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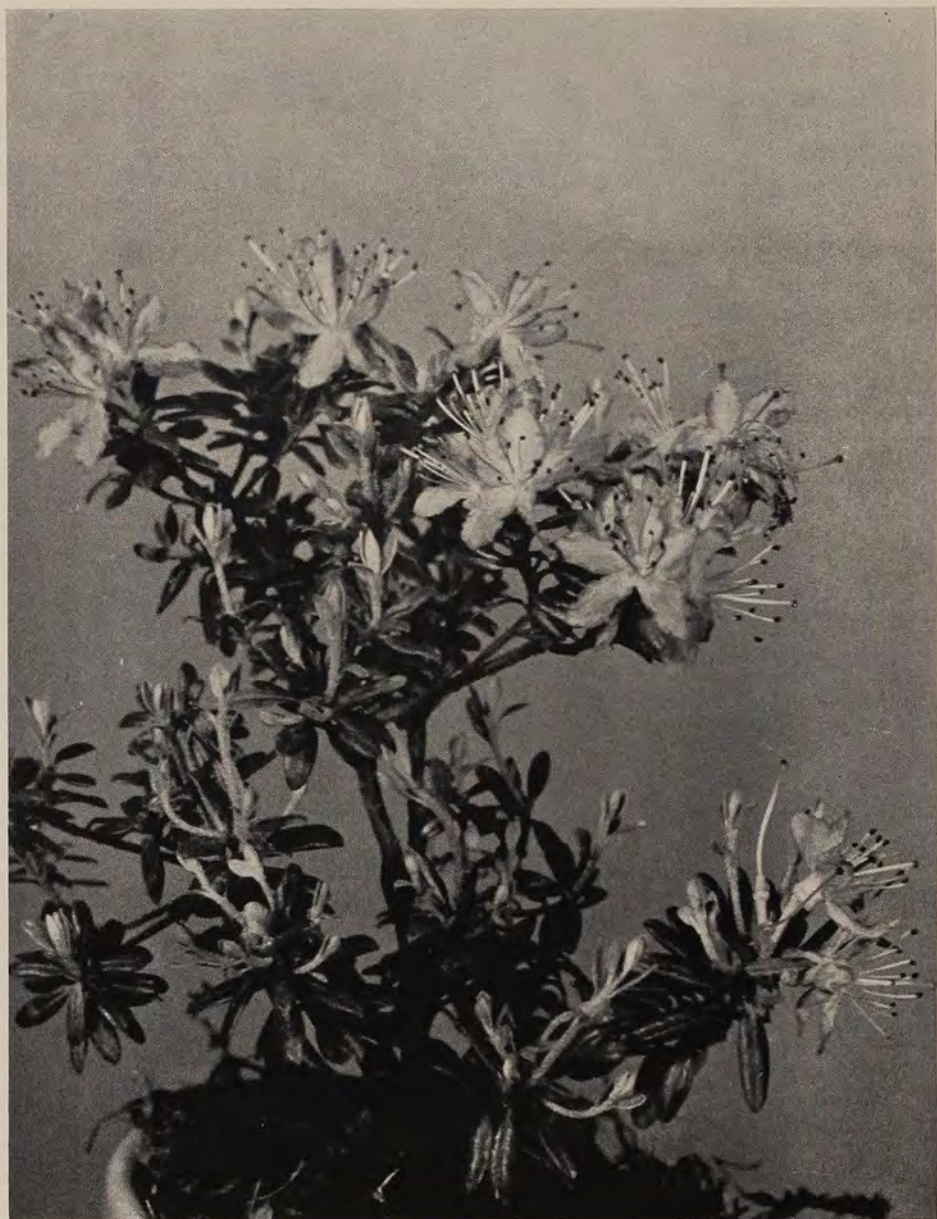


APRIL COVER ILLUSTRATION

(ERIC WALTHER)

A close-up view of the foliage of *Echeveria lozani* . . . one of the hundreds of photographs Eric Walther made of the Echeveria he grew and found in their native homes.

. . . See details on Page 73



CLAUDE HOPE

Rhododendron impeditum

[NATURAL SIZE]

Rhododendron Species

For the Small Home or Rock Garden

H. H. DAVIDIAN

Rhododendrons, which grow from a few inches up to about three feet and which are particularly well suited for the small home or rock garden, are amongst the important and popular plants in present day horticulture.

It may be of interest to give a brief note on the history of introduction of these low-growing species. The first species introduced into cultivation in 1656 was *Rhododendron hirsutum*, from the European mountains. The next was *R. ferrugineum*, which is said to have arrived about a hundred years later. A few more were added towards the end of the eighteenth and in the nineteenth centuries. Between the years 1848-1851 Joseph Hooker was responsible for the introduction of several species from the Himalaya, and during the latter half of the nineteenth century the French Missionaries made some further contributions from southeast Tibet, southwest Szechuan, and northwest Yunnan. A few others were received from Ernest H. Wilson during his exploration of western China early in the present century. In the year 1904, which is a landmark in

the history of plant introduction, George Forrest explored Yunnan and Szechuan, and in the course of seven expeditions to western China, he enriched our rock gardens with a large number of rhododendrons. Several other species and new forms were sent by various other collectors, including Farrer, Rock, Kingdon-Ward, and Ludlow and Sherriff.

The vast majority of these plants are natives of western China and the Himalaya, where they grow at elevations of eight to about seventeen thousand feet, and are found in varied habitats. Some of the species of the Lapponicum Series are said to cover the moorlands just as heather does in the British moorlands.

