericum*s are deciduous in Ithaca which is in Zone IV, but a few, such as *H. calycinum*, are evergreen.

From this brief description, it can be seen that the genus *Hypericum* offers a wide range of features attractive to the horticulturist. The majority of the species produce their flowers in July and August after most shrubs in this region have had their show. One notable exception is *H. rhodopeum* which blooms early in the spring. They range in height from the absolutely prostrate *H. yakushimense* which never rises above one-half inch to the tree-like native of the Canary Islands, *H. canariense*, which is reported to reach 20 feet in the wild. For the most part, the shrubby forms reach a height of two to four feet. The hardiest of the bushes are *H. prolificum*, *H. kalmianum*, and *H. frondosum*, all of which are native to the United States. In contrast to these, *H. canariense* is killed by a light frost. Most of the species are killed to the ground during our winters in central New York State, but send up vigorous new growth in the spring.

This genus, having been ignored by most growers, has not been treated taxonomically to any great extent. For this reason keys to the species which are not

common in cultivation are not available and identification is difficult. While descriptions do not exist for each valid name, undoubtedly there are many species with several valid but illegitimate names. Unfortunately our material has not been taxonomically identified and we are forced to use names given us by the source of the material and checked, insofar as possible, against each other and with the brief description in manuals and floras. We have omitted many plants, the names of which we are not reasonably certain. Fortunately these have proved to be the least desirable species.

For purposes of discussion we have grouped the species into classes depending upon their overall similarity. In each class we shall describe a characteristic species and then list the other members of the class and describe how they differ from the description given for the class representative.

Patulum Group

One of the most desirable groups of shrubby St. Johnsworts is typified by *H. patulum* Thumb. This species, perhaps the most widely cultivated in the genus, was introduced from Japan around 1862. In this region, the above ground portions of *H. patulum* are not hardy, being killed back to within three to six inches from the ground. The degree of injury is dependent upon the amount of mulch or snow cover. In the spring it sends up vigorous, new shoots and reaches two to three feet by mid-summer. In Zone VII it is reported to be evergreen or semi-evergreen. The arching habit of the plant gives it a pleasing shape. The light green foliage makes an interesting contrast to the pinkish, two sided young stems. The attractiveness of the vegetative parts is augmented by the appearance in July and August of bright yellow flowers ranging from one and one-half to two inches in diameter. This show of yellow flowers, green foliage, and red stems is especially welcome at a time when other flowering shrubs are not in bloom. The flowers have five sepals, five petals, and numerous stamens in five bunches opposite the petals and a superior ovary, giving the same simple charm as the meadow rose. The fruit is a five-loculed capsule de-

hiscing from the top and containing numerous seeds. The flowers are borne solitarily or in three-parted cymes. Unfortunately the arching habit tends to cause some of the flowers to face downward. One other detracting feature is the tendency of this species to hold the petals and stamens after they have lost their attraction. However, this is scarcely noticeable from a short distance and certainly no more of a disadvantage to the *Hypericum* than the same characteristic of some roses.

This species is best known through its varieties which possess ornamental features not found in *H. patulum*. The variety *henryi* Bean is a more vigorous and hardy plant with slightly larger flowers and longer leaves. It was introduced from China in 1898 and named for Augustine Henry. The variety *foresti*, Chittenden, from Southwest China, is similar to variety *henryi*, but has larger flowers. The variety *oblongifolium* (Wall.) Koehne has larger and longer leaves but less attractive flowers than those of the type on many of the other varieties. The variety *uralum* (Don) Koehne, from the Himalayas has a lower, more spreading growth and gives a darker green appearance which contrasts well with the darker red stems. The flowers are small (1 to 1¾") and of less value than the vegetative features. *H. patulum* var. *grandiflorum* which has not yet bloomed for us appears to be a more robust plant than *H. patulum*. Two newer varieties developed in England are Hidcote and Sungold. Hidcote has flowers averaging 3 inches in diameter with yellow anthers rising as high as the styles. Sungold has flowers of the same size as Hidcote, but the anthers are of a striking orange color and rise only to the top of the ovary.

Of the plants allied to *H. patulum*, *H. × moserianum* Andre, the Gold Flower, is the most satisfactory for use in landscaping. It is reported that this plant arose from a cross between *H. patulum* and *H. calycinum* made by Moser in France in 1887. Its characteristics suggest that the hybrid origin is correct. The plant forms a compact shrub of the same general growth habit as *H. patulum*, but with a more erect habit of branching and smaller size. The flower has red anthers before anthesis

similar to *H. calycinum*, while the more symmetrical overall flower shape and size resembles *H. patulum*. The leaves have a pale green under-surface which gives a pleasing effect when the branches nod. This plant should be much more widely used, especially in mass plantings, since its form is more compact, its flower superior, and its hardiness equal to, or better than, the other shrubs in this group.

H. × mosevianum has one variety, *tricolor*, which has variegated white and green leaves edged with red. The variegation is attractive, but the vigor of the plant is considerably less.

H. dyeri Rehd. is one of the more dainty species in this group. Its soft purple new growth rising to three feet presents a lacy aspect as it droops over the mature leaves which are a more dark green. The light yellow flowers are from one to one and one-half inches in diameter. The petals are pointed and have a slight curl. Fortunately, this native to the Himalayas is not as tender as its appearance would suggest. Though it kills back considerably in our zone, it is reported to be half-evergreen in areas south of New York State.

H. penduliflorum differs from the other members of the group in having reflexed petals, a conical bud, and stamens longer than the styles. The foliage is more open, the leaves smaller, and the branches more pendulous than *H. patulum*. While the plant and individual flower lack the appeal of *H. patulum*, the numbers of flowers and length of bloom give a total show of yellow which is very impressive. Moreover, there is considerable fall color in the foliage. Frequently the flowers are borne in more or less a ring near the base of the plant since the branches droop excessively.

H. chinense Linn. from China and Japan is similar to *H. patulum*, but has brighter yellow flowers, more upright habit and a light green foliage with a slight waxy bloom which gives the foliage a bluish cast. These characters are augmented by the bright pink stems. The flowers are up to two and one-quarter inches in diameter and occur singly or in groups of three to seven. The petals are more fleshy than those of *H. patulum*.

Another Himalayan species, *H. lysii-*

machioides Wall. has very attractive dark green foliage and dark red stems in the new growth. Some plants have a desirable overall reddish or purplish appearance. It is more arching than *H. patulum*, appearing almost decumbent though it reaches three to four feet. The cupped golden flowers are small but attractive. This species is said to be almost evergreen, but is quite tender here and is killed almost to the ground each year.

H. leschenaultii has an extremely lax growth habit and very small flowers. It comes from Java and Malaya, but appears to be as hardy as *H. patulum*.

Frondosum Group

Though this group is small, it contains the best of the completely hardy shrubs in this area. *H. frondosum* Michx., the Golden St. Johnswort from Southern United States, is a bush four feet in height. It has a more woody trunk than most species and reddish-brown exfoliating bark. The leaves are one to one and one-half inches long with a bluish cast to their upper surfaces. The dormant foliar buds are not covered by scales and give the twigs a greenish appearance in the winter. When protected from heavy loads of winter snow, this species is a very compact and desirable bush.

The real merit of this species is in the inflorescence which appears in July and continues to flower through the middle of August. The bright yellow flowers are borne solitarily or in three parted cymes. The stamens form a tight ring resembling a golden doughnut. The foliaceous sepals make a green frame for the petals which are irregular, fleshy, and slightly recurved. In the center of the mass of stamens is the three-loculed ovary with its three styles. This flower is one of the most interesting in the genus.

A close relative of *H. frondosum* and native to Northern United States is *H. prolificum* Linn. However, a few differences make this species less desirable. The leaves are a shiny green, lacking some of the appeal of the smoky blue-green foliage of *H. frondosum*. The bush is more willowy and has many trunks, but may reach five feet. The flowers, borne from late June to August, in general resemble *H. frondosum*. However, they are considerably smaller and even though they are more numerous,



Hypericum rhodopaeum

Hypericum calycinum





Hypericum frondosum

Hypericum floribundum





Hypericum × *moserianum*

Hypericum penduliflorum





Hypericum pulchrum

Hypericum elatum



the overall display does not equal *H. frondosum*. Its principal advantage is its great winter hardiness. This shrub is of greatest value for hedging and perhaps could find a place in conservation plantings due to its ability to spread.

H. × dawsonianum Rehd. which originated at the Arnold Arboretum is the result of a cross between a five-loculed North American species, *H. lobocarpum* Gattinger, and the three-loculed *H. prolificum*. This plant has not yet bloomed for us, but vegetative characteristics indicate it has approximately the same value as *H. prolificum*.

Androsaemum Group

H. androsaemum Linn., the Common Tutsan or Sweet Amber, is a half evergreen shrub three feet in height. In its native habitat of Europe or West Asia, this plant was thought to be of value as an herb because of its aromatic parts. The foliage of this species differs from that of the two previous groups in that it is very large, two to four inches long and one to one and one-half inches wide, and leathery in appearance, somewhat like the vine honeysuckles. The foliage color varies from a dark green on the older leaves to a purplish-red color in the young growth of some clones. There is considerable fall color in some clones. The habit of growth is more or less arching, but not willowy. The bush reaches three feet, but dies back almost to the ground in the winter in our area. The vegetative portions and the fruit of this species are its main attraction. The flowers which appear from June to September resemble a buttercup flower in color, shape, and size. The stamens are scattered around the ovary with its three slightly divergent styles. There are no black glands in the inflorescences of this species, but there is considerable variation in the color of bracts, new growth, and fruits. The latter, which are berries about the size and shape of a pea, are usually a bright red during the summer, furnishing a sharp contrast with the dark green leaves. In the fall, these berries turn to a purple color.

Calycinum Group

H. calycinum Linn., sometimes called the Rose of Sharon or Aaron's Beard, was introduced to cultivation from

Southeastern Europe or Asia Minor in 1676. This stoloniferous sub-shrub which seldom attains more than twelve inches in height is an excellent ground cover. Its leathery leaves, dark green above and glaucous below, are aligned in four ranks along the pinkish stems. The leaves persist all winter, though they turn bronze after very cold weather. This plant requires little water and does well in a wide range of soil types. It thrives well in full sun or moderate shade. Even without its large attractive flowers, this plant deserves more extensive use as a ground cover. One rooted cutting will cover about two square feet of ground with a dense cover in two year's time. The flowers are among the largest in the genus. They are borne singly and have five clusters of scarlet anthers.

Hircinum Group

H. hircinum Linn. is a compact sub-shrub up to three feet in height with a dense ball-like shape which gives it special value for modern landscape needs. The leaves are wide and blunt pointed with a light green color. When crushed, they have an odor which is unpleasant to some. The flowers are borne at the tips of the stems either singly or in groups of three. Because of their profusion they make the bush very attractive in July and August. Individually, the light yellow flowers are small and have many long stamens radiating outward from around the three-loculed ovary like golden pins in a pincushion. This native of the Mediterranean has been root hardy in our trials. The variety, *pumilum* Wats., is a smaller and even more compact shrub.

H. inodorum Willd., is like *H. hircinum* in many respects. It is slender branched shrub up to five feet, which forms a thicket similar to *Kerria japonica*. The foliage is without the odor of *H. hircinum*, but the flowers are of less value.

H. floribundum Dry., is reported to reach twelve feet in height. The leaves are more linear and sharply pointed. The flowers are bright yellow, one inch in diameter, and have spatulate, cupped petals. The sepals are inconspicuous and the stamens are shorter than those of *H. hircinum*, but the shrub blooms more profusely.

H. elatum Ait., is a three to four foot shrub from the Canary Islands differing from *H. hircinum* in having larger leaves, one and one-half to three inches long, and a more open growth habit. The flowers, found in three to many flowered cymes, are one to one and one-half inches in diameter and borne even more profusely than those of either *H. hircinum* or *H. inodorum*. This is a very desirable species that can be used in mass plantings or as a specimen shrub.

Pulchrum Group

H. pulchrum Linn., is a shrubby species from Central Europe with long, wire-like, ascending branches rising to two feet forming a compact mass of foliage. This plant is one of the daintiest members of the genus with its small oblong leaves tightly clustered around the stem near the base and thinning out above. The new growth is purplish-red while the older leaves are dark green with the stems retaining their red pigmentation. The blossoms are about one-half inch in diameter with sparsely scattered stamens with bright orange anthers. The petals are light yellow. While the flowers are attractive, this shrub's greatest value is as a textural foliage plant. This is a very satisfactory plant for use near foundations, in low borders, and in rock gardens.

Balearicum Group

H. balearicum, a native of the Balearic Islands, is one of the most unusual shrubs in the genus. Its dark green, warty, undulated leaves only one-third to one-half of an inch long are borne on warty, light brown twigs. The bush is upright, with a tree-like trunk which has exfoliating bark. The solitary, terminal, light yellow flowers are one to one and one-half inches in diameter. We have no record of its hardiness.

Rhodopaeum Group

H. rhodopaeum Friv., is a prostrate perennial with densely tomentose blue-gray foliage. Never attaining a height greater than three inches, this densely matted plant makes an excellent ground cover for dry, sunny locations. From the middle of May until early June, it has an

abundance of lemon-yellow blossoms one inch in diameter. It blooms earlier than any other species in our collection. Although a native to the Balkans and Asia Minor, it has been completely hardy here. Since there is considerable variability in the traits which impart the horticultural value to this plant, it is best propagated vegetatively from superior plants.

Canariense Type

One of the tallest species of the genus is *H. canariense* Linn., which is reported to reach a height of 20 feet in its native Canary Islands. This bush produces flowers continuously all summer on new growth. It is a very vigorous plant, but is extremely tender. It was entirely killed by frosts which did not kill tomatoes growing nearby. An attribute not found in most other species is the very pleasant, subtle odor of the flowers.

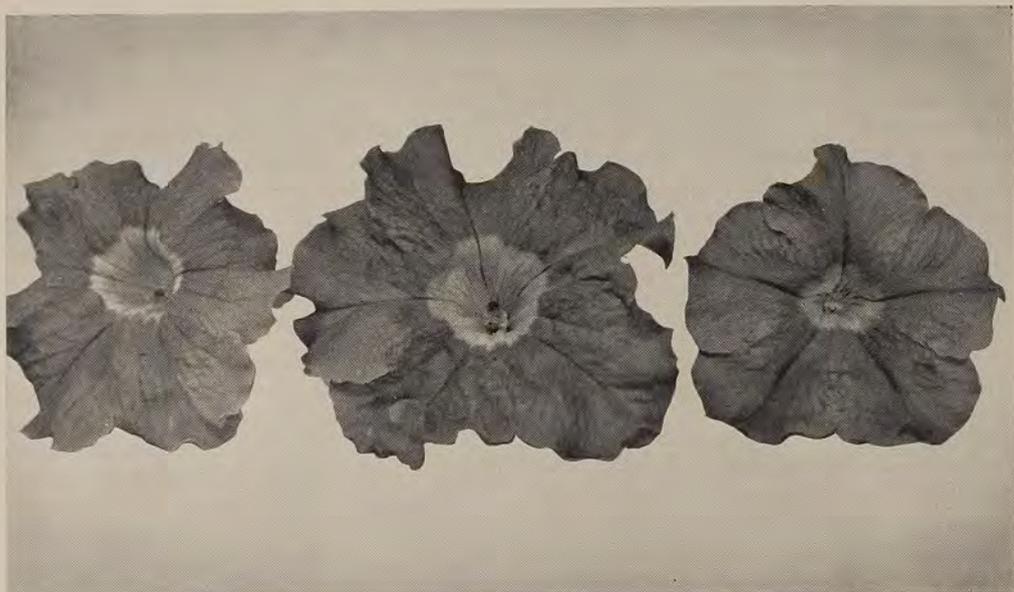
Polyphyllum Group

H. polyphyllum Boiss. and Bal., is a low, decumbent perennial from Asia Minor. This species has received more attention than most others of its type. It is usually recommended for its hardiness, pleasing foliage, and large yellow flowers. The latter range from one and one-half to two inches in diameter and resemble a pinwheel. They are borne profusely over the plant in terminal three-flowered cymes beginning in mid-June. The pointed buds are sometimes lightly striped with scarlet. The grey-green leaves are scattered along the wandering stems which reach a height of six to twelve inches. There appears to be considerable variation in this species.

H. repens Linn., also from Asia Minor, is like *H. polyphyllum* except that the flowers are brighter yellow and the buds have considerable red color.

H. olympicum Linn., from Southeast Europe and Asia Minor, is a procumbent sub-shrub similar to *H. polyphyllum*, but with bright yellow flowers two inches in diameter in several flowered cymes.

H. fragile Heldr. and Sart., from Greece, is probably the most promising species in this group. It has an upright habit and two inch flowers with considerably more scarlet on their backs than any of the others in this group. It blooms heavily and is hardy in our zone.



The hybrid grandiflora petunia (center) is larger than the grandiflora (left) or the multiflora (right) parent

The Production of New Flower Varieties

CLARK D. PARIS*

Every new flower introduction represents many years of work. Some think plant breeding is a romantic profession that employs magic or pseudo-magic to produce the novelties that are found in the seed or plant catalogues. Nothing is farther from the truth. Speaking from over eight years of practical experience with two different seed companies I know that a hybridist has lots of menial tasks to perform for several years before he can begin to reap the rewards by introducing some of his own productions. Even after his creations are in commerce the drudgery must continue because additional novelties are always needed. Then, too, every new introduction makes

the production of further distinct new varieties in the same flower class more difficult.

It is becoming increasingly harder to be a successful plant breeder without a scientific background. Labor costs are so high that a hit or miss breeding program common a generation ago is almost obsolete. Today reduction of costs is necessary. First of all, a good hybridist must know his genetics; and a knowledge of plant physiology is also very important. Pathology and entomology are two more subjects that will be helpful. Others include morphology, anatomy, and taxonomy.

The starting point for the production of a new variety is usually in a cross. Each proposed cross should have a definite purpose. The commoner reason for a cross is to combine two or more desirable characters in one plant. In flowers

*Dr. Clark D. Paris is research instructor in the Department of Horticulture at Michigan State University. He has had practical experience in breeding of flowers with two large seed companies, and his research projects are in the field of plant breeding and genetics specializing in ornamental plants.

two very important characteristics are color and habit. The use of a flower determines the habit. Thus, a dwarf spreading plant is ideal for bedding. For cutting the plants should be taller with long flower stems. Suppose a distinctive new habit is discovered in a peculiar annual such as petunia. Crosses are made with all the different colors known in that particular class of flowers. These seeds are then sown the following season and the plants are self-pollinated or selfed. The seed from the hybrid plants are sown the next year. This is the F_2 generation in which the segregation occurs. If the genotype of the color and habit is known the number of recombinations necessary to give the desired color and habit will determine the F_2 population needed. If only one gene is involved theoretically four plants would be enough to grow in order to get the wanted plant. Actually, however, it is better to grow four times the minimum requirement in order to ensure that the necessary phenotype will appear. The population minimum requirement can be determined mathematically by four taken to the n power, n being the number of genes involved. One can easily see that it would be impractical to try to grow a population large enough to recover all possible phenotypes for more than four factors. A simpler method is the backcross method. With this plan a plant with one of the desired characteristics is selected from the F_2 and crossed back to the parent having the other character. This takes more time because often it is necessary to backcross several times before the desired results are obtained.