In cultivation these low-growing species provide color from January or February until July or August, but most of them are in flower from the middle of April to the middle of June.

Although a great number of species present themselves for consideration, reference will be made in this account to a large selection which are ideally suitable for the small home or rock garden.

Anthopogon Series

One of the most remarkable in this Series is *Rhododendron sargentianum*, a native of western Szechuan, from whence it was introduced by Wilson in 1903. It is a compact shrub up to two feet high with aromatic foliage, and makes a wonderful show with its yellow or white flowers produced freely, in clusters of six to twelve. The plant is hardy, a robust grower, and is easy to cultivate.

Familiar to many gardeners is *R. cephalanthum*, discovered in 1884 by Delavay in Yunnan near Lankong and Hokin. It is fairly widespread in western China and Upper Burma at elevations of nine to fifteen thousand feet. This wide distribution and altitudinal range explains the great variability of

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the species in habit and height, in leaf shape and size, and in flower color. Amongst the several forms in cultivation, one which is compact and wide spreading bearing a profusion of pink flowers in clusters of eight to twelve, is of great beauty and generally considered to be the best. The variety *crebreflorum* is a compact shrub up to eight inches high, and is greatly admired when covered with rose-pink flowers in April or May. A close ally is *R. primulaeflorum*, uncommon in cultivation. This plant is upright in growth up to three or four feet in height with rigid branchlets, and attracts attention with its white, pink or rose flowers. It is perfectly hardy, is easy of cultivation, and is worthy of being widely grown.

Another member of this Series is *R. anthopogon*, introduced into cultivation in 1820 from the Himalaya where it is widely distributed at elevations of nine to sixteen thousand feet. It is an interesting plant with large aromatic leaves which are said to be used as incense in Tibetan monasteries. The plant is a vigorous grower up to eighteen inches high, with pink flowers produced in April or early in May. The closely related *R. hypenanthum*, also a Himalayan plant, is distinguished by its yellow flowers.

A very rare plant in cultivation is *R. laudandum*, discovered by Ludlow and Sherriff in 1936, at Tsari Lapu, southern Tibet, growing at an elevation of fifteen thousand feet. This is a compact bushy shrub, up to one foot high in cultivation, and provides an admirable display with its many-flowered pink or white trusses, in April. The only plant in the Royal Botanic Garden at Edinburgh, a neat shrub of nine inches, suffered an untimely fate some years ago.

Among the dwarf rhododendrons introduced by Forrest from Yunnan, perhaps few stand out with greater distinctiveness than *R. trichostomum* var. *ledoides*. It is a densely branched shrub up to three feet in height, sometimes low and spreading, with linear-lanceolate leaves, and large globose trusses of up to twenty-five or thirty pink or rose flowers. The plant is quite hardy, free-flowering, and should be a most valuable acquisition for any small home or rock garden.

Boothi Series

One of the earliest of all rhododendrons to burst into bloom is *R. leucaspis*, an outstanding plant, discovered by Kingdon-Ward in 1924 at Musi La, in the Tsangpo Gorge, Tibet, at ten thousand feet. It is compact in growth, up to two feet high or more, with large rounded or obovate leaves up to two inches long, and is extremely charming when adorned with large, pure white, single or paired flowers. The plant is easy of cultivation, but as it flowers in February or March, disappointment is to be expected, for the flowers and flower-buds are sometimes completely destroyed by early spring frosts. Otherwise it is hardy, and well deserves the Royal Horticultural Society's Award of Merit which it received in 1924 and the First Class Certificate in 1944. A near ally is *R. megeratum*, "lovely in the highest degree," with openly bell-shaped or saucer-shaped yellow flowers, usually in single or paired clusters. It is a compact shrub or sometimes straggly and spreading, with rounded leaves, very glaucous beneath. Although hardy, it is particular as to position in the small home or rock garden. To obtain the best results, some shade and protection from wind are essential.

Another interesting plant in this Series is *R. auritum*, known only from an isolated locality in the Tsangpo Gorge near Pemako-chung, where Kingdon-Ward discovered it in fruit in November 1924. Although in its native home it is said to reach a height of ten feet, in cultivation in the Royal Botanic Garden at Edinburgh, it hardly exceeds three or four feet, being of a bushy habit with tubular-bell shaped creamy-yellow flowers about an inch long, produced in great profusion. It has proved to be of sturdy habit, fairly fast growing, and is well worth attempting.

A popular plant of great merit is *R. tephropeplum*, one of Farrer's discoveries in northeast Upper Burma in 1920. It was subsequently collected by Forrest, Rock, and Kingdon-Ward in other localities in Burma, Yunnan, Tibet, and Assam, at elevations of eight to fourteen thousand feet. As is to be expected from its wide geographical distribution and altitudinal range, it varies considerably in height of growth, in the shape and size of the leaf, and in the size of the

flower. It is a spreading or upright shrub, with tubular-bell shaped, pink to carmine-rose flowers in clusters of three to nine. A low spreading form is ideally suitable for the rock garden and should be in every collection of rhododendrons.

Campylogynum Series

An old favorite in gardens is *R. campylogynum*, a most attractive plant, discovered in 1883 by Delavay on the Tali range, western Yunnan, and introduced by Forrest from the same region in 1912. It is a neat, spreading shrub, up to eighteen inches high, with bell-shaped flowers usually single or paired, nodding on long flower-stalks. The flower color is very variable from salmon-pink to almost black-purple. The variety *myrtilloides*, first collected by Kingdon-Ward in northeast Upper Burma, has tiny flowers, and well deserves the Award of Merit and First Class Certificate which it received in 1925 and 1943, respectively. Variety *charopoeum*, discovered by Farrer in northeast Upper Burma, has larger flowers than the type, being about an inch long. In hardiness of constitution, in general adaptability to various situations, in freedom of flower, in beauty of habit and of flower, and in ease of cultivation, this species and its varieties have all the essential qualities of ideal plants for the small home or rock garden and deserve the widest possible recognition.

Camtschaticum Series

A particularly fine species is *R. camtschaticum*. Although it was first introduced in 1799 and reintroduced several times since then, it is still uncommon in cultivation. The plant is hardy and well adapts itself to cold gardens. It is a deciduous low-growing shrub usually up to nine inches high with deep rose-purple or rose-crimson, rotate or openly funnel-shaped flowers. This plant has an interesting feature in that it layers itself as it grows along the surface of the ground. In the rock garden in the Royal Botanic Garden, Edinburgh, it provides an admirable display with masses of flowers in May or June.

Ferrugineum Series

This Series consists of three species, *R. hirsutum*, *R. ferrugineum*, and *R. kotschyi*, all of which are natives of the European mountains. *R. hirsutum* is of historical importance because, as already mentioned in the introduction, it was the first rhododendron introduced into cultivation in Britain in 1656. In its native home it is confined to limestone formation, but in cultivation it thrives and flourishes in acid soils. It is a pleasing shrub up to two or three feet high with bristly hairs on the margins of the leaves, and rose-pink or rose-scarlet tubular-bell shaped flowers. Closely related is *R. ferrugineum*, known as the "Alpine Rose of Switzerland," which is similar to its ally in several respects. In the rock garden in the Royal Botanic Garden, Edinburgh, it forms a conspicuous feature, and is an unusually attractive sight when adorned with a profusion of rose-purple flowers. *R. kotschyi* is a densely branched shrub, usually up to two feet in height, and is exceedingly charming with its deep rose-purple flowers, narrowly tubular with spreading lobes. All three species are perfectly hardy, and are extremely useful in that they are late flowerers, prolonging the flowering season into June or July.

Glaucophyllum Series

One of the finest in this Series is *R. glaucophyllum*, a native of the Himalaya, from whence it was introduced by Hooker in 1850. The species is fairly common in cultivation, and grows up to four feet in height or more, but some forms up to eighteen inches are well suited for the rock garden. An attractive feature is the glaucous under surfaces of the leaves. The flowers are bell-shaped, up to an inch long, pink, rose or pinkish-purple, in clusters of four to ten. The variety *tubiforme*, which grows up to two or three feet high, seldom fails to display the beauty of its long tubular rose-pink flowers in April or May. Closely akin is *R. tsangpoense*, discovered and introduced by Kingdon-Ward in 1924 from the Doshong La, Tibet. It is a vigorous-growing shrub up to two or three feet, with bell-shaped pinkish-purple flowers about an inch long. In cultiva-



ERIC WALTHER

Rhododendron tephropeplum



ROYAL BOTANIC GARDEN, EDINBURGH

Rhododendron leucaspis

Rhododendron campylogynum var. *myrtilloides*

ROYAL BOTANIC GARDEN, EDINBURGH



tion, several plants should be grouped together to give effect to the beauty of the flowers.

Special reference must be made to *R. charitopes*, "lovely of aspect," an uncommon plant in rock gardens. Farrer discovered this species in the Shing Hong Pass, northeast Upper Burma, in 1920 at an elevation of twelve thousand feet. It grows up to two or three feet high with large rounded leaves, and is of exquisite beauty when covered with large widely bell-shaped flowers of apple-blossom pink speckled with crimson. The plant is hardy, but requires a sunny aspect with some protection from wind, for the best results to be obtained. It is a charming plant for the rock garden, and is worthy of more general cultivation.

A remarkably distinct species in this series is *R. brachyanthum*, a native of Yunnan and southeast Tibet. It grows up to five feet, but a spreading form, up to two feet high, is well adapted to the rock garden. The flowers are yellow, bell-shaped, on long flower-stalks, in clusters of three to ten. It is a valuable plant in that it is a late-flowerer, the flowers appearing in June or July.

Lapponicum Series

This series consists of a great array of rhododendrons, most of which have proved their worth in general cultivation. Comment will be made on a selection of eleven species which, amongst others, may be considered both choice and interesting, worthy of being grown in any collection.

An exceptionally fine and popular plant is *R. impeditum*, discovered by Forrest on the Lichiang Range, Yunnan, in 1910. This is a compact shrub, up to one foot or more in height, very free-flowering, and exceedingly attractive with its pale or purplish-blue flowers in clusters of up to five. The plant is highly rated, and received the Award of Merit in 1944.

One of the most distinct and beautiful in this Series is *R. hippophaeoides*, an upright shrub of two or three feet. It commences to flower towards the end of April or early in May. Kingdon-Ward discovered this plant in 1913 growing in

the Valley of Chung River, Yunnan, at ten thousand and five hundred feet. It has been introduced into cultivation on several occasions. The best form is one with large deep violet-blue flowers, in clusters of up to nine. The species is very hardy, and is easy to grow.

Another exceptionally fine plant is *R. microleucum*, the albino of this series. The species was described in 1933 from a plant growing in the rock garden at Exbury, raised from Forrest's seed presumably collected in western China, and was awarded the First Class Certificate in 1933. It is compact in growth, up to eighteen inches high, and is most attractive when covered with white flowers in April or May.