Once the results are obtained the plant can be increased asexually if it is propagated as a clone; but with seed propagated plants the job is much more complicated. This plant should be self-pollinated. Often a cage of nylon or cheesecloth is built around the selection to keep insects from cross pollinating it. Before caging all open flowers and seed pods are removed to eliminate contamination. Most flowers will set seed under a cage without hand pollination; but a few such as petunias have to be pollinated, usually with a camel hair brush. The cages are opened and all open flowers are brushed. Sometimes once is enough but usually two or more pollina-

tions are necessary. In petunias it is a common practice to remove a sepal as a flower is hand-pollinated in order to mark it from any seed pods that happened to have been missed prior to caging or one that had accidentally been crossed. All seeds are picked by hand from the selections. The seeds are dried, cleaned, and sown the following season. About twenty plants are grown from each selection. If these plants are uniform in all respects the whole row is saved. Usually a cage is erected over the whole row; but a better practice is to select a large number of individuals and cage them separately. These are then lined out in an isolated block. Any selections that do not appear to be good can then be removed without damaging the remaining stock. If the row was caged and one plant had given undesirable progeny then reselections should be made in the block and these should be lined out.

Only rarely does a selection from a F_2 come true enough the first season. Usually additional selections must be made and these are lined out the following year. This procedure may have to be made several times before the row becomes true enough to row cage. Once a novelty is row caged samples are usually grown in various sections of the country to test it under different climatic conditions. The size of the isolation block or stock seed block is determined by the amount of seed needed for the year of introduction. This amount varies considerably with the novelty. The seed from this stock seed block is used to plant the crop which will produce the seed to be sold.

The procedure following treatment with chemicals to induce tetraploidy or with x-rays to induce mutations is similar to that described above. The initial treatment often results in partial sterility. This can often be eliminated by painstakingly hand-pollinating every flower, but two or more generations must be grown before any improvement can be noticed. All these procedures take time. Sometimes, after all this meticulous work the selection eventually is lost because of this sterility.

Another reason for making crosses is to study the possible use of the hybrids for commercial use. The hybrid corn

producers have demonstrated that it pays to grow hybrid corn; so the public is more or less hybrid conscious. The all-double petunias were actually one of the first F_1 hybrid flowers sold commercially since all the seed is produced on single-flowered plants. These flowers are pollinated with pollen from homozygous double plants. Another early F_1 is the Red and Gold Hybrid marigold. To produce these the Dwarf Mexican Orange is planted in alternate rows with the Dwarf French Double Robert Beist. In the marigold, pollen is usually produced only in the tubular florets. The Dwarf Mexican Orange is rogued so that only fully double plants are left. The bees and other insects carry the pollen from Robert Beist to the other parent. The seed is hand picked from the Dwarf Mexican Orange.

One advantage of growing the first generation hybrids is that they are larger-flowered, more vigorous, and more floriferous than either parent. This phenomenon is known as hybrid vigor or heterosis. Another merit of F_1 's is the fact that they are much more uniform than the average open-pollinated variety. As in the production of open pollinated varieties, it takes a great deal of behind the scene preparation before a commercial hybrid can be introduced. Here is where a knowledge of genetics is valuable. Before an inbred should be used for test crosses it must be as homozygous as possible. Theoretically, every time a plant is self pollinated the number of heterozygous genes is reduced by one half. Thus, after five selfings all but one thirty-second of the genes are homozygous. Actually, however, this is true only if the most homozygous plants are selected in each generation. Even the experienced hybridist cannot distinguish the homozygote from the heterozygote; but his "batting average" is much higher than the novice's. Since the heterozygous plants are generally more vigorous and larger flowered than the others, it takes a lot of self discipline to select the weaker plants and discard the best. It sometimes happens that an inexperienced hybridist will keep selecting the plants that will segregate. It is always a relief if the characteristics that are desired are due to recessive genes because these will not appear unless both parents carry them—

at least in a heterozygous condition. Such plants are much easier to true up. When the characters are dominant it is a different story. Unless incomplete dominance is present it is very difficult to distinguish the true breeding plants. Sometimes a sharp observer will note a recessive character that is closely linked with the desired dominant character. Then if a plant carries the recessive trait chances are good that it will be homozygous for the dominant trait also. The usual procedure is to self the plant and grow the progeny the next season. This brings up another pitfall. It is practically impossible to grow all the seedlings from any one plant until they flower. When thinning or pricking out the seedlings the stronger ones are usually saved. This may account for some seemingly true breeders which do not breed true in later generations. The weaker plants may be the segregates.

After the selection has been selfed for at least four generations then one may begin to use it in test crosses. Once, again a knowledge of genetics is very helpful in planning these crosses. It is essential to know which colors and/or habits are dominant. Other characters are equally important in some flowers; such as, doubleness, flower placement, amount of flowers, flower size, and length of flowering season. Sometimes the desired characters are due to recessive factors. In that case both parents must carry these traits. In others the presence of the homozygous dominant genes in one parent is sufficient to have the desired characteristic in the hybrid. When each trait is controlled by a single gene the production of a suitable hybrid is not too difficult; but this is seldom the circumstance. Usually each feature is due to the interaction of several factors. For example, the habit of any plant may be due to several things. Height of primary stem, number and length of basal branches, length of internodes, number and length of axillary branches and stem strength all contribute to a plant habit; and each of these may be due to one or more genes. For this reason the backcross method described previously is often used to introduce a new color into a desirable plant form. The inheritance of color is often very complex. Japanese geneticists have identified twenty-six sep-

arate factors which control flower color in Japanese morning glories. On the other hand, doubleness is often due to one gene. It is dominant in petunias, marigolds, African violets, and nasturtiums but recessive in stocks, sweet williams, and morning glories.

Quite often the parents of a commercial hybrid appear to be identical in most respects. This is because some of the most wanted traits are all recessive. Therefore, both parents have to carry them before they will appear in the F_1 . In these cases the lines may have a common origin, but each parent has been inbred for several generations. This is necessary before the hybrid will show much increase in size. In petunias two plants from an inbred line may be selfed for as few as three generations and show heterosis when they are recrossed, but usually a line is inbred longer than that.

After a good hybrid is produced, more work has to be done to determine the most economical way to produce the seed for sale. As this involves considerable hand work, anything that will reduce the amount of this, will reduce the cost. The parental lines are often low in fertility. To overcome this, two hybrids are sometimes used to produce a commercial hybrid. If one of the parent inbreds happens to be a good pollen producer, then only one hybrid may be used as a seed parent. The technical term for the first type would be a four-way cross while the latter would be a three-way cross. Plant breeders have their material inbred so much that seldom is there much difference in appearance between the two-way, three-way, and four-way crosses.

Another way that the seed cost may be reduced is by the use of cytoplasmic male sterility. By using this method, the emasculation process is eliminated because no pollen is produced. In this type of sterility the inheritance is through the cytoplasm. All the progeny from a cytoplasmic male sterile will carry this trait. Unless a restorer gene is present, no pollen is produced. These genes are rare enough so that it is folly to depend on them to produce sufficient pollen to perpetuate a line. Therefore, a sterile line and a fertile line must be kept of any inbred that may be used as a seed parent for a hybrid. This almost doubles the amount of work necessary to produce a good inbred line.

Not all inbreds produce equally good hybrids, even though they appear to be identical. This phenomenon is known as combining ability. Often this ability applies throughout the crosses in which any certain inbred is used; but not infrequently some F_1 's may be mediocre and others may be very good. For this reason it is necessary to carry a number of lines in each color, habit, and season along. The dream of every plant breeder is to find one parent that can be used for a large number of crosses. One hybrid petunia seed producer has one homozygous inbred large-flowered single that can be used in the production of three all double and three grandiflora hybrids.

At present petunias and snapdragons are the only two flowers in which many commercial hybrids are offered. One prerequisite for economical production of F_1 's is that a number of seeds must be produced from each seed pod and that the plant must be relatively fertile. This is where a knowledge of plant physiology comes in very handy. When the optimum temperature, light intensity, and nutrition levels for seed and pollen production are known, then this environment can be maintained as far as possible in order to reduce the cost. Before World War II, super double nasturtium seed was offered, but since they were the result of hand pollination, the cost of production became prohibitive. Each pollination produced only three or four seeds. Recently F_1 marigolds have been introduced. These are produced by a method similar to the one used for Red and Gold Hybrids.

Most flowers are normally cross pollinated hence they have to be bagged or caged to keep insects from carrying foreign pollen to them. Flies, bees, moths, and butterflies are usually the insects that pollinate flowers, but unusual cases are known. At one time a seed company had trouble truing up the large fully double African marigolds. Whenever seed from a caged selection was planted, a number of hybrids would almost always appear. The techniques were double checked but to no avail. One day a thrip was noticed with a pollen grain in its jaw. This proved to be the source of trouble. Now, after caging the other plants are removed from within a radius of eight to ten feet of the cage. Since thrips are wingless, this creates a suffi-

cient barrier. The same year, a head of Dwarf Mexican Orange from a Red and Gold Hybrid project was covered with a glassine bag. The head was kept covered from the bud stage until the seed was ripe. This head contained three seeds, all of which proved to be African-French hybrids. The thrips had crawled up the stem under the bag.

At present, flower breeding is becoming almost a profession, since mounting labor costs have largely eliminated the hit and miss projects of the past. Plant breeding is a nice hobby, but do not be disappointed if you do not obtain much that is worth saving.

Editor's note—The terminology provided here is to help the reader in a better understanding of this paper.

Dominant—A character possessed by one parent of a hybrid which appears in the F_1 generation to the exclusion of the related recessive character.

F_1 —The first generation offspring following a given cross, or mating.

F_2 —The offspring derived by selfing or

crossing between each other of individuals of the F_1 generation.

Gene—An hereditary unit that controls a particular character.

Genotype—The genetic constitution of a plant expressed and latent in contrast to the phenotype.

Heterozygous — One containing both genes of a pair but with only the dominant one expressed.

Homozygous — One containing both genes from each parent for a character that are alike.

Phenotype — The characters of a plant actually expressed rather than its genetic constitution (genotype). The way a plant looks, not its genetic designation.

Recessive—A character which is carried by the plant but is not expressed in the presence of the dominant one.

Segregation—The separation of the characters from each parent in the F_1 generation and their random recombination in the following generations resulting in offspring of different types.

Correction Note

The legend for the Lycoris illustration on page 120 in the April 1959 issue of The National Horticultural Magazine should read: The Sperry Lycoris

The Montreal Botanical Garden

H. TEUSCHER*

The program outlining the functions of a newly to be established botanical garden depends by no means only upon those who design, develop and organize it but always very largely also upon those who supply the funds. Formerly all botanical gardens were attached to universities, their financial requirements being covered either by the universities themselves or by the reigning royalty of the country. In consequence their main function was to serve as aids in the teaching of university students and in scientific research. This function determined the layout which was mainly utilitarian and in which the beauty of general appearance was of very minor importance.

The last four or five decades have brought a change in this old-established and rather one-sided pattern, mainly because it became ever more necessary to employ public funds for the financing of any such undertaking. When the taxpayers' money is involved, the taxpayer rightly and justly demands that his own needs be considered and that the function of such a botanical garden be concentrated largely upon serving the general public. This is a very sound and much to be welcomed development. In some instances, this change of attitude has even led to a change of name because the very name "Botanical Garden" had

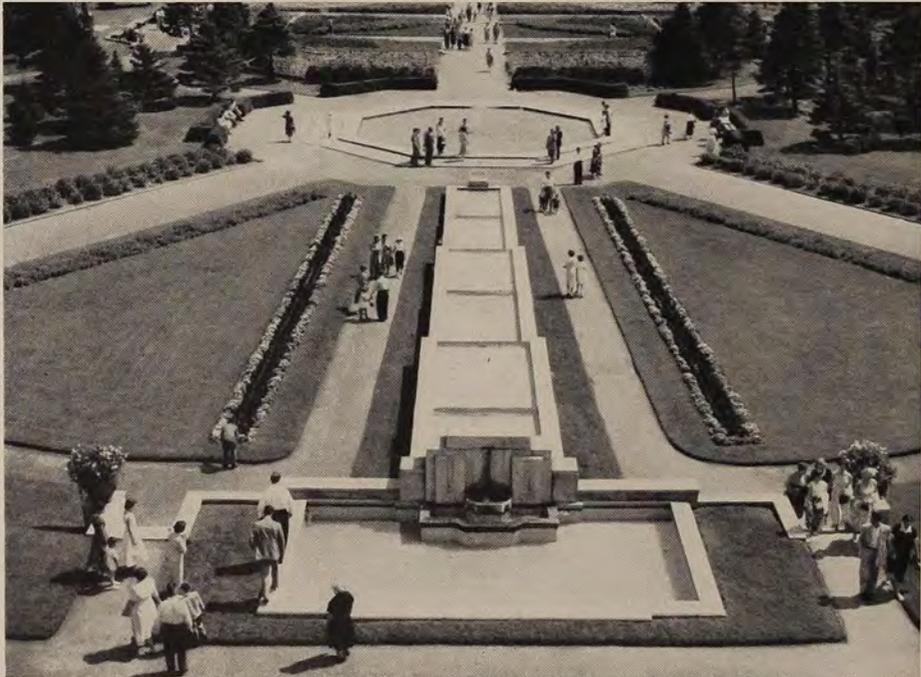
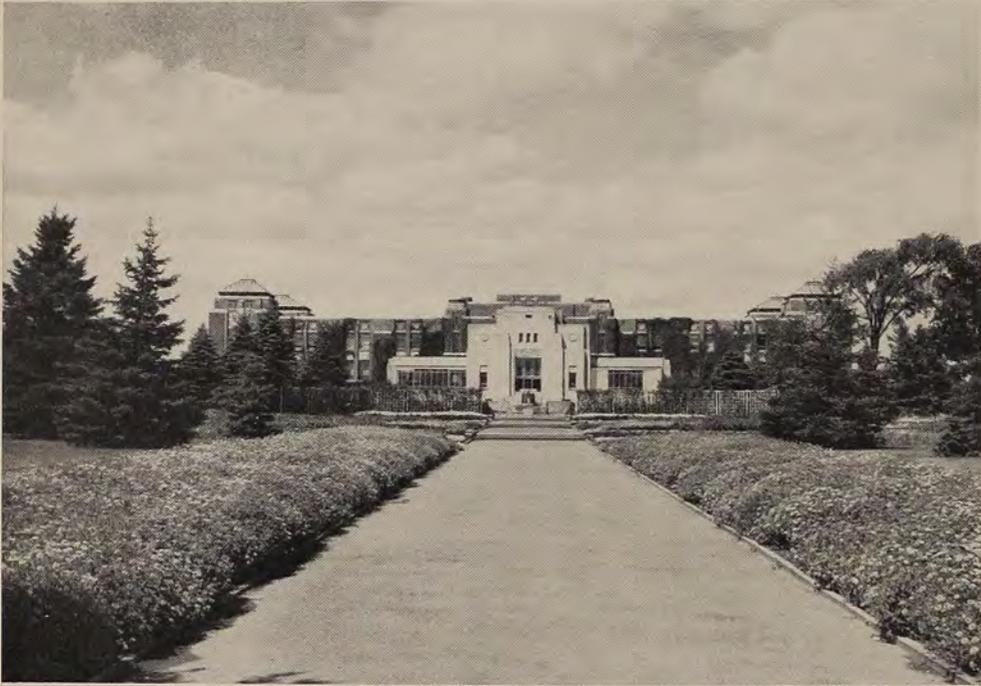
become suspect of designating a snobbish and purely scientific institute. In consequence, what actually is a botanical garden is sometimes called an Arboretum. That is unfortunate, because an arboretum is merely a collection of trees and shrubs as which it forms a part of any full fledged botanical garden. The misapplication of the name only creates confusion.

The program of the Montreal Botanical Garden was shaped by two coordinating forces which were responsible for its establishment, and which determined the direction its development took. The first and foremost of these forces was the Reverend Frère Marie-Victorin, the botanical garden's founder and first director, who was also the founder and first director of the Botanical Institute of the "Université de Montréal." He was a scientist and an educator but he also was a great humanitarian. He wanted a botanical garden which would be a scientific institute but which would also serve the education of the general public in the widest possible sense. The second force consisted in the fact that the Montreal Botanical Garden is owned and maintained entirely by the City of Montreal and constitutes a section of the City's Park Department. Therefore, it actually is a City Park, a specialized one to be sure but still a City Park, with all that this implies. All of its employees are members of the City Park Department. In consequence, the public with us is king, and our main efforts are concentrated on serving the public. A picnic ground, a restaurant and a playground are included in our layout, and our service of information on plants is one of our most prominent activities.

*Mr. H. Teuscher designed the Montreal Botanical Garden and has served as its curator since its early beginnings. Besides his curatorial duties he has been responsible for bringing together most of the Garden's living collections.

This account of Montreal's outstanding garden should be of special interest at this time since an International Botanical Congress will be held in Montreal during August of this year.

Pedestrian entrance to the Montreal Botanical Garden (top). The wide path leads through the garden of summer-flowering annuals. The Administration Building is in the background. Reverse view of the path and garden as seen from the Administration Building (bottom).



The water and bog garden (top) and a portion of the school garden (bottom) where some two hundred pupils are taught the fundamentals of practical gardening under the direction of a school teacher. The instruction serves as an introduction to the appreciation of plant life, supplementary to the courses included in the school curriculum.





Teuscheria cornucopia

A new orchid genus from Ecuador, named in honor of the author, and introduced into cultivation by the Montreal Botanical Garden

The garden covers an area of about 200 acres and in general appearance is most of all a very beautiful park. Its large collections of plants are displayed in a series of attractive as well as highly instructive individual gardens, such as the garden of summer-flowering annuals, the garden of ornamental perennials, the rose garden, the garden of economic plants, the garden of plants used by the American Indians, the fruit garden, the garden of medicinal plants, the formal rock-garden, the large *Alpinum*, the *Fru-ticetum* (a collection of shrubs), the water- and bog garden, the hedge garden, the iris garden and the turf-, lawn- and ground cover garden. The selection of most desirable varieties which these gardens contain are kept up to date by means of test plantings in the large centrally located nursery where every year hundreds of new varieties are under observation. Complete records of all the varieties tested are on file and are employed in our information service. The large arboretum, covering about $\frac{1}{3}$ of the whole garden area and extensive ecological groups, showing the flora of Eastern Canada in naturalistic setting, are only partly completed. A genetic garden and a taxonomic garden are still in preparation.

The school garden, where 200 school children under the direction of a school teacher and a gardener are taught the fundamentals of practical gardening on individual plots, is typical for our educational activities. A combination of shelter-tool-house and office, equipped with lockers and washrooms and with a greenhouse and workroom attached to it, is now to be added to the layout. This school garden which has been in operation for over 20 years has been so successful that on public demand similar school gardens are now to be organized under our supervision in other parts of the City also. A series of public courses on the various phases of gardening is, of course, also included in our activities. A weekly television program and weekly film shows for children during winter are very popular.