More sturdy of habit, and one which is uncommon in rock gardens, is *R. dasy-petalum*, first collected by Forrest on the Li-ti-ping, northwest Yunnan, at eleven thousand feet. It forms a compact bush usually up to two feet high, and seldom fails to put forth a wealth of color in April or early in May. The plant is recognized by the large broadly funnel-shaped flowers, deep purple-rose in color, in clusters of up to four.

Few plants are more significant than *R. russatum* when it provides a mass of bloom in late spring. The species is one of Forrest's discoveries in northwest Yunnan growing at twelve thousand feet. It is a variable plant up to four feet high, but the smaller forms are excellently suited for the rock garden. The flowers are usually larger than in most species in this series, being pale purplish-mauve to deep violet-mauve in color, in clusters of four to eight. The plant is easily grown, and is generally regarded as being one of the best of this series.

Mention must be made of *R. lapponicum*, one of the most difficult of all species. Although first introduced in 1825, it is still a rare plant in cultivation. It is a slow-growing shrub up to about nine inches high, with deep purplish flowers in clusters of two to six. The plant should be grown in cold gardens, fairly moist at the root, with some shelter from strong winds, for the best results to be obtained.

One of Kingdon-Ward's finest discoveries is *R. chryseum*, a small shrub which grows up to two feet high with bright yellow flowers in clusters of two to five.

Amongst the several forms in cultivation, one introduced by Rock is a compact shrub which no one can fail to admire when covered with a profusion of flowers in April or May. The species is hardy and should be included in every collection of rhododendrons. A close ally is *R. flavidum*, discovered by Soulié in western Szechuan. It grows up to three or four feet high with large pale yellow flowers, and is a valuable plant for the small home or rock garden.

Two other species, worthy of special notice, are *R. intricatum* and *R. stictophyllum*. The former is upright in growth, up to two or three feet, with pale lavender-purple or mauve flowers, whilst the latter is compact, up to two feet, with purple to deep rose-purple flowers. Both species flower very freely, and give delightful color displays in April or May. Yet another fine plant is *R. scintillans* up to two or three feet high, with pale rose-purple or lavender-blue or deep blue-purple flowers. It is a pleasing species, very highly rated, particularly the form with deep blue-purple flowers, and it received the Award of Merit in 1924 and the First Class Certificate in 1934.

Lepidotum Series

Amongst the later-flowering species is *R. lepidotum*, which is widely distributed in the Himalaya and western China at elevations of eight to sixteen thousand feet. It is a very variable plant, and in cultivation it is compact or straggly or upright up to two or three feet high with pink to crimson or yellow flowers. The species has long been in cultivation, having been introduced in 1850. The free-flowering compact forms up to eighteen inches high are well worth growing in the rock garden. An ally is *R. baileyi*, a remarkably distinct species which makes a fine show in May with its deep crimson-purple or deep purple flowers in clusters of five to nine or more. It is a fairly fast-growing shrub and reaches up to four or five feet in height, although the smaller forms up to two or three feet are well suited for the small home or rock garden.

One of the most beautiful of all species is *R. lowndesi*, a dainty spreading deciduous shrub, up to three or four

inches high in cultivation, with single or paired yellow flowers situated on long flower-stalks. It was discovered in 1950 by the late D. G. Lowndes in Nepal growing in rock crevices at thirteen thousand and five hundred feet. The species flowered for the first time in the Royal Botanic Garden at Edinburgh, raised from seed taken from a herbarium fruiting specimen collected by Polunin, Sykes and Williams in Nepal in 1952. It has proved to be most attractive in flower, and would be well worth acquiring for every rock garden.

Maddeni Series

An interesting species in this series is *R. valentinianum*, discovered by Forrest in 1917 in the Shweli-Salwin divide, Yunnan, at eleven thousand feet. Two forms are in cultivation, one introduced by Forrest, a compact spreading shrub up to about eighteen inches high with rounded leaves; and one introduced by Rock, upright in growth up to three feet with pointed leaves. The beautiful large yellow flowers, in clusters of two to six, appear freely in March or April, but unfortunately, they are apt to succumb to heavy spring frosts. A near ally is *R. ciliatum*, introduced from the Himalaya in 1850. The plant is common in cultivation, and grows up to three or four feet in height or sometimes up to five or six feet or more. In March or April it provides a mass of color with its white or pink flowers which, however, like those of its ally, are liable to be destroyed by early spring frosts.

Moupinense Series

An early flowering rhododendron is *R. moupinense*. It is a most remarkable species of two to four feet, introduced by Wilson from western Szechuan where it often grows as an epiphyte on broad-leaved trees. The plant flowers in February, and when it escapes the frost, it heralds spring with a blaze of white or rose-pink, funnel-shaped flowers. An attractive feature is the young foliage, bronzy-brown in color. The species is easy to grow, and is well worth a place in every rock garden.



ROYAL BOTANIC GARDEN, EDINBURGH

Rhododendron moupinense



ROYAL BOTANIC GARDEN, EDINBURGH

Rhododendron williamsianum

Rhododendron imperator

ROYAL BOTANIC GARDEN, EDINBURGH



Neriiflorum Series

An exceptionally fine plant, being one of the most elegant of Forrest's discoveries, is undoubtedly *R. forresti* var. *repens* which well deserves the First Class Certificate awarded to it in 1935. It is a creeper with single or paired large, tubular-bell-shaped crimson flowers, for which the dark green foliage provides an effective contrast. The plant is a slow grower and is reputed to be difficult, although in the Royal Botanic Garden at Edinburgh, two large plants seldom fail to display the beauty of their flowers produced with great freedom in April or May. The closely related *R. chamaethomsoni* is an upright straggly shrub, up to two or three feet high, with large flowers, usually crimson in color, in clusters of up to four. Like its ally, it is a slow grower and many years are required before it flowers freely. The flowers appear in March or April, but an early spring frost takes its heavy toll.

Another delightful plant in this series is *R. aperantum*, discovered by Farrer in 1920 in northeast Upper Burma, covering the high alpine slopes for miles. In cultivation it grows up to about two feet high with leaves arranged in rosettes and large, pink to deep crimson or yellow flowers. Although it is a slow grower and often a shy flowerer, it is well worth attempting, being one of the finest in its series. The plant is quite hardy but requires some shade and protection from wind. Related to it is *R. didymum*, a pleasing species with leaves covered beneath with fawn or silvery indumentum. It is hardy in sheltered positions, and a well-grown plant two to three feet high, laden with large deep crimson flowers, is most effective in June or July.

Saluenense Series

One of the most striking in this series is *R. calostrotum*, discovered by Kingdon-Ward in northeast Burma at an elevation of thirteen thousand feet. The species is variable in habit; it may be compact or upright, up to three feet high. Some forms up to one foot are extremely free-flowering and make a fine show in May or June with large, saucer-shaped pinkish-purple or crimson flowers, com-

pletely hiding the leaves. The young foliage, bluish-green in color, is most distinctive and attracts attention. The plant is very hardy and is easily adaptable to any position in the rock garden. Variety *calciphilum* has smaller leaves, with pale pinkish flowers.

A fairly common plant in cultivation is *R. keleticum*, first collected by Forrest in southeast Tibet in 1919. It is a semi-prostrate spreading shrub, usually up to one foot high, and produces masses of large, deep purplish-crimson flowers in May or June. Its near ally, *R. radicans*, is a completely prostrate creeper with very narrow leaves, and provides a glorious display of dark rose-purple flowers in May. In some forms a distinct feature is the rooting of the branches as they creep along the ground. Although both species are hardy, early severe frosts are apt to damage the plants, as was seen in the Royal Botanic Garden at Edinburgh last season.

Another charming plant is *R. prostratum*, discovered by Forrest on the Lichiang Range, Yunnan, growing at fifteen to sixteen thousand feet, almost at the limit of vegetation. It is a prostrate spreading shrub, usually up to one foot high, which no one can fail to admire when smothered with crimson flowers in April or May.

Other interesting species include *R. saluenense* which grows from two to four feet high, flowering in April or May; *R. chameunum*, up to two feet, usually with smaller leaves, the flowers appearing in May or June; and *R. nitens*, a late flowerer, extending the flowering season into July or sometimes August.

Scabrifolium Series

One of the finest in this series is *R. spiciferum*, a free-flowering species, discovered in 1891 by Delavay in northwest Yunnan. It is a spreading shrub up to three feet high with bristly and pubescent branchlets and leaves. In April or May it makes a wonderful sight with its rose flowers in axillary clusters in the upper parts of the shoots. The plant is hardy, is easy to cultivate, and should be grown in every small home or rock garden.

Taliense Series

Reference must be made to *R. prorum*, a remarkably distinct species which, however, is very rare in cultivation. Forrest first collected this plant in mid-west Yunnan in 1923, growing on rocky slopes at thirteen to fourteen thousand feet. It is a prostrate shrub up to about one foot high, with large leaves covered with a thick wool beneath, and large creamy-yellow flowers with deep crimson spots. The plant is a slow grower, and many years are needed before it reaches the flowering size. It is a unique species in its Series, however, and should be more often seen in cultivation.

Thomsoni Series

A most outstanding plant is *R. williamsianum*, discovered by Wilson in western Szechuan in 1908. This is a compact shrub usually up to three or four feet high with rounded leaves, and is exceedingly beautiful when laden with large pink or rose bells in April or early in May. A most remarkable feature is the young bronzy growths which, however, are often destroyed by late spring frosts; otherwise it is hardy in sheltered positions, and is a first class plant for the small home or rock garden.

Trichocladum Series

A very distinct member of this series is *R. lepidostylum*, one of Forrest's discoveries in western Yunnan at eleven to eleven thousand and five hundred feet. It is a compact shrub up to three or four feet high, and is remarkable for its exceptional qualities as a foliage plant. With its young bluish-green leaves covered with a glaucous sheen, it is a plant of great beauty and is always admired. In May or June it makes a fine show with its single or paired yellow flowers, and is worthy of being widely cultivated.

Triflorum Series

A remarkably fine rhododendron is *R. hanceanum* var. *nanum*. This is a compact shrub, up to one foot high, and is most pleasing when covered with

masses of yellow or creamy-white flowers in clusters of six to twelve or more, in April. Although a slow grower, it is an excellent plant for the small home or rock garden.

Another beautiful plant with yellow flowers is *R. keiskei*, a native of Japan, from whence it was introduced in 1908. It is somewhat compact in growth or sometimes straggly, up to two or three feet high or sometimes more, with large flowers produced freely in clusters of three to five. In some forms a prominent feature is the young foliage of a bronzy-brown color. The plant is hardy, but to grow it satisfactorily, some protection from wind should be provided.