During the school year the 8th and 9th grades of all the French Catholic schools of Montreal come to us once for half a day. Two classes of about 35 children each come together so that some 70 chil-

dren are taken care of in the forenoon and 70 in the afternoon. Altogether this program reaches every year some 450 school classes with over 15 thousand children. The instruction given serves as an introduction to the appreciation of plant life, supplementary to the courses included in the school curriculum, and the children have to write an essay on what they have learned at the Botanical Garden. The teacher in charge of this course is actually a school principal who has been delegated to us full time for this purpose by the French Catholic School Commission of Montreal. During summer he is in charge of the school gardens. So far, unfortunately, we have been unable to persuade the English Protestant School Commission to make a similar arrangement, but this will undoubtedly come eventually.

In addition, we maintain a school of gardening where professional gardeners are trained in a 3 years practical and theoretical course.

The layout of our garden includes, furthermore, a complex of 9 large conservatories and 28 service greenhouses which contain large collections of tropical and subtropical plants. Altogether—inside and outside—we now have over 15 thousand different kinds of plants. These include, in the outside garden, collections of rock garden and alpine plants, fern, iris, gladiolus, hemerocallis, phlox, aster and bulb collections as well as hardy water and bog plants from all parts of the world and some 4,000 kinds of trees and shrubs. The greenhouse collections include: 1,400 species of orchids plus several hundred orchid hybrids, 375 kinds of begonias (over half of them species), 280 kinds of bromeliads, fine collections of ferns, cacti, aroids, gesneriads, tropical foliage plants, tropical economic plants, tropical aquatic plants, etc.

Among the unusual or rarely cultivated plants included in the conservatory collections of the Montreal Botanical Garden may be mentioned *Welwitschia mirabilis* which first flowered with us in 1951. We also have several interesting species of *Dischidia* including *D. puberula*, *D. purpurea*, *D. rafflesiana* and *D. vidalii* (*D. pectinoides*). Among plants which were introduced by us into cultivation are several interesting species of Ecuadorean orchids as well as the ges-

neriad *Trichantha minor*, the handsome *Billbergia venezuelana*, *Aechmea filicaulis*, and the rather spectacular scarlet-bracted *Guzmania gloriosa*, collected by me in Ecuador in 1956.

The conservatories which have been built in such a manner that their whole soil surface is unincumbered by heating tunnels, etc., are landscaped, each in a different fashion, so that the choice plants they contain produce a dramatic impact. The idea again is to arouse most of all the interest of the general public, though the botanist also will find much to admire. The large center conservatory serves for a continuous flower show with highlights in fall (chrysanthemums), at Christmas, and at Easter. The others contain permanent and special displays, such as begonias and gesneriads, cacti and succulents, ferns, aroids, tropical epiphytes in a jungle setting and tropical economic plants. A large tropical house, a large subtropical house and an aquatic house are still to be added.

Our scientific activities include the testing of plants for hardiness and for their usefulness in City park planting; applied physiology in the propagation of plants; plant pathology for which we have a special laboratory; the study of cultural methods for rare and difficult plants; the study of soils and fertilizers and the taxonomic study of our large plant collections which contain many new introductions. One new orchid genus and a number of new species in different families have already been described from living plants in our possession. Others which also appear to be new to science are still under observation.

That our large administration building includes, of course, an adequate library and herbarium as well as laboratories and lecture rooms will be evident from the foregoing. It may yet be mentioned, however, that the top floor of our administration building houses as our guest, the Botanical Institute of the Université de Montreal. This is an extremely fortunate arrangement for which again Frère Marie-Victorin was responsible. We cooperate closely but we cannot interfere with each other, since our financial support comes from two different sources and the two administrations are independent. Both institutions

profit equally by this association. Two large greenhouses, directly attached to the laboratories of the Botanical Institute, are reserved for research purposes and, being divided into several sections, are used jointly by the Botanical Garden and the Institute. This has the effect that the work of the researchers cannot encroach upon the general greenhouse space of the Botanical Garden.

The Montreal Botanical Garden had its inception in 1932 when 200 acres of land at the East end of the City were first set aside for this particular purpose. Construction, however, did not start until 1936 when the Provincial Government made large funds available for unemployment relief work. Work continued apace, with as many as 2,000 men employed, until the fall of 1939 when World War II broke out. By that time nearly $\frac{2}{3}$ of the Botanical Garden had been completed, including the administration building. Until 1948 we had to concentrate mainly on the maintenance of what existed. Thereafter, construction gradually started up again. The medicinal garden, the garden of plants used by the American Indians, a special garden of fruit trees on dwarfing stock, the hedge garden, the lawn and turf garden and 3 sample backyard gardens were built during the years after 1948. During 1956 to 1958 the nine large conservatories were built at a cost of about $1\frac{1}{2}$ million dollars, and 6 additional service greenhouses were constructed also.

Our staff now numbers 113 which include 16 scientists and horticulturists, 19 office staff, 46 gardeners and 32 laborers including mechanics, painters, carpenters, etc. During summer as many as 30 or 40 temporary gardeners and laborers are added.

The very fact that the City of Montréal supports us so liberally shows that our work is considered of importance to the general public. This it has become, because we have spared no effort to make it so. No restraint is placed on our scientific activities as long as they are not allowed to interfere with our public services which have to come first and foremost. This undoubtedly will have to become more and more the attitude of all botanical gardens if they wish to succeed, and if they have to depend on public funds.



Hibiscus hybrid 'Annie J. Hemming'

The Hardy Herbaceous Mallows

E. SAM HEMMING*

*E. Sam Hemming is president of the Eastern Shore Nurseries, Inc., Easton, Maryland. He is interested in the less common plants that are adaptable for landscape use.

The mallows or hardy herbaceous hibiscus, are largely polybrids. About the turn of the century my father, Ernest Hemming, was one of several hybridizers who became interested in the possibilities of the Common Marsh Mallow, *Hibiscus moscheutos*. His efforts were

first successful when he pollinated *H. coccinea*, a southern species not hardy north of Maryland, with pollen from *H. militaris*, a hardy species from Pennsylvania. From this cross he obtained one plant, with red flowers, which withstood Philadelphia winters. When this plant bloomed, the flowers were pollinated with pollen from *H. moscheutos* and the resultant progeny showed a considerable diversity in flowers and foliage. The flowers varied in size from four to ten inches in diameter and ranged in color

from pure white to dark red, through white with red eye, light pink, deep pink, and scarlet. The foliage varied from deeply cut, or pinnate, to entire halbert, with a considerable range in between.

Under the name Meehan Mallow Marvels the plants developed by my father were marketed as seedlings and attained a gratifying degree of popularity. It was his feeling, however, that they had been marketed too soon and that work should be continued with a definite goal in view so that actual clones could be propagated vegetatively and sold. When, later in life, he had an opportunity to return to hybridizing the mallow with me as his assistant, a definite goal was sought. We decided the perfect plant should have these qualities: a flower of beautiful color with overlapping petals, opening flat, rather than cup-shape; foliage dark green and shiny, rather than the pubescent foliage of *H. moscheutos*. This goal was attained in the patented variety Annie J. Hemming.

It is interesting to note some of the information obtained along the way to the concrete results. For example, while the color range has been extended by the addition of shades of red and pink, no success has been achieved in an attempt to produce a hardy perennial yellow by using *H. manihot*, a more or less tender annual species. Although the flower size now extends from a pygmy of three inches in diameter to a giant of twelve, the largest sizes lose from the standpoint of beauty. Double flowers have not been obtained but there are flowers with six, seven, eight, and nine petals, instead of the usual five. Flowers with crinkly and wavy petals have been produced but efforts to produce a pure white flower without pubescent foliage have failed, so that we guess these two factors are linked.

Culturally, the plants are easy to propagate and grow. Clones are propagated by division and will root as cuttings; also seed and seedlings are easily produced. Considerable hardiness has been achieved. These mallows can be grown in New England, southern Ontario and Quebec, west to the Great Lakes, though not in the northern section of the Middle West. They can be grown south to the Gulf States and in

the west along the Pacific Coast but would not grow in the Rockies nor in arid areas, except with much watering. In the north they should be given the sunniest exposure as cool weather in summer inhibits flowering.

When found in nature, the hibiscus is, almost without exception, a swamp or marsh plant, particularly *H. moscheutos*, but in the garden the hibiscus does its best in normally rich garden soil with plenty of rainfall or irrigation, liking especially the warm humid climate of seashore areas. While the mallows are herbaceous, they should be treated in the landscape as a woody shrub because they are long lived and need only be given normal garden cultivation to last indefinitely. An individual plant could surely be made to live fifty years if it were so desired.

It is usually as late as the middle of May before the mallow begins to send its shoots above the ground but then it grows very rapidly until it reaches its full height. A mature plant can be expected to be four to six feet high and as broad. In Maryland, flowering starts about the first of July, if the weather is warm, and continues through September and until frost in October. A vigorously growing plant produces buds as fast as the flowers open. Each flower lasts only one day but I kept records which show that a two year old plant has produced two hundred and fifty blooms in a season. When frost has killed the stems, the tops should be cut back to six inches and, in extremely cold sections, should be heavily mulched.

In the landscape, the mallows may be used in many ways: as a shrub in a border, against an evergreen background of pines, cedars, and the like, or, as the background of a perennial border where their late blooms come at a period when so few others are left. If they are planted beside a pool the extra moisture helps them and the flowers, reflected in the water, give double beauty. A single mallow is attractive as a dooryard plant and mallows also will make a fine summer hedge. For landscaping seashore and other summer cottages, the mallow is a particularly good choice because its cheery colorful blooming time coincides with vacation time and, for the novice gardener, it is almost foolproof.

The Cultivated Eugenias In American Gardens

PART 2

EDWIN A. MENNINGER

New World Species

The New World species of *Eugenia* are just as numerous—probably a thousand of them—and just as confusing, or more so, than their Old World relatives. Something new is added here, however, for among the New World species are many that bear luscious and delightful fruits, and palate appeal always takes precedence over beauty or utility.

Brazil is particularly rich in these edible numbers, and their botanists, breaking away from *Eugenia*, have created a host of new genera, including *Abbevillea*, *Campomanesia*, *Stenocalyx*, *Calyptanthus*, *Aulomyrcia*, *Phyllocalyx*, *Gomidesia*, *Rubachia*, *Marlierea*, *Britoa*, *Myrciaria*, etc. Some of these have not yet been widely accepted. Insofar as the following species are listed in the forthcoming *Hortus III*, the author sticks to that classification of them, and gives the accepted synonyms. However, this author hopes that the compilers of *Hortus III* will give this exceedingly difficult family a lot more study in an effort to reconcile conflicts herein with the book in its preliminary form. Certainly species not cultivated should be eliminated, and species that are in cultivation should be included if the book is to have its maximum usefulness to the layman.

This author omits the genus *Cleistocalyx*, which appears in *Hortus III*, because it is not encountered in cultivation. He includes the new genus *Myrcueugenia* because one very beautiful flowering tree in that genus has appeared on the American landscape. Several plants grown in the United States and formerly classed as *Eugenias*, are now referred to *Myrtus*, *Myrcia* and other genera and have been omitted here.

West Indian and South American Species

Eugenia aggregata (Vellozo) Kiaersk.
Cherry of the Rio Grande.

This native of Brazil was introduced to Florida and California in 1938 under the erroneous name of *Myrciaria edulis* (Vell.) Skeels, and still is offered by some nurseries in California under this name. It is a handsome ornamental shrub or small tree, evergreen and somewhat slow growing, useful for landscaping but not well known. It is cold hardy and can take temperatures to 24 degrees F.

Generally it is a shrub or small tree to 15 feet with bark green and pale orange, peeling or shedding in thin layers. Leaves glabrous, thick, short petioled, narrow elliptic, apex obtuse, base acute, dark shining green, entire but somewhat revolute, veins obscure, petiole grooved, blade to 3 inches long and $\frac{3}{4}$ inch wide. Young new leaves may be silky tomentose.

The flowers are solitary but borne in pairs opposite each other in the axil of a bract at the base of new growth. Flowers on one-inch stalks. Two conspicuous leafy, heart-shaped or ovate bracts are borne below each flower, not united but overlapping and clasping pedicel. Sepals 4, spreading flat, narrow, slightly constricted at base. Petals 4, white, alternating with sepals, recurved back, to $\frac{1}{2}$ inch long. Stamens numerous, to $\frac{3}{8}$ inch long, erect in center of flower, borne on edge of disk. Ovary inferior, style one, green, slender, as long as stamens.

The fruit is a berry, oblong or obovate, to one inch long and $\frac{3}{4}$ inch wide, turning orange-red and then deep purple-red when fully ripe. Skin thin; flesh pale orange, juicy, of good flavor, slightly sub-acid. Seeds absent in some fruits, others with one or two large white seeds to $\frac{3}{8}$ inch long, round, but flat on sides adjacent to each other. The ovate bracts persist at base of fruit and the 4 sepals persist on top of fruit. Fruit edible and can be used for making a pie. The fruit has a cherry-like flavor.

Flowering takes place in March, April or early May and the fruit is ripe in about 3 weeks.

The plant is well adapted to the rocky alkaline soils of Dade County, Florida, and does well in acid sand. It should be grown more.



JOHN NOONAN

Eugenia aggregata

Nomenclature here is extra confusing. The Brazilian tree above described is not listed in *Hortus III*, but that reference book does list another *E. aggregata* as a synonym for *E. condensata* Baker, a Madagascar tree which, so far as this author can determine, is not in cultivation in the United States.

Because of the complications, Dr. R. Bruce Ledin of the University of Florida's Subtropical Experiment Station at Homestead, has given me this story of the Brazilian *E. aggregata*:

"In 1938 William H. Ott of Whittier, California, obtained seeds of a plant labeled *Myrciaria edulis*, the 'Cambuca' of Brazil. He was corresponding with Dr. H. S. Wolfe, then in charge of the Station here, and told him that in São Paulo this plant is called 'Rio Grande Cherry.' He sent Dr. Wolfe two seedlings and he planted them out in the arboretum September 22, 1938. In 1941 they fruited and have done so nearly every year since then. The Station has distributed a number of seedlings over the years as *Myrciaria edulis*, and since 1955, as *Eugenia aggregata*. It makes a very handsome evergreen shrub or small tree which in some years (April and May) fruits very heavily. The fruit is edible and actually quite good, except it does not have an awful lot of flavor—I like *Eugenia luschnathiana* better. The plant is quite cold hardy.

"This plant has been offered to the trade by Mr. Ott, and also the Armstrong Nursery in Ontario, California, has offered it for sale. It is

listed, described, and illustrated in their 1952 catalogue, page 99, as *Myrciaria edulis*, the Cherry of the Rio Grande: 'We think this is one of the finest new subtropical fruits to be introduced to California.'

"I have never been satisfied that this plant was properly identified and I am certain that it is not in the genus *Myrciaria*, for according to Bailey's Manual, the hypanthium tube is prolonged beyond the inferior ovary, as in *M. cauliflora*, in which a small ring of calyx tissue is present on top of the fruit—this is not present in our plant. So our plant is not a *Myrciaria* and it is not *Eugenia edulis*.

"In the spring of 1955 I sent flowering material and a photograph of the fruit to Dr. Richard Howard at the Atkins Garden of Harvard. He replied:

"The herbarium specimen of the unknown Myrt. arrived safely and we are pleased to have the material. As you are well aware, the American *Myrtaceae* is in a horrible shape, but I think I have the answer for you on this particular plant. It is neither *Myrciaria edulis* nor *Myrcianthes edulis*, but appears to belong in a small section of *Eugenia*. The specimen you sent compares favorably with the type of *Phyllocalyx cerasiflorus* described by Berg. This section was established on the basis of the large involucre bracts which subtend the flower and fruit. This genus must now be recognized as a section of *Eugenia*. However, the name "*cerasiflorus*" is preoccupied and the next available name apparently is *E. aggregata* (Vellozo) Kiaersk. The species is based on a specimen collected by Sellow in Minas Geraes in Brazil. We have a duplicate of the type as well as a photograph of the type from the Paris Herbarium. There seems to be little doubt that this is the correct identification. I showed your material to a visiting botanist from Colombia who is also quite an expert on the flora of Peru and he reports that they have the same material in cultivation and unidentified. He has checked over our work on this particular specimen and agrees that *E. aggregata* is the most appropriate name for this material at the present time."

Eugenia atropunctata Steud.

This shrub or small tree to 18 feet from Dutch Guiana has inconspicuous white flowers and bears tiny black fruits of no value. In manner of growth and general appearance the tree resembles *Syzygium jambolana* except that the leaves are much smaller. It was introduced by the USDA as P. I. 221180 but has not been widely distributed.

Eugenia brasiliensis Lamarck. Grumichama or Grumixama.

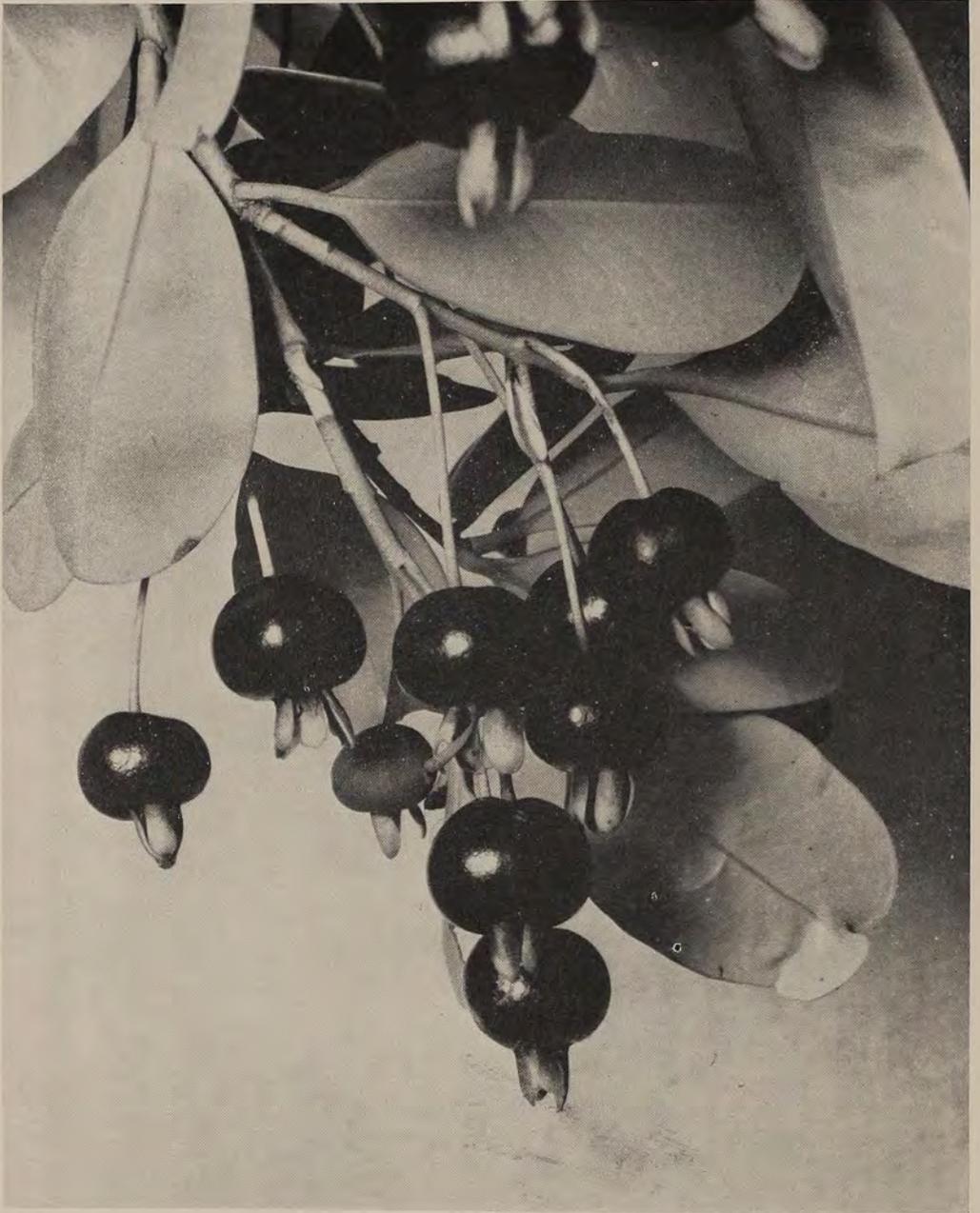
(Syn. *Eugenia dombeyi* (Sprengel) Skeels; *Myrtus dombeyi* Sprengel).