Uniflorum Series

This Series contains some of the best and most charming of all dwarf rhododendrons. One of these is *R. imperator*, a prostrate spreading shrub usually up to six inches high, discovered by Kingdon-Ward in Upper Burma in 1926. It is a plant of very great merit, and in May it gives one of the most delightful of all color displays, with its large funnel-shaped, deep pinkish-purple flowers. It is a slow grower, however, and somewhat difficult to establish. The plant is hardy, but requires a sheltered position.

Another splendid plant, common in cultivation, is *R. pemakoense*, one of Kingdon-Ward's discoveries in the Tsangpo Gorge, southeast Tibet. This is usually a compact shrub, up to about eighteen inches high, and one of its chief merits is that it flowers abundantly at a remarkably early age. It is hardy and makes a wonderful sight with its large pinkish-purple flowers in March or April. Yet another fine species in this Series is *R. uniflorum*, a small semi-prostrate shrub with broadly funnel-shaped flowers, appearing in April or May. It is a most desirable plant for the rock garden, although in cultivation it has not received the wide recognition it deserves.

Another noteworthy species in this series is *R. ludlowi*, discovered by Ludlow and Sherriff in southeast Tibet at thirteen thousand and five hundred feet. It grows up to one foot high, with small leaves, and single or paired bell-shaped yellow flowers which are large for the size of the leaves. The plant is a slow grower and somewhat difficult in culture,

but is worthy of a place in every small home garden or rock garden.

Among Hooker's discoveries in the Himalaya, one of the best is *R. pumilum*, a prostrate shrub, usually up to six inches high. It flowers freely, and cannot fail to impress us with the beauty of its pink bells in May or June. Although the plant is hardy, a sheltered position in the garden is desirable.

Virgatum Series

A well-known species which has long been in cultivation is *R. racemosum*, first collected by Delavay in northwest Yunnan in 1884. It has been introduced by various collectors from different areas in western China. The species is very variable, and grows up to eight or nine feet high, with leaves glaucous beneath. One of Forrest's plants [under No. 19404] is well suited for the rock garden.

It is a compact shrub of two or three feet, and provides an admirable display with its deep rose axillary and terminal flowers covering the upper parts of the shoots. The plant is a robust grower and is easy to cultivate.

Among Hooker's Himalayan discoveries, a particularly lovely plant is *R. virgatum*. It varies considerably in habit and height, but the spreading forms, up to two feet high, have proved to be extremely valuable for the rock garden. The flowers are large, pink, single or paired, and are produced freely in axillary clusters along the shoots, in April or May.

It is apparent that these low-growing rhododendrons, having such diversity of form and color, provide a wide range of choice to the gardener. Many of these are easy to grow; some are difficult and require careful cultivation; however, they are all eminently suitable for the small home garden or rock garden.



ERIC WALTHER

Echeveria elegans, one of the finest of species, shown in an informal manner in the rock garden of Victor Reiter, Jr., San Francisco.

Echeveria

ERIC WALTHER

Popularity of ornamental plants depends on several factors such as beauty, availability, and ease of cultivation. Of these the first is, of course, paramount. On it will depend the effort made to meet the other two requirements. Public taste and preference fluctuate, and what is popular today may be out-of-fashion next year. No group of plants illustrates this fickleness of the public better than do cacti and succulents. We are willing to concede that, no matter how interesting and, yes, perhaps beautiful, they may be, one needs to cultivate a liking for cacti. Succulents in the broadest sense are in a different category, for they are much less demanding, and not any less

interesting and beautiful. Of the various succulents available through American dealers the Family CRASSULACEAE, and more particularly the genus *Echeveria*, offer many worthwhile items with many facets of quality, including plants useful as house-plants, as garden ornaments for the rock-garden, and as fascinating subjects for study of plant-form, botanical problems, and the like.

Highly interesting is the history of the genus *Echeveria*, both from horticultural as well as botanical aspects. Nothing was known of *Echeveria* in Europe before 1793, when the first species, *E. coccinea*, then grown at the Madrid Botanical Garden, was illustrated in Cavanilles'

Icones. This plant was then assigned to the genus *Cotyledon*, a mistake still plaguing us today. The plant had reached Madrid as one accomplishment of botanical surveys then being made in "New Spain," under the patronage of King Charles III. These explorations were undertaken by a commission headed by Mociño and Sessè, who made extensive collections in the New World and employed a Mexican artist to prepare drawings of many of the novel plants found. The artist was D. Atanasio Echeverria, after whom A. P. DeCandolle named the genus in 1828. DeCandolle had only four items to deal with, *i.e.*, the afore-mentioned *E. coccinea*, *Dudleya caespitosa* and two others known to him only from drawings by Echeverria, *E. teretifolia* and *E. gibbiflora*.

A fascinating story is told about these drawings, which DeCandolle had borrowed from Mociño, whom he met at Montpellier while lecturing there. Suddenly Mociño asked for the immediate return of these pictures to take with him to Spain, whither he was returning, and where he hoped his work would finally be published. To retain all that valuable knowledge, DeCandolle mobilized over a hundred volunteers to make copies. It was well that this was done, for nothing is known today of the fate of Mociño's collections after they were returned by DeCandolle.