Although a tall Brazilian tree, this was first introduced in 1911 as P.I. 30040 from Mauritius



JULIA MORTON

Eugenia aggregata



NIXON SMILEY

Eugenia brasiliensis



NIXON SMILEY

Eugenia luschnathiana

where it was described as a very fine shrub, 10-18 feet with glazed leaves and white blossoms.

Considerably cultivated in southern Brazil for its delightful fruits that look like oversize gooseberries and taste somewhat like huckleberries, the *Grumixameira* (the suffix—*eira* in Brazil refers to the tree rather than the fruit) divides into several races, white-fruited, red-fruited, and deep violet-fruited.

Dr. Wilson Popenoe introduced this tree again in 1914 as P.I. 36968 and wrote of it:

"Both as a handsome ornamental tree, and for its pleasantly flavored, cherrylike fruits, the grumichama deserves to be planted in gardens and dooryards throughout the Tropics. It has not yet become well known outside its native country, Brazil, though it is cultivated in numerous Hawaiian gardens, and even in as remote a part of the world as Mauritius.

"The tree, which grows to 25 or 35 feet, is shapely and densely clothed with deep glossy green foliage. The individual leaves are elliptical, about 4 inches in length, thick and leathery. The fruits ripen here in November, and in general appearance very much resemble cherries. The form is round or slightly flattened, the color deep crimson. The stem is one inch or more in length. The thin skin enclosed a soft, tender pulp, of mild and delicate flavor. The seeds, one to three in number are rounded or hemispherical, about one-fourth to three-eighths inches in length. The grumichama is one of the most agreeably flavored myrtaceous fruits we have tasted and in addition is a beautiful and shapely ornamental.

"Plants which were brought in by Dorsett, Shamel, and myself from Brazil in 1914 have behaved in a most interesting manner at Miami, Fla. Not only have they withstood several rather severe winter frosts, but they have commenced to flower while still quite small,—only 5 feet high, in fact,—and I shall be very much surprised if the plant eventually does not become as popular in southern Florida as its relative, the pitanga, is today. It has large, thick leaves, dark green and somewhat glossy. The flowers are white, an inch broad, and suggest those of the guava in general appearance. The dark-red fruits, the size and shape of a northern cherry, contain a single large, round seed, and are soft and delicate in texture, with a sweet, pleasant flavor which is quite agreeable at first trial. One of the interesting features of the plant is the remarkably short time which elapses between the appearance of the flowers and the ripening of the fruits."

Eugenia ligustrina (Swartz) Willd.
Privet Stopper, Birch Berry.

This native of the West Indies (Puerto Rico, Jamaica, Cuba, Hispaniola, St. Martin to Trinidad, and Brazil) is not well known in cultivation in Florida but is listed in Standardized Plant Names and probably was offered by Royal Palm Nursery years ago.

Plants at the Sub-tropical Experiment Station at Homestead (seed came from the Atkins Garden in Cuba) are slow growing, evergreen, ornamental shrubs 6 to 10 feet high (in West Indies to 20 feet), with thick, tight growth. Bark rough. New leaves dark reddish-brown. Branches slender. Leaves small, thick, opposite, simple, entire, with conspicuous dots above and below, dark green above, pale below, obtuse, midrib prominent and impressed, narrow elliptic to linear-elliptic, one inch or less long and $\frac{3}{8}$ inch or less wide. Conspicuous linear bracts or scales at nodes on new growth oppressed, to $\frac{1}{4}$ inch long. These persist and become dry and papery on the older twigs.

Flowers on slender stalks to one inch long; flowers solitary on lower part of branches of first year's growth in spring in axils of the scales or linear bracts mentioned above. Sepals 4 or 5, $\frac{3}{8}$ inch long, recurved, glandular dotted; petals 4 to 5, white, $\frac{3}{4}$ inch long. Fruit globose, glandular dotted; to $\frac{1}{4}$ inch wide, sweet, edible, red to dark red-black in color, borne on short stalk and usually ripe in June; with 1 to 3 small seeds.

Eugenia luschnathiana Klotzsch ex Berg.
Pitambo or Pitomba.

(Syn. *Phyllocalyx luschnathianus* Berg.)

A Brazilian small evergreen tree, sometimes to 30 feet, introduced from Rio de Janeiro in January 1911 as P.I. 29423 and sparingly grown in South Florida. It bears orange-yellow, agreeable aromatic fruits. The flavor suggests an apricot but the pulp is very fibrous.

Eugenia supraaxillaris Spring. Tatu.

Although in South Florida this Brazilian fruit tree is a low, inconsequential shrub with thin leaves and inconspicuous flowers, it is regarded with considerable favor by southern California landscapers. In fact, Roland H. Hoyt in his new "Ornamental Plants for Subtropical Regions," calls it "probably the best (of the Eugénias) in adversity . . . wind, poor soil and dryness." He adds: "Shrubby or a tree 25 feet with very large dark leaves that are pale beneath . . . turn over in the wind for a show, good in developing lively masses of foliage."

This plant is native of Brazil where its edible fruit is prized (Hoehne: "Frutas Indigenas").

Hortus III lists *E. supraaxillaris* with the note: "probably *E. axillaris*." Other authorities definitely dispute this presumption.

Eugenia tomentosa Cambess.

(Syn. *Phyllocalyx tomentosus* Berg.)

A handsome small tree to 20 feet, bearing edible yellow fruits 1 inch in diameter, resembling large gooseberries in appearance. Appears to stand light frost. (See contradictions under *Myrciaria edulis*.)

Eugenia uniflora L. Surinam Cherry.

Syn. *E. michelii* Lam.; *Stenocalyx michelii* Berg.; *Stenocalyx brasiliensis* Berg.)

Popenoe called this Brazilian shrub or small tree "the best of the Eugénias." Rarely seen in Florida as a tree to 25 feet, it is one of our most easily grown and popular hedge plants, its bright evergreen foliage lending itself to boxing. New leaves are a pleasing shade of red.

The 8-ribbed crimson or black 1-inch fruits are eaten out of hand or used in making jelly and mixed drinks. Plants must be 4 or 5 years old before they begin to bear plentifully, but when mature they frequently develop two crops a year. The Surinam cherry is rare in California, although it is cold resistant to 20° and is prized for oceanfront planting because of its resistance to salt spray.

The cherries are first green, then yellow, orange and finally a deep crimson. They should never be eaten till fully ripe when they drop off the bush at the touch of a finger, for immature fruits are resinous and pungent. When ripe they have a delightful aromatic, distinctive flavor. When a newcomer first tastes a Surinam cherry, he often finds it disagreeable. But oldtimers like nothing better than a handful to eat.

Eugenia uniflora has several common names. Where "Surinam" came from is uncertain because the plant did not originate in Dutch Guiana. In Brazil the fruit is called Pitanga (which should not be confused with another species *Eugenia pitanga* Kiaersk., a low shrub, all young parts covered with reddish down. This is not in cultivation here). Another common name is Brazil Cherry.

The Surinam Cherry is believed to be the only *Eugenia* fruit that is offered for sale in Florida markets.

Myrceugenia apiculata (DC.) Niedenzu. Temu.

(Syn. *Eugenia apiculata* DC.; *Eugenia luma* Berg.; *Myrtus luma* Molina but not of other authors.)

Hortus III describes this as a shrub or small tree of 6 to 30 feet, bark becoming golden brown, flaky. Leaves ½ to 1 inch long, ovate to oblong, sharply apiculate. Flowers cream-white becoming suffused coral red, about ½ inch across, cymes long-peduncled, petals 4, calyx lobes 4, rounded. Fruit black. October. Chile. Inhabits moist shaded areas. Useful in subtropical areas as landscape plant, windbreak, or for hedges. Withstands full sun.

This tree was brought into cultivation some years ago by the California State & County Arboretum at Arcadia. Under the names *Myrtus apiculata* and *Myrtus luma*, it has been cultivated in England for a hundred years and is prized for its profuse flowering. Over there it is sometimes confused with *M. lechleviana*, a

very similar Chilean plant. Both are commonly called "tree myrtle."

Myrciaria cauliflora Berg. Jaboticaba.

(Syn. *Eugenia cauliflora* DC.)

This name has been confused in the literature. Actually there are three different, but closely allied trees in Brazil with similar fruits that are known collectively as Jaboticaba. For an explanation of distinguishing features of *Myrciaria cauliflora* Berg., *M. jaboticaba* Berg. and *M. trunciflora* Berg. see Hoehne's book on Brazilian fruits. Incidentally, the Brazilians put major emphasis on the first syllable, then run the other syllables together fast with only a minor accent on "cab"—JAB'-ot-i-CAB'-a.

These evergreen trees to 35 feet, upward branching from near the ground, bear clusters of short-pedicled white flowers with conspicuous stamens, produced directly from trunk and branches. These are followed by thick-skinned, grape-like fruits that are 1 to 1½ inches diameter, the pulp a pleasing vinous flavor suggestive of the muscadine grape. Each fruit contains 1 to 4 oval seeds.

Christian Halbinger Frank, Mexico City, who has been growing Jaboticaba there, writes: "*M. jaboticaba* takes 5 years until fruiting and *M. cauliflora* 30 years, but *M. cauliflora* has better fruit. Grafted trees from the *M. cauliflora* tree on the estate of S. W. Youngmans, 1020 N.W. 49th Street, Miami, are the best to bear consistently in this area so far."

Harry Blossfeld, São Paulo, Brazil, plantsman, writes of these trees:

"Some 200 miles west of São Paulo is a city named Jaboticabal which got its name from the fruit tree. In that city there are thousands of trees in all back yards and orchards. People stream to the city at harvest time and orchard owners charge an entrance fee for which you can pluck as many fruits as you can eat. Or they charge another fee for each five gallon can you take out with fruit. Jaboticaba jelly is most popular with us and any suburban piece of land offered for sale is charged an additional price for each Jaboticaba tree standing on it. Jaboticaba trees are practically the only trees ever transplanted in a big size with root ball; with this one exception, nobody would here care for buying a grown-up tree and pay for its hauling. It takes from 12 to 15 years to get a plant from seed into first fruiting, but by grafting on a more vigorous variety here known as 'Paulista' it is possible to get young trees to bear fruit three years after grafting, or six years after sowing the stock."

Paulo Nogueira-Neto from São Paulo, Brazil says: "Our jaboticaba trees are now severely attacked by a fungus. It is a great problem. The fruits are covered by the yellow spores of the fungus and also the leaves are attacked."



ARTHUR RUHNKE

Eugenia uniflora



Flowers and fruits of Myrciaria cauliflora





JULIA MORTON

Myrciaria floribunda

Myrciaria edulis (Vell.) Skeels.

Hortus III describes this: "Tree to 20 feet; brs. pendant lvs. 2.3 in. long, willow-like and rusty-pubescent when young; fls. $\frac{1}{2}$ in. across axillary or terminal in clusters; fr. about 2 in. long, pear-shaped, downy, ill-smelling, orange-yellow. February. Brazil." The same reference book gives *Eugenia edulis* Vell. as a synonym.

Confusion begins here because the tree being grown in Florida under the name *Eugenia edulis* Vell. definitely is not in the genus *Myrciaria*, and consequently cannot be *Myrciaria edulis*. Here is Dr. Bruce Ledin's description of the tree cultivated in Florida:

"This native of Brazil is an evergreen shrub or small tree with an open, scraggly type of growth. Branches tend to be at right angles to the stem and this accounts for the open growth. New leaves and branches are soft white pubescent but mature growth is glabrous.

"Leaves willow like, opposite, simple, set rather far apart, short petioled; blade small and narrow, to 3 inches long and $\frac{3}{4}$ inch wide, but mostly 2 to $2\frac{1}{2}$ inches long and $\frac{5}{8}$ inch wide, or smaller, becoming thick and leathery, acute, lanceolate to elliptic-lanceolate or almost linear, midrib prominent but lateral veins somewhat obscure and few in number (5 to 6 pairs).

"Flowers solitary in axils of leaves on new growth, about one inch across, with 5 recurved pointed hairy sepals, 5 white petals, and many prominent stamens.

"Fruit large, to 2 or $2\frac{1}{2}$ inches in diameter, globose, covered with a fine pubescence ("downy"), pale yellow-green, edible but not desirable as it has a very pronounced odor and flavor suggesting garlic.

"This is not a handsome plant and the fruit is not especially desirable; grown mostly as an oddity. Originally offered to the trade by Reasoner's Nursery in Oneco, Fla., many years ago."

Confusion increases as we review the description of *Eugenia edulis* which appears in Peter Riedel's (California) book "Plants for Extra-Tropical Regions." He wrote:

"A small willow-like tree from the river Plata in Brazil. There are still a few specimens in Santa Barbara, survivors of those Dr. Franceschi grew. The best one is in Dr. Franceschi's old nursery, just above Franceschi Park, a specimen 18 foot tall, with a very graceful habit, pretty at all times but a spectacle when yellow with fruit which, in some seasons completely obscures the foliage. It varies in size both large and small fruits being found on the same branch, but an average sample weighed 3 ounces, was $2\frac{1}{2}$ inches in diameter with a circumference of $7\frac{1}{2}$ inches. This fruit is delicious, the shape of an apple or peach and somewhat downy and yellow. In a good year, the ground under the bush is so thickly covered with fallen fruit that one may not step there without crushing one or more of them. It will never be a good shipping fruit

because it is soft and the skin is thin and easily broken but, if it were much better known, no home orchard would be without it. This small bush, in certain seasons bears over 2000 fruits but, in other years, may have but a few. It grows where it gets no cultivation at all and only the water resulting from the usual rainfall. Seedlings in pots have given some difficulty; they do not like having their roots confined; once planted out, they seem healthy enough, though the growth, at first, is slow and the plants do not seem to bear until they are 8 or 10 years old."

Obviously, Riedel was not writing about the tree which California nurserymen call *Myrciaria edulis* but which in this article is called *Eugenia aggregata*. (q.v.) When Riedel's description was called to Dr. Ledin's attention, he wrote:

"My description of *Eugenia edulis* nearly fits Riedel's. If the plants are the same, and I think they are, I do not see how Riedel can say that 'the fruit is delicious'—our fruit has a decided garlic odor and taste and is very acid—maybe there are some good forms of it? Our fruit is yellow and is downy and the size of a peach. It definitely is not in the genus *Myrciaria*, so it can't be *M. edulis* according to *Hortus III*. Popenoe has a brief description of *Eugenia tomentosa*, page 310, and it is also mentioned on page 282 of the Proceedings of the Florida State Hort. Soc. for 1958 as the cabelluda, *Eugenia tomentosa*. These fruits came from our tree here which we have labeled as *E. tomentosa* but which appear to be *E. edulis*. Chapman Field distributed plants of *E. edulis* (*E. tomentosa*?) in 1951 (P.I. 161873) as *E. sp.*, which we have here, and the Atkins Botanical Garden in Cuba sent us seeds of *E. uvalha* in 1952 which have fruited here and they appear to be *E. edulis* (*E. tomentosa*?) which fits Riedel's description except that the fruit is not 'delicious.'

"So we have a problem here in identifying the true *E. edulis* and *E. tomentosa*."

Unfortunately, *Hortus III* is no help. It does not list *E. tomentosa* at all, although it does describe *E. uvalha* to the extent: "fruits round or oblate, yellow at maturity, aromatic."

The confusion may be summarized thus: The *Eugenia edulis* trees growing in Florida and California are definitely not in the genus *Myrciaria*. The plant called *Myrciaria edulis* by California nurserymen is definitely *Eugenia aggregata*. If the plant called *Myrciaria edulis* in *Hortus III* is in cultivation in the United States, this author does not know where. (See description of *Eugenia tomentosa* earlier in this article).

Myrciaria floribunda (West) Berg.
Guava or Rum Berry.

(Syn. *Eugenia floribunda* West.)

Native to the West Indies (Cuba, Hispaniola, Jamaica, Puerto Rico, Virgin Islands, Lesser Antilles, and northern South America). In St. Croix the aromatic balsam-flavored berry is used

for preserves and put in rum for flavoring. The fruit makes excellent jam with an aromatic flavor.

The plant was distributed by the USDA in 1932 but probably was offered by the Royal Palm Nursery at Oneco, Florida, many years ago. It is not well known in cultivation.

Handsome shrub or tree to 30 feet, but in Florida to only 15 feet high, forming a thick dense growth. Bark guava-like, mottled, and peeling in thin flakes. Leaves opposite, simple, entire, glabrous, with obscure glands, short petiole; margins tend to be revolute; blade lanceolate to ovate-lanceolate, tapering on upper part to a long narrow point; lateral veins obscure; 2-3 inches long and $\frac{5}{8}$ inch wide.

Flowers white, $\frac{3}{8}$ inch diameter, nearly sessile, borne profusely, often one flush after another as in coffee, in clusters of 4 to 6, in axils of leaves. Calyx of 4 minute sepals represented only as mere points; petals 4, white, very small; stamens numerous, white, conspicuous, borne with the sepals and petals on upper rim or edge of cup or hypanthium; ovary half inferior, not joined to hypanthium, rather seated at its base; style longer than the stamens.

Fruit borne solitary, near ends of twigs, globose, short-stalked, with 2 small bracts at base, $\frac{1}{2}$ inch long. In the yellow form the surface is resinous dotted and the flesh translucent showing the many veins. Besides the yellow fruited form just mentioned, another type has dark-purple-red fruit, almost black, like the color of jaborcaba, the veins and dots obscured because of the dark pigment; this black type tastes better as it is not so resinous. Seeds one, large, dark colored, kidney shaped and filling most of the fruit so flesh is scanty.

Flowers produced May to July, usually in June, with sometimes a second flowering in September. Fruit is ripe from August to October, with the September bloom maturing fruit in November and December.