Since that time our knowledge of the genus has advanced immeasurably. Now there is no question of its validity nor its clearcut distinction from both *Cotyledon* and *Dudleya*. Final proof was the establishment, by Charles Uhl of Cornell University, that in *Dudleya* the basic number of haploid chromosomes is seventeen, with multiples of that number being frequent, whereas in *Echeveria* the chromosome number appears to be so variable that a definite basic number could scarcely be designated. Only a single species, however, is known with seventeen haploid chromosomes, and, personally, we know of no proven hybrid between these two genera. *Cotyledon*, as now circumscribed, is confined to South African plants, usually with inflorescence terminating the vegetative axis, leaves most often in opposite pairs, and with its petals connate into a long

corolla-tube. The genus is known to have nine, rather large, haploid chromosomes. The nearest relations to *Echeveria* are *Pachyphytum* and *Graptopetalum*, with both of which it crosses readily, and both of which are confined to Mexico and Arizona.

The genus *Echeveria*, while predominantly Mexican, does extend to South America, following the Andes chain all the way to northwestern Argentina, while one species, *E. strictiflora*, is native to the Big Bend country of western Texas. The various species are all decidedly rock-plants, never growing on level ground, and frequently ascending to elevations of over fourteen thousand feet. The number of known species is still growing with continued explorations. For instance, when we started what we hoped would be the final revision of our monograph manuscript, our list totaled a hundred and eight names. Since November [1957] this list has now grown to a hundred and forty-nine items, and at least another ten, possibly new, species are under observation, largely the result of recent discoveries in Oaxaca and Chiapas by Thomas MacDougall of New York City. This coincidence of the discovery and introduction of so many new species with the availability of a reasonably adequate amount of herbarium material is a challenge and an opportunity, both to the botanist and the horticulturist.

There is great need for an up-to-date monograph of the genus *Echeveria*, to facilitate determinations of the various plants found in cultivation and in the field. Herbarium specimens are surprisingly scarce, the total number extant in the herbaria of the world probably amounting to less than a thousand. Of course, pressing and drying such intractable succulent material is apt to be discouraging, and even if successfully done results in specimens often scarcely resembling the living originals. Any adequate treatment must be based primarily on living plants from definite localities in their native habitats, cultivated under substantially uniform conditions. Records should include ample clear photographs, detailed drawings of adequate scale, and accurate color notes. The late J. N. Rose had contemplated a

monograph of the CRASSULACEAE along the lines of his famous CACTACEAE; and for this purpose not only had gathered, in 1905 at the United States Botanic Garden, a collection of over a thousand living plants, but had commissioned the taking of numerous photographs and the preparation of a set of very fine water colors by F. A. Walpole. These collections in the United States National Herbarium (Smithsonian Institution) constitute the largest, most comprehensive anywhere, and must of necessity be the basis of any future work.

Horticulturally, *Echeveria* is limited in usefulness by frost, for few species and varieties are completely hardy, except perhaps in California or Florida. The smaller cushion-forming types are so readily stored indoors that their preservation through a cold winter is no problem. All of these are most readily propagated from even quite small cuttings, which grow so rapidly as to make acceptable plants the same season. Seedlings also grow quite rapidly but are rarely to be depended upon to come true to name. Hybridization is easy, too easy in fact, and few of the resultant plants are of enough merit to be worth preserving. Exceptions are such deliberate hybrids as Set-Oliver, Derosa, Imbricata, etc. Culturally, *Echeveria* is not a xerophyte, but appreciates ample moisture during summer. Mexican winters are dry and sunny, a condition often difficult to reproduce, but careful attention to good drainage will help.

From the known predilection of most *Echeveria* species for rocks, steep cliffs, and even tree trunks, it is evident that they prefer perfect drainage. Many species occur in partial shade, others in full sun, and perhaps some of the distinctive features developed have arisen in response to such variations in light intensity. A species originally collected at fourteen thousand feet elevation no doubt will thrive in a cool place, while another coming from less than five thousand feet may need a warmer spot and a warm greenhouse in winter. In Mexico *Echeveria* is often more readily found on the north side of a hill, where there is more persistent moisture, some shade from the denser vegetation, and more vegetable mould resulting from the lat-

ter. Experience has demonstrated that *Echeveria* responds promptly to feeding, best done during the growing period. Of pests the most serious one found in cultivation is nematode. To combat these, all soil, etc., should be sterilized and all newly acquired plants carefully inspected, the roots cut off if necessary and the plant re-rooted and kept in quarantine until proved clean. Another serious pest are the larvae of *Brachyrhinus* beetles that devour the roots and underground stems. Modern insecticides now available need to be used freely. Aphids, thrips, red spider, and mealybugs are common pests and may easily disfigure *Echeverias* if not controlled promptly. At least one species, *E. maculata*, owes its specific name to the blotches that appeared on its leaves subsequent to mealybug infestation when young. Some of the weak-growing species may successfully be grafted, as *E. harmsi* on *Sedum dendroideum*, etc. and the finest plant of this (better known as *Oliveranthus*) that we ever saw was grown on this understock.

Of several questions that will be asked, two concern which and whence, i.e., what are the best kinds of *Echeveria* recommended and where may these be obtained. In California several wholesale growers are engaged in growing these, sending carload lots of them east every spring to the various retailers—the dime stores, and others. The plants so made available are, of course, the more common ones. For the rare novelties one must rely on information from botanic gardens, local garden clubs, and more especially the several cactus and succulent societies. Most of the latter are affiliated with the Cactus and Succulent Society of America that publishes a bi-monthly journal, which is now running a series on *Echeveria* by the present writer. Another potential source could be the recently organized International Succulent Institute, Inc., J. W. Dodson, Secretary, 921 Murchison Drive, Millbrae, California.