O. W. Barrett, in "The Tropical Crops" says: "The guava-berry, *E. floribunda*, of the Virgin Islands and Puerto Rico, has long been known for its dark red or blackish fruits of the size of a small cherry. The intense balsam-like aroma of the purplish pulp is hardly equaled by any other fruit; it is used in making jams, and formerly a heavy liqueur and a strong wine, very popular in Denmark and the neighboring countries, were exported from St. Thomas in large quantities. There are three or four varieties in the dry hills of St. Croix; these vary as to size and color, but all are intensely aromatic. Unfortunately this excellent fruit does not take kindly to cultivation."

Pimenta dioica Merr. Allspice.

(Syn. *Pimenta officinalis* Lindl.; *Eugenia pimenta* DC.)

Native to Jamaica, Cuba, Mexico, and Central America. Wood, leaves, flowers, and unripe

fruit all very aromatic. Tree said to become 30 to 40 feet high in Jamaica, but usually 10 to 15 feet in Florida. Bark pale brown and mottled, peeling in flakes. Young stems conspicuously 4 angled or square. Leaves opposite, simple, petioled ($\frac{5}{8}$ inch); blade thick and papery or leathery, dark green above, pale below, glabrous, with many glandular dots on both surfaces, margins entire but undulate and revolute, apex obtuse, elliptic to elliptic-oblong or oval-oblong in shape, mid vein impressed above but more prominent and becoming yellowish below, lateral veins not many but conspicuous, blade to 6 inches long and $2\frac{1}{2}$ inches wide.

Inflorescence short, to 3 inches long, borne in axils of leaves on new growth, a many branched cyme, the branches in 3's. Flowers small, $\frac{1}{4}$ inch across; sepals 4 minute; petals 4, white; stamens many.

Fruit a berry, small, $\frac{1}{4}$ inch diameter, globose, conspicuously glandular-dotted with green, becoming dark-purple-black when ripe, pulpy, sweet but almost tasteless, with 4 small green sepals as a crown on top of fruit, 1 or 2 seeded.

This is a handsome, evergreen, ornamental tree with upright growth, attractive bark, and dense, dark green foliage. Flowers in spring and fruit ripe in early summer. It does well in alkaline mucky soil and is recommended for planting as an ornamental. It can be propagated by cuttings or seeds. The leaves both fresh and dried have a very strong, spicy agreeable odor.

The allspice of commerce (often called "Jamaica pepper"), is made from the berries which are gathered when still green but full grown and dried in the sun. The tree is not planted commercially in Jamaica but fruit is picked from wild trees or those that were left when the area was cleared. It is used locally and exported for use in cookery for flavoring, and in medicine as a stimulant, and is said to be smoked like tobacco in some places in Mexico. Oil of pimenta made from the ripe fruit is used also in medicine and in perfumery. The allspice of commerce is so named for it has the flavor of cloves, cinnamon, and nutmeg.

Eugenia Indigena to Florida

Nine species of *Eugenia* are native to Florida, but some are so seldom cultivated or even seen that few residents of the State are aware of their existence. A few agencies have tried to grow and popularize the best of them; outstanding in this effort are Simpson Garden Center, Woodlawn Park Cemetery, Fairchild Tropical Garden, all of Miami, as well as the City of Miami Parks Department.

In contrast to the rare appearance of a native *Eugenia* in anybody's garden, introduced species are planted everywhere in South Florida, almost to the point

where it might be said that at least one kind can be found in everybody's garden. They seem to be very much at home in this climate and adapt themselves to landscaping uses.

Several of the Florida species are found also in the West Indies. Contrariwise, a few West Indian natives are found in Florida but have probably been introduced. As Cuba is a hotbed of *Eugenia* species, it seems strange that so few of these have ever reached the United States.

Herewith are brief descriptions of the nine native Florida species:

Eugenia anthera Small. Small's *Eugenia*.

Farrar's "Guide to Southern Trees" says:

"This is a small tree or large shrub found in hammocks along the coast of southern peninsular Florida. It may be distinguished by its very small leaves, 1/2" to 2" long, and dark-red or black fruits. It is of no commercial value."

Small says the bark is pale, rather smooth; the leaf blades slightly paler beneath than above, the corolla slightly longer than wide. He adds that the brown heart-wood is close grained and hard.

Eugenia axillaris (SW.) Willd.

White Stopper.

(Syn. *Myrtus axillaris* SW.)

A small, slender tree of 20 to 25 feet, common in hammocks all over south Florida, often shrubby along the upper East Coast. Walter M. Buswell in his "Native Trees and Palms of South Florida" says of it:

"Flowers axillary, white, fragrant, often so dense they form a continuous cluster along the branches, calyx with pale hairs on the outer surface.

"Fruit reddish-purple, turning black, 7-12 mm. long, usually wider than long, juicy reddish-purple flesh. Often with a few or many woody galls in place of the fruit, and occasionally all the fruits replaced by galls. These galls are found on other *Eugenia* but never as abundant as on this species.

"This tree gives off a skunk-like odor that is noticed for a considerable distance and one can always be certain that the plants are somewhere in the vicinity. The odor is more noticeable from a distance than when close up; crushed leaves often have a slight odor, but not always. The flowers are fragrant; green fruits have an aromatic odor."

The leathery evergreen leaves 1-3" x 1/2-1" are mostly oval or elliptic, dull dark green above, minute black dots below. The stout petioles, sometimes winged, are purple.

Eugenia bahamensis Kiaerskou.

Bahama *Eugenia*.

(Syn. *Anamomis bahamensis* (Kiaerskou) Britton; *Mosiera bahamensis* (Kiaerskou) Small.)

West says this native of the Florida Keys and the Everglades Keys bears nearly stalkless flower clusters, seedy fruits and upright branches.

Eugenia buxifolia (SW.) Willd.

Box-Leaf *Eugenia*.

(Syn. *Eugenia myrtooides* Poir.; *Myrtus buxifolia* Sw. This is not the *E. buxifolia* of other authors.)

This West Indian tree becomes shrubby in Florida where it grows all along the east coast from Cape Canaveral to Key West. The bark is light brown, roughened by old leaf bases.

The shrub has very small elliptic or oval leaves, usually 1/2 to 2 inches long that are close set on the branches, resulting in a dense crown with lots of fine black dots on the lower surface of the leaves, though these are not always noticeable. The small white flowers are in short clusters on bare parts of the branch or on short leafy spurs. The oval or nearly round, black, aromatic fruit contains one pale brown seed. The heavy crops of berries are an abundant source of food for birds. The shrub is common on cut-over land, and West reports it is the dominant plant on some of the Florida Keys.

Other common names are Spanish Stopper and Gurgeon Stopper.

A different plant with tiny, gray-green leaves called "*Eugenia buxifolia*" and occasionally seen in Florida gardens, may be *E. buxifolia* Phil. from Chile.

Eugenia confusa DC. Redberry *Eugenia*.

(Syn. *E. garberi* Sarg.)

Sargent reported this (70 years ago) as the largest myrtaceous tree in North America, reaching a height of 50 or 60 feet, with a trunk 18 to 20 inches in diameter, and called it "one of the most beautiful of Florida trees." No one of the present generation has seen trees so large; mostly they are 30-45 feet, the branches slanting upward to form a narrow, compact crown. Buswell in 1945 reported many trees in Brickell Hammock, Miami, and some on Key Largo. Nixon Smiley (1958) found a group of trees on the north side of the intersection of U.S. Highway No. 1 and S. Miami Avenue. Unfortunately, most of the Redberry *Eugenia*s have been bulldozed from the mainland so that they have become rare, and unless brought back for use in ornamental horticulture, they may soon be extinct in South Florida. The species has been reported in the Bahamas and in some of the West Indian islands.

Eugenia confusa is the only large native tree in the genus. Leaves on old specimens are small, ovate or narrow elliptic with a long, pointed, acuminate tip, bright glossy green, 3-5 cm. long, according to Buswell; but on young trees the leaves are larger, ovate or nearly orbicular with a long, acuminate tip, small dark spots on both sides of the leaf, 4-8 cm. long. New leaves are pale red.

The minute white flowers in dense axillary



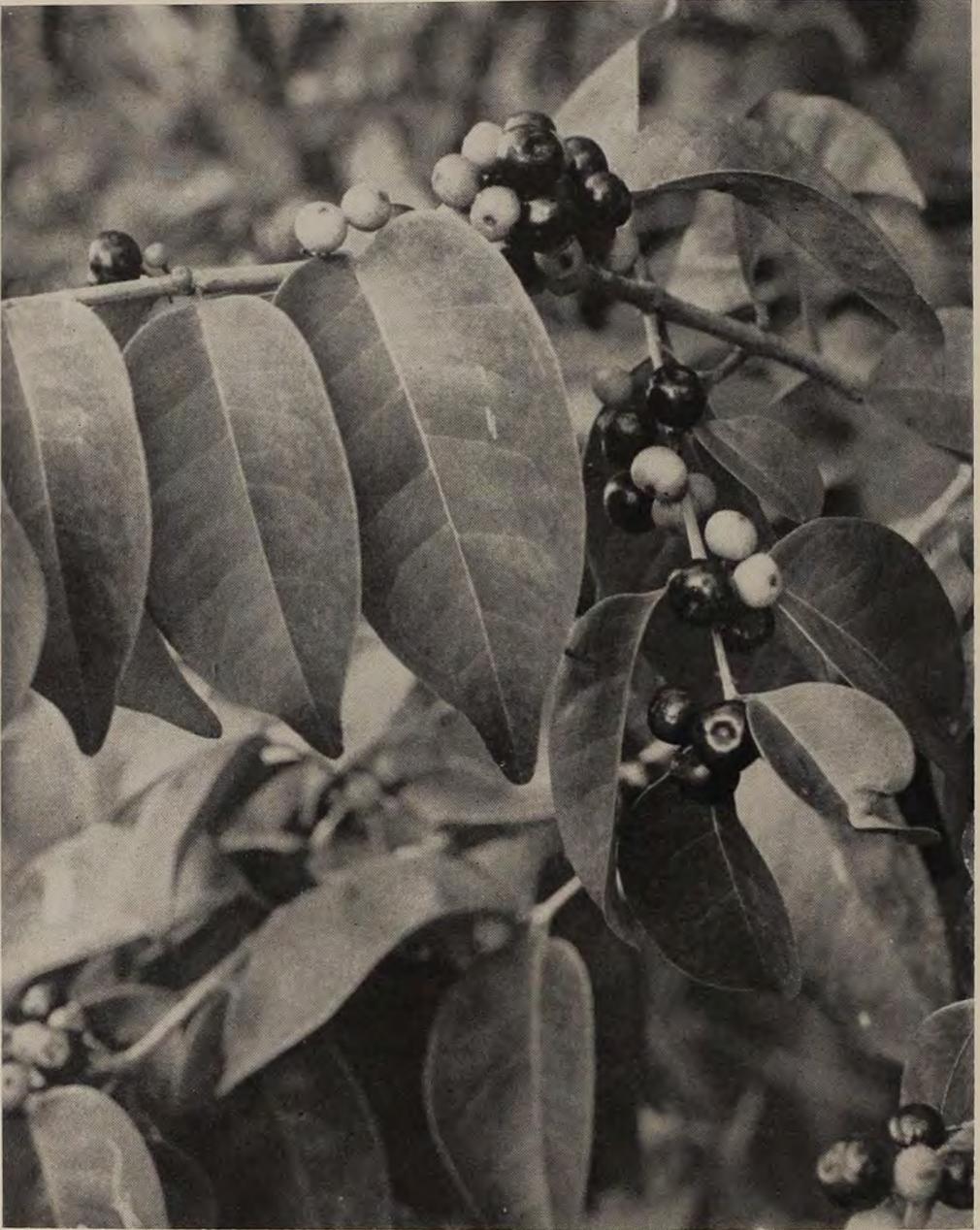
CAM-ART STUDIOS

Eugenia buxifolia



JULIA MORTON

Eugenia buxifolia



BROTHER ALAIN

Eugenia axillaris



MIAMI HERALD STAFF

Eugenia confusa



CAM-ART STUDIOS

Eugenia simpsoni

clusters in autumn, are followed by round scarlet fruits 10-13 mm. diameter.

The bark is ordinarily smooth, gray; but on older trees narrow strips of partly loose bark hang down.

Many old-timers in Florida refer to the tree as Red Stopper, but this common name is sometimes applied to other species as well. Sometimes this tree is called Ironwood, which makes for confusion because Ironwood is a "common name" for scores of different trees, including the following which grow in Florida: *Krugiodendron ferreum*, *Ostrya virginiana*, three different species of *Cyrilla*, *Cliftonia monophylla*, *Exothea paniculata*, and *Bumelia lyvoides*.

Eugenia dicrana Berg.

Twinberry Eugenia.

(Syn. *Ananomis dicrana* (Berg.) Britton; *Ananomis dichotoma* (Poir.) Sarg.)

Allied to Simpson's Stopper, this is a smaller tree 25 to 35 feet, with loose reddish bark, often in shreds. It is recognized readily by 3-flowered clusters of white, fragrant flowers in the leaf axils, followed by nearly round, reddish brown, aromatic fruits, 6-7 mm. diameter. The flower stems are longer than the leaves so that when the tree is in bloom, the numerous white stamens stand out beyond the foliage.

The tree is found abundantly in some hammocks from Cape Canaveral south to Key West, but strangely enough is missing in others.

Other common names are Twinberry Nakedwood and Naked Stopper.

Eugenia longipes Berg.

Trailing Eugenia.

(Syn. *Mosiera longipes* (Berg) Small).

Ordinarily a shrub to 3 feet with slender erect branches, but occasionally a small tree. It is found chiefly on the Keys, especially on Big Pine Key.

The oval or ovate leaves are conspicuously reticulate, glossy above, and have dark red veins beneath.

The tiny white flowers, dense bunches of white stamens resembling guava flowers, are often abundant and Buswell called them "very showy." The fruit is dark purple or black.

Eugenia rhombea (Berg.) Krug & Urb.

Spiceberry Eugenia.

(Syn. *Eugenia foetida* Pers., *Y. rhombea* Ber.)

This small tree occurs in Florida only in hammocks in the southern tip of the State and on the lower Keys to Key West.

The olive green leaves with conspicuous black dots on them, are ovate, tapering gradually to a narrow, round tip. They are from 1 to 2 inches long.

The white flowers, about 1/8 inch wide, are in few-flowered clusters in the axils. These are followed by nearly globular 1/2-inch fruits that are orange and red, turning black, the skin somewhat roughened by glands.

This species also is sometimes called Red

Stopper.

At one time this species was referred to *Eugenia procera* (SW.) Poir., a West Indian species, and Nehrling in "My Garden in Florida" wrote of it:

"This also is a very handsome Eugenia with fine dense evergreen foliage. The berries are orange, tinged with red, and black at maturity. Fruits picked in their orange color supplied seeds that germinated without difficulty. These Eugenias ought to be largely propagated and used as ornamentals. All of them make fine, dense small trees when given sufficient room to develop. None of them do well in dry soil. Hammock soil, consisting mainly of rotted old leaves, is what they require."

Erdman West, author of "Native Trees of Florida" reports that he has never seen this species growing in Florida.

Eugenia simpsonii (Small) Sarg.

Simpson's Eugenia.

(Syn. *Ananomis Simpsonii* Small).

A dense strongly buttressed, upright evergreen tree to 50-65 feet that grows sparingly in some of the hammocks north of Miami, and one of the handsomest of Florida trees. Unfortunately it is rare both in the wild and in cultivation. It is distinguished by leathery leaves, elliptic, oval or obovate, bright green and shining on the upper side; the tip acute or round and notched, black dots above and below, 2-7 cm. long. The spicy-fragrant white flowers in forked clusters of 3 to 15, on long slender peduncles, are made up of a dense mass of stamens with fine thread-like white filaments and tiny, globular pale yellow anthers. The edible, round or oval, aromatic red fruits, 12-15 mm. diameter, are hunted by birds. The thin, smooth, creamy or pale reddish-brown bark flakes off, exposing fresh, lighter colored bark and giving the trunk a mottled appearance, not unlike the related common guava (*Psidium guajava*). *Eugenia simpsonii* is sometimes known as Simpson's Stopper or as Simpson's Nakedwood. Its specific name honors Charles Torrey Simpson, pioneer botanist of the South Florida wilderness.

Small says the foliage contains a volatile oil, somewhat resembling that of nutmeg in flavor.

A. A. Bullock of the Herbarium at Kew Gardens has protested the author's conclusion in Part I of this article, that is, "Bullock and Harrison refuse to accept *Syzygium* as generically distinct from *Eugenia*." He writes:

"I must protest strongly concerning your misrepresentation of the nomenclatural note by my colleague S. G. Harrison and myself on the correct name of the common Clove. We nowhere suggested that *Eugenia* and *syzygium* are congeneric and indeed we do not accept such a classification. What we said was that we consider that the clove is correctly assigned to the genus *Eugenia*."

"The characters by which *Eugenia* and *Syzygium* are separated, and how far both of them should be divided into distinct genera and/or infrageneric groups, remains a matter of opinion. The broad distinction between the two main genera—Old World and New World—which you mention in your opening paragraph, is broadly true, but this does not mean that the Clove should be assigned to *Syzygium*."

This author notes that *HORTUS III* does assign the Clove to *Syzygium*.



A wild form of Ficus from Japan with attractive lobed leaves

Hunting ornamentals in a Tasmanian rainforest



The Longwood Gardens-USDA Plant Introduction Program

W. H. HODGE

The introduction of ornamental plants from abroad is something which has been going on since earliest colonial times when colonists imported not only the basic grains, fruits, and vegetables needed for sustenance, but also the familiar trees, shrubs, and garden flowers of Britain and Europe to decorate their gardens and dwellings.

In the earlier decades most of this plant introduction activity was haphazard, carried on by the new immigrants as they moved into this country, by correspondence with friends back home or through the help of seed merchants or nurserymen. As the years progressed, plant exploration and introduction for ornamentals, as for agricultural materials as well, became more formalized. At the turn of this century such famed institutions as the Arnold Arboretum were sending out plant hunters like E. H. Wilson through whose efforts a number of new though now familiar ornamentals were introduced.

In 1898 our own Federal government also formally entered the picture with the formation of a special unit in the Department of Agriculture whose duties included the exploration for and the introduction of new plants. More to the activities of this one unit than to any other in the Department of Agriculture can our farmers and plant breeders be

thankful for the remarkable range of crop plant varieties that are grown today so lucratively in America. So successful has this program been during the past half century that its operations have served as a blueprint copied by other nations throughout the world.

Although Federal plant explorers have been better known for their agricultural introductions, ornamentals have not been entirely passed by. In the earlier years, especially, men like David Fairchild, Joseph Rock, and Frank N. Meyer sent in, among their more numerous agricultural introductions, a number of ornamentals some of which, like the Lace-bark Pine (*Pinus bungeana*), Siberian Elm (*Ulmus pumila*), David Lily (*Lilium davidi*), and popular Meyer Zoysia lawn grass (*Zoysia japonica*), are now widely grown in this country.

Unfortunately, in recent years the continuing need of new or better ornamentals or wild species useful in ornamental breeding programs has been too frequently overlooked. This is not because there are no longer wild or domesticated species, varieties or strains, worthy of import as ornamentals, for the fount of ornamentals will certainly yield productively for years to come. Explanations for contemporary lack of support for such programs are not lacking. For one thing, the dangerous consequences of the

introduction of new or little-known insects or diseases along with introduced plant material have made quarantine regulations more and more restrictive. Thus, it is no longer as easy to bring in new plants, particularly those propagated vegetatively. Nevertheless, foreign plant material required for our dynamic agriculture continues to be introduced, which leads one to point out that the thousands of people interested in this country (either directly or indirectly) in ornamentals are relatively disorganized compared with the growers of crop plants. Yet ornamental horticulture is big business in the United States, but until the lobbying talents of this group can approach those of the agricultural interests, they will find Congress still reticent about allotting additional funds for ornamental research.

One might logically expect botanic gardens and arboretums to have increasing interest in all phases of ornamental horticulture included the exploration for and the introduction of new types. Certainly this kind of activity has long been associated with such institutions. Yet some of these very institutions—in a time of expanding suburban populations, with accompanying burgeoning horticultural interests—are content to cut back on the upkeep of their living plant collections in favor of more basic scientific work either in the laboratory or herbarium. Though such basic research is certainly necessary, some phases of it might be better carried on by our colleges, universities, or other research institutions. One might reasonably ask, if botanic gardens and arboretums are to give up their primary public activities of maintaining and displaying living collections of plants who else is there to carry out this increasingly important function?

It was to help remedy this situation that the Longwood Foundation, Incorporated, through its subsidiary, Longwood Gardens of Kennett Square, Pennsylvania, helped initiate in 1956 a new sustained program directed solely to the field of exploration and introduction of ornamental plants. This program has been set up as a cooperative one with the United States Department of Agriculture. In this program Longwood Gardens cooperates through grants of funds needed to maintain plant explorers in

the field as required. The New Crops Research Branch (a new name for the old Division of Plant Exploration and Introduction of the U. S. Department of Agriculture) with headquarters at Beltsville, Maryland, is the actual action agency charged with implementing the recommended exploratory program.

The plant introduction "know-how" of this unique Federal organization encouraged the establishment of the Longwood Gardens-USDA exploration program as a cooperative one. Among benefits obtained are the following: Plant explorers working under this set-up become employees of the U. S. Department of Agriculture and thus when abroad have the advantage of traveling as official representatives of the Federal government; all ornamental plant introductions are facilitated entrance through Federal plant quarantine which is, of course, a USDA activity; ornamentals entering the country automatically are assigned accession numbers, the familiar plant introduction (or "P.I.") numbers which eventually appear in a permanent printed inventory with worldwide distribution—assurance against future loss of valuable plant collector's data; and, finally, the extensive physical facilities (including a chain of Federal and State plant introduction stations) and trained personnel of the Federal plant introduction organization make it possible to identify, propagate, and distribute introduced plants effectively to all interested technical workers at arboretums, botanic gardens, experiment stations, and other institutions wherever they may be in this country or abroad. Thus, this Longwood Gardens-USDA program should benefit ornamental horticulture throughout America rather than merely one limited horticultural segment, institution, or individual.

The early twentieth century work by American plant explorers focused attention on bringing together new ornamental plants suitable primarily for the colder parts of the United States. Ornamental explorations specifically beneficial to other regions of the nation have been very few. Accordingly, emphasis of the first explorations has been on these neglected areas. Explorations are planned jointly by a committee made up of members of the two cooperative organizations, but proposals for explora-

tions either by area or by ornamental group are directed to the New Crops Research Branch.

Four distinct explorations for ornamentals have already been completed under this new cooperative program. The first of these, undertaken in 1956 by John L. Creech, USDA horticulturist, encompassed southern Japan* whose warm temperate climate is similar to parts of the southeastern and Gulf coasts of the United States as well as the milder coastal belt of the Pacific Northwest. Collecting in Japan was concentrated in the remote forest regions of the southern part of the archipelago on the Islands of Kyushu, Shikoku, and lower Honshu. Native to these islands are a number of broad-leaved evergreen species which should add variety to plant materials presently grown in our country. Collections in Japan ranged across the whole field of ornamentals and the introductions brought in include wild species as well as new or little known selections of cultivars developed in those islands. Among the latter is an outstanding series of new chrysanthemums selected at Japanese chrysanthemum shows, including varieties from the Shinyukyu Imperial Garden at Tokyo.

A second cooperative exploration, made in 1957 by Frederick G. Meyer, USDA botanist, focused attention on plant collections both public and private in southern Europe — France, Spain, Portugal, and Italy, but also including Great Britain. The gardens of these countries are famed for the wealth of their collections which have received the treasures of European plant hunters for years. Certain of these ornamentals have not been successfully or widely established in America. Many should become better known as a result of this second exploration.

The third and fourth explorations were initiated during 1958. The third, which covered the sub-tropical frost-touched states of southeastern Brazil, was undertaken by Llewelyn Williams, USDA botanist, who concluded his work in the late spring. This trip will yield,

it is hoped, showy flowering trees suitable to the climates of Florida and southern California (as well as, of course, Hawaii and Puerto Rico) where home owners, whether they want to or not, have to think about frost tolerance in their sub-tropical woody ornamentals.

During the period September 1958 through February 1959 a fourth exploration was conducted in Australia by George Spalding, USDA horticulturist. Australian wildflowers are famed for their showiness and unusual forms, but have yet to become well-known in cultivation in America. Requiring for the most part a Mediterranean type of climate of wet winters and dry summers, these introductions from "Down Under" should fare best in southern California where they will be initially tested at the Los Angeles State and County Arboretum. Some, like the more familiar acacias, make worthwhile subjects for conservatory culture and newly introduced species of this group will benefit, of course, institutions like Longwood Gardens, which maintain outstanding conservatory displays of exotic ornamentals.

Although a number of the new plant immigrants resulting from this Longwood Gardens-USDA program are already showing promise as useful ornamentals, it is still too early to be able to report definitely on how they will do in America. Several seasons are normally required to increase the introduced plant material, which is often represented at time of entry by only a few seeds or even a single cutting. Certain restricted materials may be delayed a season or more in post-entry quarantine. After increase of new stock is effected, the USDA distributes immigrant material to cooperators for evaluation. Eventually the choicest introductions will stand out among all brought in. They may serve only as outstanding additions to the collections of botanic gardens or arboretums. On the other hand, if they meet the approval of the general public, they should become available through nurserymen or seed dealers and thus eventually find their place as new ornamentals in many of the gardens of America.

*See "Exploring Southern Japan for Ornamental Plants," THE NATIONAL HORTICULTURAL MAGAZINE, April 1958. [Copies available from the Society at \$1.]

Deciduous Azaleas From Cuttings

WARREN BALDSIEFEN

Supreme among the non-evergreen shrubs, decorating themselves in a galaxy of colors from the very earliest evidence of spring until the first tangle of autumn is apparent, deciduous azaleas represent potentially one of our most important gardening plants. Out of bloom their use as landscape subjects is further heightened by their diversity in habit and foliage. Yet, with the exception of *Mollis-Japonicum* and *Schlippenbachii* seedlings, deciduous azaleas are but seldom seen.

The sale by unscrupulous collectors of native material literally ripped from the mountains; the unconscionable selling by merchandisers of bare root imports; the failure of grafts, no matter how artfully made, to thrive but for a relatively few years; these and other reasons have very decidedly served to place a stigma on these magnificent plants.

If the loss is to be corrected, it can only be brought about with handsome, healthy, long-lived plants, and these can only be developed from rooted cuttings. Seedlings are no substitute for named clones; grafting may, and often does, produce a short lived plant and one which vegetates for only the briefest span in fringe areas where ecological conditions are somewhat or totally adverse to the requirements of the plants; and layering in any form is slow to provide quantities of plants. In addition, layered plants in too many cases develop long naked stalks while attached to the stool plant which later make ungainly specimens. This, however, results from faulty nursery practice.

Outlined herein is the method used at Rochelle Park, New Jersey, which has performed with consistent success these many years. Each step is described in full and in the exact sequence in which they are taken.

The rooting takes place in a modified Nearing frame. As many of you know, this frame is an outdoor Wardian type enclosure the approximate size of two hotbed sashes placed end to end, partitioned in the middle forming two separate units, with a superstructure overhead excluding all direct rays of the sun. Blueprints for its construction and de-

tails for its operation can be obtained from Mr. David Leach of Brookline, Penna., or myself.

Into each of the two units in a frame are emptied and leveled, three bushels of shredded commercial peat moss. On top of this is added two bushels of shredded commercial peat moss thoroughly mixed with two bushels of washed coarse masonry sand. This too is carefully leveled. Thinly spread over this is a $\frac{1}{4}$ inch of coarse masonry sand which prevents the peat moss from floating with watering. Into this medium the cuttings are set. They are spaced approximately 2 $\frac{1}{2}$ inches apart in the row and the rows are approximately 1 $\frac{1}{2}$ inches wide, allowing about 3-400 cuttings per unit. Cuttings are never crowded so that leaves overlap to any extent. In rooting, carbohydrates plus nitrogenous substances are required, which are synthesized in the leaf. Hormones alone are not the answer. So it is necessary on inserting the cuttings that they be so arranged that each leaf receives the maximum amount of light.

In Rochelle Park deciduous azalea cuttings are taken beginning the latter part of May and extending through the middle of June, depending on the season, the age and location of the stock plants. The cuttings on stock plants growing in full sun mature before those grown in semi-shade. The exception are those cuttings which break at the base of the current season's flowers. Precise timing in taking the cuttings, heretofore linked with success or failure, does not appear to be vital and cuttings may be taken from the same plant at intervals of a week or more with good results. The stem growth of deciduous azaleas is strigose. As the wood of the stem matures, beginning at its point of origin, and advancing toward the growing tip, the bristles gradually vanish and give way first to a light colored smooth bark, which later transforms to a woody, rough brown bark.

In preparing a cutting it is essential not to use the woody or smooth part of the stem. The later in the season the cutting is made the more decisive this fact becomes. Cuttings are usually 4 inches long, slightly larger or smaller

bearing no influence on rooting, with usually three leaves, trimmed, if they are too large. Trimming leaves is reputed to weaken cuttings but I have never noticed any ill effects from the practice. Two inches or less of the cutting are inserted in the medium so that the bottom leaf barely rests on the sand. If cuttings are placed deeper in the medium the base of the cutting will protrude down into the soggy peat, at times causing it to rot.

On all cuttings the terminal bud or growing tip is pinched off and I cannot stress too strongly the critical significance of this step for I consider it of vital importance in the overall success of rooting and subsequent growth the following spring. It is established fact that indoleacetic acid is synthesized in the growing tip and upper leaves and then transported to other parts of the plant. Indoleacetic acid being an aid to rooting, it would appear that removing this apical bud, and upper leaf or two when succulent, would have an inimical effect on rooting, but this is not true. It does not impair rooting, but on the contrary it augments the process, unreasonable as it may seem. Of equal significance is the almost immediate expansion of the axillary buds, clearly visible within a week or 10 days after removal of the terminal. A spurlike shoot or shoots is often produced at these leaf axils in the rooting sheds. But whether or not shoots are produced, these swollen axillary buds are the points of origin from which growth commences the following spring.

Before inserting in the rooting medium, all cuttings are soaked for about 15 hours, exact timing having no noticeable effect on rooting, in 3-indolebutyric acid, 75 ppm with the exception of the yellow flowered azaleas which are treated with a 50 ppm (parts per million) solution. For some reason the yellows are more sensitive to treatment and may burn in the 75 ppm solution if the wood is slightly immature for cuttings. The cuttings are not wounded as would be the case in preparing large leaved rhododendron cuttings. Half inch wire mesh is placed over pyrex glass trays filled with solution, and into this the cuttings are set. No special enclosure or other conditions are provided for the soaking of the cuttings. Trays are placed, indoors or out, in a semi-shaded location.

On being removed from the trays the

cuttings are immediately wrapped in either wet burlap or polyethylene to prevent drying, and then as soon as possible set in the rooting frames. The cuttings are set in holes made with a template. Cuttings are watered in, not tamped. The rooting medium is drenched until a layer of water $\frac{1}{4}$ to $\frac{1}{2}$ inch deep momentarily covers the sand. The glass is then fitted tightly over the cuttings and left undisturbed until the next watering in about a week. There is ample water if, on inspecting the frames in the morning, water has condensed on the under-surface of the glass. Water once each week the first month whether or not there is apparent need. In draining off through the medium the water draws down a fresh supply of oxygen essential in rooting.

Depending on the amount of sunshine and condition of the cuttings, many will strike roots after 4 weeks. By the beginning of August virtually all will be rooted. At this time water is for the nonce withheld and the plants are removed from the rooting frame between the latter part of August and the beginning of September. It is best to wait until the evenings become cool, before transplanting the cuttings. No effort is made to force growth on the cuttings at this time. Such an attempted alteration of the innate cycle of the little plants and the disruption of the normal metabolic processes taking place at this time in preparation for dormancy, is most unwise. Over aeons of time these plants have adapted themselves to their environment. One of the requisites for survival was to cease growing in late summer and make the necessary physiological adjustments for winter. And it is a discreet plantsman who shows respect for the laws of nature. The method herein described does not require any late-season forcing or other unnatural conditions to insure the start of growth the following spring. This, of course, is the most important aspect of propagating deciduous azaleas. The greatest problem has always been to induce the cuttings to start into growth the following spring after they have been rooted. The procedure described in this paper eliminates this problem.

Cuttings are transplanted from the rooting bins into 14 x 20 x 4" cedar flats, 24 cuttings per flat. The flatting medium consists of 2 parts shredded commercial

peat moss, 1 part sifted or shredded top soil, and $\frac{1}{2}$ part Michigan peat moss. In this mixture a strong root system has its genesis and the cuttings develop into young plants able to withstand a winter outdoors. The medium is friable so that it will not remain soggy after drenching rains, as would be the case if the percentage of soil equalled or exceeded that of the peat. Also the physical structure, chemical and mineral composition of the mixture are similar to that in the planting beds into which the cuttings are to be later moved in the spring, so that the shock of moving will be reduced to a minimum. Many propagators use 100% commercial peat moss as a flatting or potting medium for newly rooted cuttings, but I consider such treatment not to be in keeping with the best interests of the plants. Biologically, nutritionally, and minerally it is a poor medium for roots. Although large root masses form, these roots often fail to leave the peat upon transplanting into soil. In addition the peat ball remains intact for many years, holding excessive moisture during periods of prolonged rainfall.

After being flatted the cuttings are placed in a double lined cinderblock frame running north and south. The frame used at Rochelle Park is about 50 feet long and 12 feet wide with a ridge pole about 1 foot higher than the sides. This rise allows ample drainage after the glass is set in place, yet the incline is so slight that the sun's rays in early morning reflect off the glass with a minimum warming of the frame. The object of having two rows of cinder block is for insulation so that temperature fluctuation during the winter is held to a minimum. The height of the frame is determined by the four courses of 8-inch blocks set up without mortar. The dirt floor of the frame on which the flats are set is ground level. While it would appear to be advantageous to use a deep pit for overwintering, our present location makes this impossible.

Once set in the overwintering frame in late August or early September, the plants are shaded with lath admitting about 50% sunlight. At this time no glass is used. In early October the lath shading is temporarily removed, glass is placed over the cuttings and the shading

replaced. Each sash is propped open a few inches at this time. The purpose of the glass being to keep off autumn rains, allowing the soil sufficient time to dry and become aerated before freezing weather sets in. Any excessive active absorption of water at this time of the year, when drastic temperature fluctuations are common, followed by a freeze, could cause the bark of the little plants to split. The soil, therefore, is permitted to dry to a point where the leaves of the cuttings actually flag for want of water. When this condition exists the plants are sprinkled only lightly so the leaves again regain their normal position and appearance.

The beginning of November the glass is closed tightly on the frame and left undisturbed until the end of the year, at which time the lath shading is again temporarily removed and a sisal-craft paper covering is placed over the glass. The lath shading is then replaced to hold down the sisal-craft. It remains in place until mid-March. Such a covering does not place the inside of the frame in total darkness, but rather a dull twilight.

In mid-March before the sun and warmer weather warm the inside of the frame the sisal-craft paper is removed and the glass again ventilated. This ventilation prevents overheating and the danger of stimulation that might occur during successive clear days the latter part of March. The beginning of April, as weather permits, the glass is removed and the plants bedded out, mulched and shaded. Bedding out this early in the season produces a substantially larger root system by fall and a second growth (the same year) two to three times larger than would be the case if bedding were postponed until late April or early May. In climates warmer than that of Rochelle Park bedding-out can begin at a much earlier date, weather permitting.

The first season the little plants do not receive any commercial fertilizer, yet many attain a height of a foot or more. These are generally cut back in fall or the following spring to insure a sturdy, well ramified plant. The second season is made under lath but the young plants are transplanted into the sun in the fall of the second year or before growth begins the following spring.

A Book or Two

The Pruning of Fruit Trees

Paul Champagnat (Translated from the French by N. B. Bagenal). Crosby Lockwood & Son, Limited, 26 Old Brompton Road, London, S. W. 7, England. Distributed by John de Graff, Inc., 31 East Tenth Street, New York 3, New York, 1954. 166 pages. Illustrated. \$2.95. (Library).

An interesting comparison of European and American pruning methods, which is well illustrated and informative. As presented the various types of training fruit trees are easily understood (pyramid, fuseaux, cordon, T-piece, palmette, Verrier, Lorette, espalier, etc.) also subsequent growth response to each.

This book should be a welcome addition to the library of the gardener who has limited space in which to grow tree crops even though, in some instances, there may be difficulty in mastering the European terminology employed.

W. E. W.

An All The Year Garden.

Margery Fish. Transatlantic Arts, Inc., Hollywood by the Sea, Florida, 1958. 144 pages. Illustrated. \$5.25. (Library).

Any one whose love for a garden has been the fruition of his own work and garden labors will read Mrs. Fish's book with both literary and horticultural delight. It is highly readable and profitably informative.

The author's purpose is not simply to list plants that furnish a year-round bloom in her English garden. It is rather to present plant material that will make a garden a place of abiding interest and charm, through all seasons, by careful attention to "beauty of form, grouping, textures, and foliage," as well as to climax of bloom.

The list of plants and their varieties described is almost encyclopedic in scope—over 750 interestingly presented—but the net result is to make one covetous of scores of them. There may be a slight feeling of frustration in wondering just how many would be easily available to American gardeners.

While touching briefly on many classes of plants, the author presents most completely helleborus; violets; primroses; iris—chiefly those other than the tall bearded; true geraniums rather than pelargoniums; penstemons; hardy cyclamens; and various ground covers. Excellent photographs are a feature.

FRANK J. GILLIAM

Tree Maintenance.

P. P. Pirone. Oxford University Press, 417 Fifth Ave., New York 16, New York, 1959. 483 pages. 148 illustrations. \$10.00. (Library).

Since its publication in 1941 Dr. Pirone's *Maintenance of Shade and Ornamental Trees* has served as an authoritative and uniquely helpful reference to the diversified problems attending the culture and care of trees for street, lawn and park use. With modified title, this third and larger edition provides the usefully new information which again brings this text well abreast of a changing field, for it has been revised throughout with respect to subject approach as well as to cultural and pest control recommendations.

While chapters on tree growth, cultural conditions, and the detailed problems of tree care represent an up-to-date version of the earlier editions, the topic of tree selection, as well as subsequent considerations of low-growing deciduous trees as opposed to tall trees and evergreens, are newly presented in topical reflection of currently modified thinking on these matters.

Although this reviewer may not yet be quite so ready as the author to relegate "such old standbys as oaks, elms, and planes to secondary parts and—cast the so-called small- or low-growing trees in the leading role" (with the exception of the planes) the viewpoint on this subject reflects good thinking and is nonetheless welcome. With inclusion of Japanese Pagoda Tree, Kentucky Coffee Tree, Sassafras and Tree of Heaven, the author's concept of a "small" tree is at least commendably elastic.

A selected bibliography provides over 360 references, while an appendix is devoted to the increasingly recurring problem of shade tree monetary evaluation. Like its predecessors, this volume is certain to become an indispensable reference for any one concerned with the planting and care of trees.

HENRY T. SKINNER

Rock Garden Plants.

Doretta Klaber, Henry Holt and Company, 383 Madison Avenue, New York 17, New York, 1959. 173 pages. Illustrated. \$3.95. (Library).

Mrs. Klaber has certainly given the reading gardener food for thought, as well as space for notes, in the very comprehensive book on rock garden plants, with the main theme on "new ways to use them around your home."

(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.)

She writes that all plants mentioned in the book have survived neglect and have had to fight burning heat and icy cold—that the majority have appeared none the worse for it. The book is delightfully illustrated in line drawings done by the author, and begins with a look at the need for these plants, followed by a description of the home garden in Northeastern Pennsylvania—and old farm house with a rocky hillside and woods. She discusses propagation, sowing seeds, the frames and soil mixtures, taking cuttings, the plants which respond to layering, how to divide plants, and the all important nursery row. Finally there is a list of the plants themselves, together with an index of common names, seed houses (where to buy the seeds), and the succession of blooms for the area from which she writes.

The reviewer shall add this title to the Christmas gift list of books she should like to receive!

F. P.-K.

The Power of Prayer on Plants.

Franklin Loehr. Doubleday & Company, Inc., 575 Madison Avenue, New York 22, New York. 1959. 144 pages. Illustrated. \$3.50. (Library).

The title of this book is more than unfortunate, and the book itself offers very slight evidence to support such a title.

No gardener is going to find help from it, and no one concerned with researches in prayer, in prayer techniques, will find much that has not been better treated elsewhere.

It is not the wish or intent of the reviewer to suggest that the title indicates something that cannot be, that could not be, as he is interested, in fact concerned, both with prayer as such and in every phase of horticulture, in which the germination of a few seeds of two monocots will, in fact, can, offer only slight evidence.

The scientific outlines of the experiments seem faulty, or if one wants a more gentle word, incomplete. There is no definition of the word prayer, not of the particular prayer that was used, whether uniform among the experimenters or otherwise. Many points of failure or partial success are faithfully indicated, but that is not enough when the experimenter in the field of prayer moves into the field of science in its materialistic form. The "human element" is stressed, but not sufficiently in that there are possibly no vocabulary terms for describing the elements that make up the living forces in the individual. The author leans on various persons all of whom are acknowledged, but one feels that he might have found far more in the published works of Gerald Heard than the text would suggest, and still more in the older manuals of prayer that are known from the ages of the past. No where is there any suggestion as to whether or not, there is any importance of any kind whatsoever, in harnessing prayer, to mundane matters such as seed germination and growth, or hatching of silkworm eggs, the other intrusion on the title, since more than one manual of prayer will suggest that evolution in the prayer life will sooner or later bring the practitioner to a point where such things fall outside life itself.

B. Y. M.

Hanging Flower and Plant Decorations.

Zelda Wyatt Schulke. Hearthside Press, Inc., 118 East 28th Street, New York 16, New York. 1958. 125 pages. 123 illustrations. \$3.95. (Library).

In this book are presented numberless ideas for placement of plant displays against walls or suspended from ceiling or doorway. Floral arrangements, dried materials, and pot plants are all adapted to new "up in the air" situations.

The book could perhaps be best described as a catalogue of hanging decorations utilizing plant materials, both fresh and preserved, with detailed written descriptions of each design—the specific materials and techniques used in its development.

The home owner with limited space for arrangements, or with a desire for new and unusual floral displays may gain inspiration by looking through these photographs and comments.

CAROL LANDA

The Gardens in the Royal Park at Windsor.

Lanning Roper. Doubleday & Company, Inc., 575 Madison Avenue, New York 22, New York. 1959. 120 pages. Illustrated. \$10.00. (Library).

Mr. Roper has done an excellent job, both for the gardening traveler, who should read the book before visiting the gardens thus making himself familiar with the plants and where they are located in the gardens, and for most of us who have to be content to dream.

The superb black and white photographs should prove very helpful to anyone who is interested in naturalistic gardening, either to improve on what they already have achieved or for those starting out from scratch. The photographs cover large sections of the gardens, not only close ups of individual plants, but lovely vistas, and the clever groupings for textual effects—all the skills of the landscape artist are here portrayed, the light and shadow play, the strong vertical lines of tree trunks, long winding paths, leading off into the unknown, compelling one to follow, and the use of water through most of the garden, lakes, ditches, or ponds—these photographs together with the color plates are mouth watering.

The text is full of interesting accounts of how and when the gardens were started, the plants used, their botanical names and fairly detailed descriptions, enough anyway that one would recognize them in the area where they grow. Mention is made of the soil and light requirements. Not all the plants are trees and evergreens or deciduous shrubs. There are roses, lilies, narcissus, primula, iris, and many others, all growing happily in these gardens which are not intended to contain one specimen of every tree or shrub, for these are not botanic gardens, but the plants used appealed to those in charge for their decorative value, and these gardens should be thought of as private gardens made accessible to the public.

The reviewer especially enjoyed this book for she visited these great gardens in the making just after World War II.

F. P.-K.

Gardening for Gourmets.

Ruth A. Matson. American Garden Guild and Doubleday & Company, Inc., 575 Madison Avenue, New York 22, New York. 1959. 262 pages. Illustrated, \$3.95. (Library).

A pleasant book to read for those who "have a little land and a liking for poking about the earth," and whose pleasures of gardening are linked "with the pleasures of the supper table." The author writes of planning and planting of a vegetable garden and for the joys of harvesting fresh vegetables for immediate use. She describes her methods and practices with jottings from her garden log book for each month. These are reminders of what to do.

There is a chapter entitled "Come into the Kitchen"—a collection of recipes for using fresh vegetables and herbs in cooking. This book is not one intended for reference nor the more technical phases of vegetable culture.

C. B. L.

New Ways with Dried Flowers.

Ruth Gannon. The Studio-Crowell Publications, 432 Fourth Avenue, New York 16, New York. 1958. 136 pages. 92 Illustrations (4 in color). \$4.75. (Library).

New Ways with Dried Flowers is a gathering together of known facts about those plant materials which can be dried, their growing habits, and their methods of preservation—all presented in easy-to-find order.

The only truly original ideas offered by this book are in the arrangements which it features. These are far more imaginative and modern in their concept than the usual dried displays.

A chapter devoted to other uses of dried materials gives instructions for the making of such articles as pictures, screens, lampshades, and placemats. Sculptured garland and picture frame designs are an outstanding contribution to this section.

The author proves that dried displays can be colorful and dramatic.

CAROL LANDA

Modern Art in Flower Arrangement.

Emma Hodkinson Cyphers. Hearthside Press, Inc., 118 East Twenty-eighth Street, New York 16, New York. 1959. 123 pages. 66 illustrations. \$4.50. (Library).

Modern Art is often hard for the average beholder to understand and so it is with some of the modern flower arrangements seen at

flower shows. The arranging and even some of the plant materials used do not conform with those of the past, present, or even the future!

For those interested in modern floral art, Mrs. Cyphers' latest book will supply them with many fresh ideas. The book is profusely illustrated with captions added, listing plant materials, names, and descriptions of the containers, together with the names of the arrangers and photographers.

The text discusses modern art, surveys the modern movement, the contemporary styles and their uses in the home. But the final test is the test of all good art: Does it conform to the principles and elements of design? Read the book and find out for yourself!

F. P.-K.

The Rockwells' Complete Book of Roses.

F. F. Rockwell and Esther C. Grayson. American Garden Guild and Doubleday & Company, Inc., 575 Madison Avenue, New York 22, New York. 1958. Color and black and white illustrations. \$5.95. (Library).

"The Complete Book of Roses" is just what the title indicates—a complete treatise on the subject. It would be difficult to ask a question on roses or rose growing which is not answered somewhere in the book.

In the Horticultural world the husband and wife team of Rockwell and Grayson is well and favorably known not only as authors but also as artists. Their artistic abilities, at least to a great extent, must account for the remarkable quality of most of the one hundred and forty-seven photographs, forty-four in color, and the twenty-nine line drawings.

The chapter titled "Rose Grower's Rose Finder" is made up of various lists of roses suitable for any possible or imaginary use. It also contains lists of shrubs, evergreen as well as deciduous, for use as back-ground planting in rose gardens; and if that were not enough companion plants for roses are listed in two groups, low ones for edging and taller ones presumably for interspersing with roses. There might be reason for disagreeing with the authors on their selection of companion plants, but the matter is hardly of enough importance to warrant an argument.

The book is dedicated to a most lovable rosarian, Eugene S. Boerner, Newark, New York; and in the Foreword credit is given to him and a number of well-known authorities for their help and encouragement.

NEILS J. HANSEN

The Gardeners' Pocketbook

Quick Growing Trees for Shade in Small Gardens.

Several times in recent months I have been involved in conversations about quick growing trees suitable for small places, that would give shade. In a former note, I discussed the large leaved *Firmiana simplex*, but it is not the only species that is useful.

There are two species of "raintrees" grown in the South for their quick habit of growth, good light shade, and small dimensions. The Goldenrain is *Koelreuteria paniculata*, sometimes called paniced goldenrain. The other is very much like it but is much less cold hardy, and is known as the "flame goldenrain", *Koelreuteriana formosana*. Both of these are grown on the Gulf Coast, but the latter has been badly injured here in cold winters.

The best way to tell the difference between the two species lies in the type of compound leaves they bear, the first only once compound, the second twice compound.

They are good trees for hot dry exposures and form irregular heads at heights of about twenty-five or thirty feet. They have showy plumes of tiny but brilliant and somewhat brassy yellow flowers in summer, that give the trees their names when the petals fall. These are followed by inflated capsules, that assume a brilliant color, often bright reddish orange before they turn brown. Many small shot-like seeds are carried on the inner margins, and when they fall, they usually germinate the following spring in alarming abundance. The matter of color on the capsules varies apparently according to location. In New Orleans on the heavy soil of the city parkways and neutral grounds, the capsules are often of spectacular color. The editor tells me that in his own garden the color never has shown, but that the fruits fade from green to dark brown. He also reports that in some locations in Long Beach, Mississippi, which is only a few miles further east, there are trees

that color as brilliantly as in New Orleans. There is no great difference in soils between Long Beach and Pass Christian.

The Goldenrains are not particularly long lived trees but they seem free of insect pests and diseases and certainly are tolerant of drought and poor soil. Both species love the sun.

Two fast growing Asiatic elms are often met with in our coastal plain cities and towns. One of these in the writer's opinion is very much more attractive than the other. This is the Chinese elm, *Ulmus parvifolia*. The other is the Siberian elm, *U. pumila*. Unfortunately these trees are often confused in the trade and the names interchanged. The species more commonly seen is the Siberian elm. The other is far superior.

The Chinese elm is almost evergreen with a slender delicate habit and small very shiny leaves. It flowers and fruits in the autumn, which is unlike the habit of most elms, and certainly unlike the Siberian elm that flowers very early and immediately matures its fruits.

Both are resistant to the Dutch Elm Disease and seem to thrive almost anywhere they may be planted. The Chinese species which is much to be preferred ranks with the four or five very best small shade trees for the Lower South.

Another small tree, a native, that should be mentioned as a possibility for use in small gardens, is the evergreen Carolina Cherrylaurel (*Prunus caroliniana*, syn. *Laurocerasus caroliniana*). It is of great value, not only because it is available but also because it has beautiful shiny foliage, and attractive white flowers in early spring that come in short crowded spikes. These are followed by black drupes that fall freely and according to the editor are almost as great a nuisance as the fruits of the mulberry, his other "hate" among "trees-planted-for-the-birds." The tree makes a crown of pleasing symmetry when planted by itself in full sunshine. It may also be

planted rather close to the waterfront along our Gulf Coast, even where it will certainly get winds that are mildly salty.

It seems to vary in popularity from town to town, but where it is popular, it has been used for about every conceivable purpose, as a hedge, a screen, a foundation accent or portal plant, and a street tree. It takes shearing well, and can be treated as a topiary plant. For an open sunny year, no better tree could be selected to provide shade on the lawn or over a back yard patio.—EDWARD HORDER, *Mobile, Alabama*.

Golden Clarion Lilies

It is with some trepidation that one attempts some of the new lilies in the Deep South which has a climate so far different from that of the Pacific northwest. There are warnings particularly for the pink and rose tinted trumpets that the color may not be all that it should in the heat and dryness. So far no such note has been read in regard to the yellow hybrids.

Two years ago three bulbs of a hybrid strain of lilies known as Golden Clarion were purchased from a regular retail source. They all flowered the first year as good bulbs should and were splendid. This note is to report on the second year performance. One bulb split up and has produced a clump of small shoots which look as if they meant to remain, and in health. One plant produced the usual pair of blooms but the third carries four splendid flowers this season. All look as if they would be as permanent here as any lily could desire, which is splendid as they come into flower in early June when there are no competing lilies, only the indestructible daylilies.

With them this year flowered for a first time the Golden Regal lily, again from a regular retail source. Of the six bulbs only three flowered, one bud failing to mature and the other two having single flowers per shoot, very fine and differing from Golden Clarion chiefly in the lack of any tinting on the outside of the petals. If this proves to be permanent and happy, there will be a second yellow lily of importance. Regal itself, is not too happy in this garden, though

each year it is a little better than the last. As compared to its performance in the North it looks feeble, though very welcome.—B. Y. M., *Pass Christian, Mississippi*.

Stewartia malacodendron Versus Stewartia ovata grandiflora

When two species look very much alike, particularly with respect to their flowers, it is natural that there will be considerable confusion in identification. A situation of this sort arises with respect to our two native species of *Stewartia*. Both of these are showy flowered small trees found along our southeastern coast and overlooked in large part by nurseries. *Stewartia malacodendron* (syn. *S. virginica*), is commonly called the Silky Camellia. It is primarily confined to the seaboard region east of the Appalachian mountains. According to Gray, this should settle the matter, for the Mountain Stewartia, *S. ovata* (syn. *S. pentagyna*) is supposed only to be found in the mountains to the west of the range of *S. malacodendron*.

An anomalous situation occurs in the region around Williamsburg, Virginia, where *S. ovata* var. *grandiflora* (the Williamsburg Camellia) is found. The flowers of this variety are larger than those of *S. ovata* (up to four inches) with occasional extra petals and instead of having the usual white or creamy stamen filaments and yellow anthers, the stamen filaments may be purple or lavender, but are still terminated by yellow anthers. The same tree may bear both flowers with the ordinary creamy filaments and flowers with filaments of varying degrees of purple. *S. ovata* and its variety bloom sporadically over a two or three week period, similar to all other *Stewartia* species except *S. malacodendron*.

Stewartia malacodendron differs entirely in its blooming habit, resembling a late-blooming dogwood to a casual observer. The whole tree blooms at one time with no prolonged opening of buds. The flowers are slightly smaller than the large variety of *S. ovata*, but resemble it in many respects. Careful study of the flower shows the prime difference to be that the purple coloring of the filaments extends into the anthers and pollen. The

leaves are smaller and silkier, with more deeply notched margins than those of *S. ovata*.

The Mountain *Stewartia* and its variety grow in the rolling hills covered with white oaks, tulip trees and dogwood, while the loblolly pine woods in the coastal plain are the usual home of the Silky *Camellia* when growing in Virginia. The ranges of the two species again overlap in central Alabama and in North Carolina, although it is not known whether the variety *grandiflora* of *S. ovata* is present in these regions.

The authorities say there is no evidence that the two species have hybridized to form the distinctive purple filamented variety *S. ovata* var. *grandiflora*. The difference in the manner of blooming has even led the "splitters" among taxonomists to place *S. ovata* in a different genus, *Malacondendron*, as *M. pentagyna*.—FREDERICK W. COE, *San Anselmo, California*.

Michelia doltsopa in San Francisco

The Strybing Arboretum in Golden Gate Park successfully grows and flowers a number of plants from the Himalayas and western China. Among these are several forms of *Magnolia campbelli*, and a number of species of *Rhododendron*, and now we may add *Michelia doltsopa*, an evergreen tree which flowered in the arboretum for the first time in February of this year. It is possible that this tree has not flowered previously in this country. It has been imported from England into the Pacific northwest but has not flowered there. The tree is evergreen and its large flowers, about six inches across, creamy white and fragrant, look very much like those of a magnolia. This resemblance is not unexpected since *Michelia* and *Magnolia* are closely related genera; their most obvious difference being in the position of the flowers, axillary in *Michelia* and terminal in *Magnolia*.

Michelia doltsopa was introduced into horticulture in England nearly forty years ago through seed collections of Reginald Farrer and George Forrest. The Strybing Arboretum tree, however, did not come from England but originated from seeds received in 1953 by the nursery in Golden Gate Park from G.

Ghose and Company of Darjeeling, a dealer in Himalayan seeds. These seeds were germinated as soon as received and of the seedlings two were planted out in Strybing Arboretum in 1955 in a warm place sheltered from the wind. They are now about ten feet tall. Cuttings made from the original seedlings were easily rooted under the mist system of propagation used in the nursery in Golden Gate Park, and within the next several years there should be other trees flowering in the park.

Michelia doltsopa has a wide geographical distribution in the Himalayan region extending from Nepal eastward through Assam and Upper Burma to southeastern Tibet and western Yunnan. It grows in forests and thickets or sometimes in open situations at altitudes between 4500 and 9000 feet. According to Dandy (J. E. Dandy, 1950, *Curtis's Botanical Magazine*, plate 9645) it "is a valuable timber tree, attaining large dimensions and yielding a wood which, although light and soft, is very durable and easily worked. Gamble stated that it was the most important building tree of the Upper Darjeeling Forests, and added that it had been largely planted, its natural reproduction being somewhat difficult."

Michelia doltsopa was first discovered in Nepal in 1803 by Francis Buchanan-Hamilton (1762-1829) who spent twenty years in various parts of India and the Himalayas and contributed much to the early knowledge of the plants of these regions. He spent nearly a year in Nepal and his collections from there together with those made some years later by Nathaniel Wallich constituted the materials which led to the publication of the first flora of Nepal by David Don in 1825. The name *M. doltsopa* was given to the tree by Buchanan-Hamilton, based on a vernacular name used in Nepal, and published first by DeCandolle in 1817. Wallich has also collected this plant and he included it in 1826 in his illustrated flora of Nepal as *Magnolia excelsa*, not realizing that it had already been named in 1817. Because of this, the tree has been known for many years as *Michelia excelsa*. In fact, it was under this name that the seeds from Ghose were received by Golden Gate Park.

Michelia doltsopa did not become known to horticulture for more than a



C. E. CROMPTON

Michelia doltsopa flowered in Strybing Arboretum, 1959

hundred years after it appeared first in botanical literature. Reginald Farrer collected seeds of it in Upper Burma in 1918 and sometime later George Forrest collected it in western Yunnan. From both of these collections trees were grown in England. P. M. Syngé, (Patrick M. Syngé. 1950. *Camellias and Magnolias, Reports of the Conference held by the Royal Horticultural Society*, Pages 101 and 107.) writing of a visit to Caerhays Castle in Cornwall in southern England, describes the beautifully scented, creamy white flowers of this plant growing on "enormous dome-shaped" shrubs raised from Forrest's Yunnan seeds. Syngé states further that it is a rare plant and reputed to be tender even in Cornwall. A photograph of one of the plants at Caerhays (*Gardener's Chronicle—Gardening Illustrated*. April 7, 1956, p. 365) shows a flower with petals more numerous than those on the tree in the Strybing Arboretum. Elsewhere in England *M. doltsopa* has flowered in the gardens of the late Lord Aberconway at Bodnant in Wales and in the Lt.-Col. Messel of Nymans, Sussex.

Information regarding native habitats of plants in cultivation is of much interest but not always available. The late Frank Kingdon-Ward wrote (F. Kingdon Ward. 1933. *Plant Collecting at the Source of the Irrawaddy, Journal of the Royal Horticultural Society* 58: 106-107) of seeing many trees of *Michelia doltsopa* in Upper Burma on a trip which he made in 1930 and 1931 to the headwaters of the Irrawaddy River. These trees were in the temperate rain forest, above the sub-tropical and hill jungles, at about 6000 to 8000 feet elevation. In this region "the temperate rain forest is in the close neighbourhood of the snow peaks. It is, therefore, very much colder in the winter, and not so hot in the summer. Snow falls, but it does not lie to any extent at 6000 feet; it lies a little at 8,000 feet. About a third to a quarter of the forest is deciduous. There are a few conifers, *Pinus excelsa*, *Podocarpus* and one or two others, but it is chiefly remarkable for its Rhododendrons and its Ericaceae. Twenty or thirty species of *Rhododendron* occur in this belt. . . . In the spring one of the most noticeable features was the wonderful foliage of the young leaves and breaking

buds, particularly amongst the Lauraceae and some of the Ericaceae, e.g., *Pieris*, *Gaultheria* and *Vaccinium*. Amongst the deciduous trees was a very beautiful species of *Cercidiphyllum*. . . . The mountains are extremely steep and the valleys are very narrow, so that even with the sun travelling in a high arc at mid-summer, straight over the valley, it did not shine into the narrow gorges for very many hours, and the difference in the vegetation on the two sides was astonishing. You find on this exposed side *Pinus excelsa*, a number of rather stunted bushes, and higher up, forest. On the shady side you get dense forest of much more tropical-looking and more evergreen trees, in great variety. The sun used to set behind this range early in the afternoon even in midsummer, and the whole of one side, owing to the height and the steepness of the mountains, was thrown into deep shadow, whereas the sun continued to shine on the other slope. . . . *Michelia doltsopa* is the earliest tree to flower in this belt; I think it is worth cultivating, if hardy. It grows to 60 feet high. It is practically evergreen, and we noticed what was extremely interesting—when we had a snowstorm the whole of the flowers would be practically killed off, and after a few days the whole tree would be covered with flowers once more. It seems to keep serial flower buds ready, and when one lot died off the next lot came on as soon as the weather was a little less inclement. It was a very common tree, especially on the sheltered side of the valley, and grew as low as 5,000 feet and as high as 7,000 feet. The higher trees are in flower about April."—*Elizabeth McClintock, California Academy of Sciences, San Francisco, California.*

On Seed Germination

In the *Gardener's Chronicle* and *Gardening Illustrated* [England] for July 12, 1958, the editor, Roy Hay, devoted his editorial to a description of his experience this last Spring in germinating seed under the type of intermittent mist which is widely used in striking cuttings. He reported excellent germination for sixty or more kinds of plants, including a number of vegetables, and even such small seeds as those of primula, begonia, streptocarpus, and others. He reported

having no damp-off whatever, which he attributed to the frequent lowering of the surface temperature of the seedlings by the intermittent application of cold water in the form of mist. He did not mention the seed medium that he used. Perhaps it was the John Innes Seed Mixture that is widely used in England. His experiment was conducted in a greenhouse with a minimum temperature of forty-five degrees Fahrenheit and with soil-warmed benches giving a soil temperature of sixty degrees.

I was particularly interested in reading his account, as I had accidentally made a somewhat similar discovery in early May 1958. A description of the conditions under which I first noted the effect, will clarify my own observations. For a number of years I have germinated some eighty to one hundred types of plant seeds per year. These are mostly of species and a considerable number of them species of bulbous, cormous, or tuberous plants. These have been germinated in small home-made seed boxes four inches deep, and in most cases six by seven inches in size, though this has varied somewhat. They are made of California redwood, and except for the two end pieces, are of boards about one-eighth inch thick. In the bottom of each box, three or four holes are drilled, usually about nine-sixteenths inch in diameter. In use these are crocked in a manner similar to the drainage hole in a pot.

The boxes are filled about three-quarters full of dry horticultural vermiculite and the seeds either thinly scattered on the surface or, if large enough, spaced in position. A label is slipped in the box, the seeds covered with a bare sprinkling of dry vermiculite to a depth of one-half inch, depending on the size of the seed.

When a number of boxes has been prepared in this way, they are set in a pan containing a half-strength solution of a complete soluble fertilizer. I have usually employed one called Spoon-it. The vermiculite rapidly becomes saturated with the solution, and the boxes are then set to one side to drain, and covered with small panes of glass. I have found the method quite satisfactory on the whole. The half-strength fertilizer gives enough readily available plant

food to somewhat reduce the wide-ranging root growth that often occurs when vermiculite alone is used.

Having lost, last winter, the space where I used to set these boxes in a rather dim light, I found the location I used this spring less than satisfactory. I had a number of failures and some cases of very low germination. In early May, I became disgusted with the failure of some seeds to germinate when past experience had shown me they should have sprouted in April. I prepared to dump several of the boxes, setting them to one side in my greenhouse, after removing the glass, and then forgetting to dump them. Some ten days later, when I next happened to look at them I found what appeared to be almost one hundred per cent germination.

A note of explanation is in order: In this part of the country, one of the chief problems in a greenhouse is that of preventing too high day temperatures beginning early in mid-April. A fairly thick coat of shading is a prime necessity, but that alone is hardly enough. In an attack on this problem in my seventeen by twenty-five foot greenhouse fitted with a thermostatically controlled exhaust fan, I had tried an experiment this summer. I had rigged the controls so that when the temperature exceeded seventy degrees, the thermostat not only turned on the exhaust fan but also activated two circulating fans and a solenoid valve opening a fine mist spray that played continuously. The mist spray kept moist a single layer of cheesecloth fastened over an aluminum screen covering an open window just above the center of the rear bench. This spray and the three fans were operating all day until the thermostat registered below seventy degrees in the evening. In effect, this made the entire greenhous act somewhat in the manner of an evaporative cooler. The system worked quite well, the highest temperature inside the house all summer being ninety degrees at a time when a well shaded thermometer in my lath house registered ninety-nine. The one "bug" in the system proved to be that "drift" from the spray kept about four feet at the center of the rear bench constantly damp, so that it could not be used for plants during the late spring and summer months. It was on this otherwise unoccupied space

that I had placed the disappointing seed boxes.

Somewhat startled by this unexpected result, I moved other boxes into place in the same area. The vermiculite exposed to this constant fine mist for as long as fourteen hours a day in mid-summer, compacted down into a soggy mess that looked as though it would not serve as a seed bed for anything. The seeds were of a different opinion. Most of them germinated in it with a readiness that I have seldom seen in using more conventional methods. In the case of several larger seeds that had been carefully spaced when set in place, the germination was close to one hundred per cent. Some pots of very fine seed sown on milled sphagnum responded rather poorly, but the same seed sown on vermiculite germinated well. As an experiment several boxes were left in place for two months or more before transplanting. An effort similar to that reported in the original work on milled sphagnum as a germinating medium, was found. The plants grew to a certain size, then growth stopped, but they remained green and to all appearances healthy, and were successfully transplanted.

After reading Mr. Hay's report I am inclined to believe a mist spray that was intermittent might give even better results. My own good results were probably due to the fact that the drift of mist to which my own seed boxes were exposed, was probably finer than that usually used in intermittent mist set-ups, being just a back drift from a spray head of a type often used to produce intermittent mist in commercial nurseries. Like Mr. Hay, I had no damp-off of seedlings.

Be this as it may, this gives an easy method of germinating a wide range of plants if facilities are available to use mist. I feel that further experiments with the method are amply justified.—
L. T. PEERY, *Hayward, California.*

Centipede-grass (*Eremochloa ophiurioides*)

Although there is an excellent discussion of Centipede grass in H. H. Hume's *Gardening in the Lower South* (as early

as 1929), there has been no recent clamor about the plant in any of the magazines or papers that have come to the editor's attention. Lawns are always a difficult part of any gardener's activity and one that must be handled. A fine lawn will do more to enhance all the other work of the gardener than any one element.

Dr. Hume mentions that centipede grass has done well on sandy soils, on muck soils, and was reported as having done well on heavy clay in China. The only drawback mentioned was its less satisfactory performance in shade.

In the garden here, where the soil is deep sandy—loam, by courtesy only, it is "the" grass. It makes a carpet that is deep and wonderful to walk upon and grows well in the broken shade of pecan trees which are the only real trees in the area. The grass looks like blue grass, with fine leaves, that cut well. It one misses a cutting in July and seed starts to appear, the seeding stalks are not over six inches high and are easily mowed off when one gets to it.

Centipede grass is planted by taking sprigs or runners from the old planting and putting them in at whatever intervals one can afford. As we have our own supplies, we put them in about six inches each way and in two years we have a complete coverage and in three years a sward. Planting can be done at almost any time that one is willing to work and to give the little extra care in seeing that the sprigs do not dry out. We, being lazy, prefer to do the planting in the cool weather of spring, March or early April here. For a time, the plants will show no signs of activity, and then the runners begin. One need not weed the area, unless he wants to, and he can mow off any weeds that do appear. One need not take out existing Bermuda grass as it will soon be bested by centipede, but not killed out.

One advantage over Bermuda and Zoysia grasses, is that the runners stay on the surface and do not indulge in underground activity in any early stage. If they choose to get into a flower bed, they can be gotten off, not up, by merely running a sharp mason's trowel under them, with one swift motion. In time, roots will go down, and then one has a center of roots with which to contend.

Why any one would tolerate Bermuda, no matter how elegant the strain, is be-

yond me, provided, of course, one is a gardener and has flower beds. For other types of use, Bermuda and Zoyia may be all that is claimed for them.

As used in the home place, centipede grass requires mowing about every ten days. Our stands have had no fertilizing whatever, and have never needed water, except in the very rare times when we get no rain, and everything shows drying. In periods of excessive rain, there will be signs of yellowing on new growth in whatever low spots do not drain off quickly. This disappears as soon as the weather becomes normal.

Seed is available, but we have had no experience with it here. In new stands we have allowed seed to ripen, by omitting one or two mowings, and then mowed the seed stalks down, with some scattering of the ripened seed, but we do not depend on seeding.

Whether or not work is being done on Centipede grass to find even more elegant forms than are now available, we do not know. What we do know is that we have elegant lawns, comparable to any, that are lush green from March till whatever frost may come in autumn, usually late October. Then there will be a slight bronzing in the areas that are most exposed to frost and to sun, less in shaded areas. The winter color is no better than that of any other grass, used in the South, and we have not attempted to sow winter annual grasses on it. Actually, by planning fine borders of evergreen and semi-green shrubs one finds the winter brown to light fawn is a nice pattern of contrast.—B. Y. M., *Pass Christian, Mississippi*.

A Permanent Label Clip for Potted Plants

To some amateur gardeners who maintain their own greenhouses, permanent identification of personal collections is probably of no great importance. However, if their collections are accessible to casual visitors including children, something more substantial than the usual stick label may be of interest. The latter is too easily removed and often is either lost or reinserted into the wrong specimen pot. This is a constant problem among large conservatory collections which are open every day to the public.

This constant threat to efficient record keeping of living potted plants has been largely solved at Longwood Gardens during the past few years. Here pot culture is standard procedure and is used for handling large series of display or specimen plants grown for individual or mass planting in our large conservatories.

A very efficient stainless steel clip for holding identification labels has been designed and individually fashioned as needed through the ingenuity of one of our employees, Clarence Nead, greenhouse heating supervisor, of our Department of Horticulture. These have now been in use at Longwood for about two years. Over 10,000 have been made as required, largely as a spare-time activity, with the greater proportion being used on our large collection of potted orchids.

The clips are practically indestructible, being made of stainless steel. They are so designed that they slip tightly over the lip of the pot in such a way that they cannot be removed by the average visitor, yet they can be taken off if required. A wire hook attached to the shoulder of the clip holds standard brass embossed labels in such a way that they hang freely but inobtrusively beside the pot and yet may be easily read. These labels are not meant to be display labels, though they can be so used if necessary; they carry only such information as an accession number and basic nomenclature.

Since the problem of labeling potted specimens is one shared by many people concerned with maintaining large collections of identified plants, it is felt that a few details about the design of this clip may be of interest. The photograph illustrates the basic features.

The Longwood Gardens label clip was designed expressly for use on standard American-type flower pots. Although one size has proven to be rather universally satisfactory, clips of smaller or larger size can be made if required.

Stainless steel stock, classified as Type 304 (16 gauge, 1/2 inch wide), which can be purchased in varying lengths, serves as the basic material. This is cut into blanks approximately 4-1/16" long and these are shaped to yield clips roughly 2" long in which one arm remains flat while the other is crimped slightly for better rigidity. The whole



LONGWOOD GARDENS, G. HAMPFLER

*Pot clip designed at Longwood Gardens for
holding embossed brass labels*

operation is a simple two-step one, once blanks have been cut and deburred. The body of the clip can be formed in a single step through the use of a simple homemade jig designed for this purpose. Once the basic clip is formed a 1½" long piece of stainless steel wire (3/32" Mor-Weld #47, Type 308 Stainless Steel Welding Rod, no flux coating) is soldered in the center of the top of the clip shoulder to form a loop for holding the brass identification tag. Steel wire of the type specified is stiff enough to make it practically impossible to remove the label from the clip without the aid of a tool. Some idea of the strength of the clip when positioned on a pot is the fact that such a pot with plant and soil can be easily supported by the label when held in the hand.

When hand-fashioned, as they are at Longwood Gardens, clips of the type described can be made at a rate of about fifty an hour. This makes it possible for one person handy in metalwork to keep up with the average needs of a garden, working solely on a spare-time basis. It is estimated that the unit cost for material used in such a clip comes to about 9¢ each, not including cost of labor. At Longwood this is not considered excessive in view of the permanent nature of the material and the certainty that such clips cannot be removed readily by the visitor.—W. H. HODGE, *Longwood Gardens, Kennett Square, Pennsylvania.*

Kaempferia involucrata

Curiosity more than anything else prompted the writer to buy at bargain rates some roots of this tropical herb, and at the same time roots of *K. rotunda*, a showy species already seen, described though not quite correctly and figured in *The National Horticultural Magazine* for April 1940 (Vol. 19 No. 2 pages 125-127). As we have no delusions that Mississippi is a tropical area, the roots were potted and left on the bench in the unheated greenhouse. They were so slow in making any appearance that one wondered about the "bargain". *K. rotunda* sent up shoots first but no flowers, which always appear before the leaves.

As compared with *K. rotunda* in growth and general appearance *K. in-*

volucrata is of smaller proportions, with broader green leaves showing only a trace of marking in lighter green along the borders of the leaves, in fact with a slight suggestion of a hosta-like form, even if the fascicles of leaves appear in a very different fashion. As we had no text to inform us, it was assumed that there would be no flowering, but in time, each of the fascicles has sent up a scape with a green bract-like involucre atop from which emerge one by one the small lavender pink flowers. These open some time during the night or earlier in the morning than the writer arises, and wither in very late afternoon or early evening. Flowering seems to be continuous, and yet they have not been here long enough to know how many weeks the blooms may show. So far it is a matter of over two weeks with no sign of let up. Even the smaller fascicles of leaves are now showing signs of blooms scapes.

There is no reference to *Kaempferia* in *Hortus II* and in our edition of *The Bailey Cyclopedica*, this species is not mentioned. The genus is named for Engelbert Kaempfer, whose name is usually thought of in connection with Japan rather than the tropics that he knew. The genus belongs in the Zingiberaceae, a family that furnishes many useful garden plants in our Deep South. Presumably in areas where there would be no frost and no prolonged cold periods this plant might make a fine but probably deciduous, ground cover planting under larger and coarser plants.

Aside from the difference in number of parts, plan and formation, the flowers suggest those of *Impatiens sultana* with the long spur-like sepal showing below the petals. The color is between Pale Hortense Violet and Light Hortense Violet of the Ridgway chart.

As yet there is no indication of any seed formation, and one doubts if it may come, but the indications are that there will be more than abundant increase from the roots.

The editor would be particularly glad to hear from persons living farther south, as to whether or not it is useful there as an underplanting, if it is evergreen or must have a dormant, leafless, rest period; and any other pertinent characteristics.—B. Y. M., *Pass Christian, Mississippi.*

PS. to Kaempferia.

May 1959, brings some of the answers to my own questions as far as this part of the world is concerned. The *Kaempferia* discussed is definitely herbaceous and non-evergreen. It is also showing that the apparent habit of spreading by underground suckers or extensions of the root, holds good, and now, the pot in which it grows is lined along the edges with the numerous progenies. Will this, gardeners farther south please answer, make it a weed? It is not too fine a plant here, so that unless it will make summer swards of foliage, it is not worth too much trouble save as an incidental conversation piece.—B. Y. M.

Cassia alata

Interest in the cassias continues throughout the South and while only a few seem likely to succeed in the editor's garden, more are being tried. A seedling, grown in the familiar "can", of *Cassia alata* was bought late this summer and will spend the next winter in the cold greenhouse, before putting it out to live or die in 1959. There are plants in bloom now in the Pass, that

were planted out this spring and they make a great show.

The best view of this species came to the editor when he was in Houston, Texas on October first, for although the day was gray and there was an intermittent drizzle of rain, the place was lit in many gardens by the fine flowers of this species. The plant is a strong shrub credited with eight feet, but looking taller in Houston, well furnished with very large, coarse, compound leaves and bearing tall spike-like racemes of very brilliant yellow pea-shaped flowers. The total effect of the plant is a striking contrast to the masses of foliage of the more commonly used shrubs and small trees, and the blooming almost outshines that of the *Koelreuteria* that is in flower at the same time. This last appears a paler, greener yellow, and its airy panicles seem almost fragile as compared to the robust beauty of the cassia.—B. Y. M., *Pass Christian, Mississippi.*

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the Cherokee Rose