In former times, *Echeveria* was often utilized in the stiff, formal designs fashionable during the latter half of the nineteenth century. Modern gardens, faced with maintenance problems, might well utilize more plants which, as *Eche-*

veria, may tolerate a certain degree of neglect. It should prove possible to go away for a vacation and return home finding one's *Echeveria* collection as good or better, than it was when one departed. In California particularly, with its dry summers and mild winters, *Echeveria* can be, and has been, used very successfully for creating gardens both beautiful, interesting, and distinctive.

To realize the fullest possibilities of the genus *Echeveria*, all of its species, whether old or new, need to be considered, tested, propagated, and known. The publication of the monograph we have in hand should go a long way in bringing about that desirable end.

Recommended list of common species

| (* good | ** better | *** best) |
|------------------------|-------------------------|-----------|
| <i>affinis</i> * | <i>pallida</i> * | |
| <i>agavoides</i> * | <i>palmeri</i> * | |
| <i>alpina</i> * | <i>peacocki</i> * | |
| <i>amoena</i> * | <i>pilosa</i> * | |
| <i>carnicolor</i> | <i>potosina</i> ** | |
| <i>chihuahuensis</i> * | <i>pulvinata</i> *** | |
| <i>coccinea</i> | <i>pumila</i> * | |
| <i>craigiana</i> * | <i>purpurorum</i> ** | |
| <i>crenulata</i> | <i>rubromarginata</i> * | |
| <i>derenbergi</i> ** | <i>runyoni</i> ** | |
| <i>elegans</i> *** | <i>secunda</i> * | |
| <i>fulgens</i> * | <i>setosa</i> *** | |
| <i>gibbiflora</i> * | <i>simulans</i> | |
| <i>gilva</i> ** | <i>spectabilis</i> ** | |
| <i>glauca</i> ** | <i>sprucei</i> * | |
| <i>grandifolia</i> * | <i>subalpina</i> * | |
| <i>harmsi</i> *** | <i>subrigida</i> * | |
| <i>leucotricha</i> * | <i>subsessilis</i> * | |
| <i>lozani</i> * | <i>tolucensis</i> * | |
| <i>microcalyx</i> * | <i>turgida</i> * | |
| <i>multicaulis</i> | <i>violescens</i> * | |
| <i>nodulosa</i> * | <i>whitei</i> | |
| <i>nuda</i> | | |

Recommended list of hybrids

| | |
|---------------------------|-----------------------|
| <i>angustata</i> * | <i>hoveyi</i> |
| <i>atrosanguinea</i> * | <i>Imbricata</i> *** |
| <i>clevelandi</i> * | <i>kewensis</i> |
| <i>Derosa</i> ** | <i>kircheriana</i> * |
| <i>Doris Taylor</i> * | <i>mutabilis</i> * |
| <i>flammea</i> * | <i>scaphylla</i> * |
| <i>glauco-metallica</i> * | <i>Set-Oliver</i> *** |
| <i>grusoni</i> * | <i>Victor</i> ** |
| <i>haageana</i> * | <i>weingarti</i> * |

Eric Walther

Mr. Walther died July 1, 1959, shortly after submission of the manuscript of the forgoing article. He was born August 14, 1892, in Dresden, Germany. He came to this country in 1909. In 1918, he started to work in Golden Gate Park as a gardener under John McLaren, superintendent. He undoubtedly soon showed an aptitude for the more botanical aspects of gardening and horticulture, for in 1924 he was responsible for the Catalogue of Trees, Shrubs, Vines, Evergreen Ground Covers, etc., Growing in Golden Gate Park, included in the 54th Report of the Board of Park Commissioners, San Francisco.

In 1937, the bequest from Mrs. Helen Strybing for an arboretum and botanical garden in Golden Gate Park came to the City of San Francisco. Mr. Walther was put in charge of the construction and planting in the area set aside for the arboretum, according to a master plan which was drawn up by both Mr. McLaren and himself. He was in charge of the Strybing Arboretum from its beginning in 1937 until he retired in 1957.

Mr. Walther had a keen awareness for the need of new plants and he always tried to bring potentially good ornamentals into Strybing Arboretum from all sources available to him. He claimed to have introduced into Strybing Arboretum: *Magnolia campbelli*, *Camellia reticulata* 'Captain Rawes,' *Cistus purpureus*, *Clethra arborea*, *Sedum morganianum*, *Buddleia salviifolia*, *Ternstroemia sylvatica*.

Mr. Walther developed an interest in succulent plants, particularly in the Crasulaceae. He worked on the genus *Echeveria* and left an unpublished monograph of this genus at the time of his death. He published numerous articles on this genus in the *Journal of the Cactus and Succulent Society*. He provided in his will for the publication of his monograph on *Echeveria* and this is to be published soon.

E. McC.

ERIC WALTHER



Echeveria elegans as grown in a farm yard in Omitlan, Hidalgo, Mexico



ERIC WALTHER

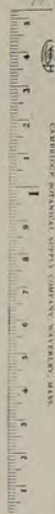


ERIC WALTHER

Echeveria 'Set-Oliver'

Echeveria gibbiflora, from a drawing
by D. Atanasio Echeverria (Top, left)
Echeveria 'San Miguel' (Top, right)
Echeveria pilosa (Bottom, left)
Echeveria bifurcata (Bottom, right)

CRASSULACEAE.



ECHEVERIA *gibbiflora*





ERIC WALTHER

Echeveria 'Imbricata'



ERIC WALTHEK

Echeveria elegans



ERIC WALTHER

Echeveria violescens, as a pot plant

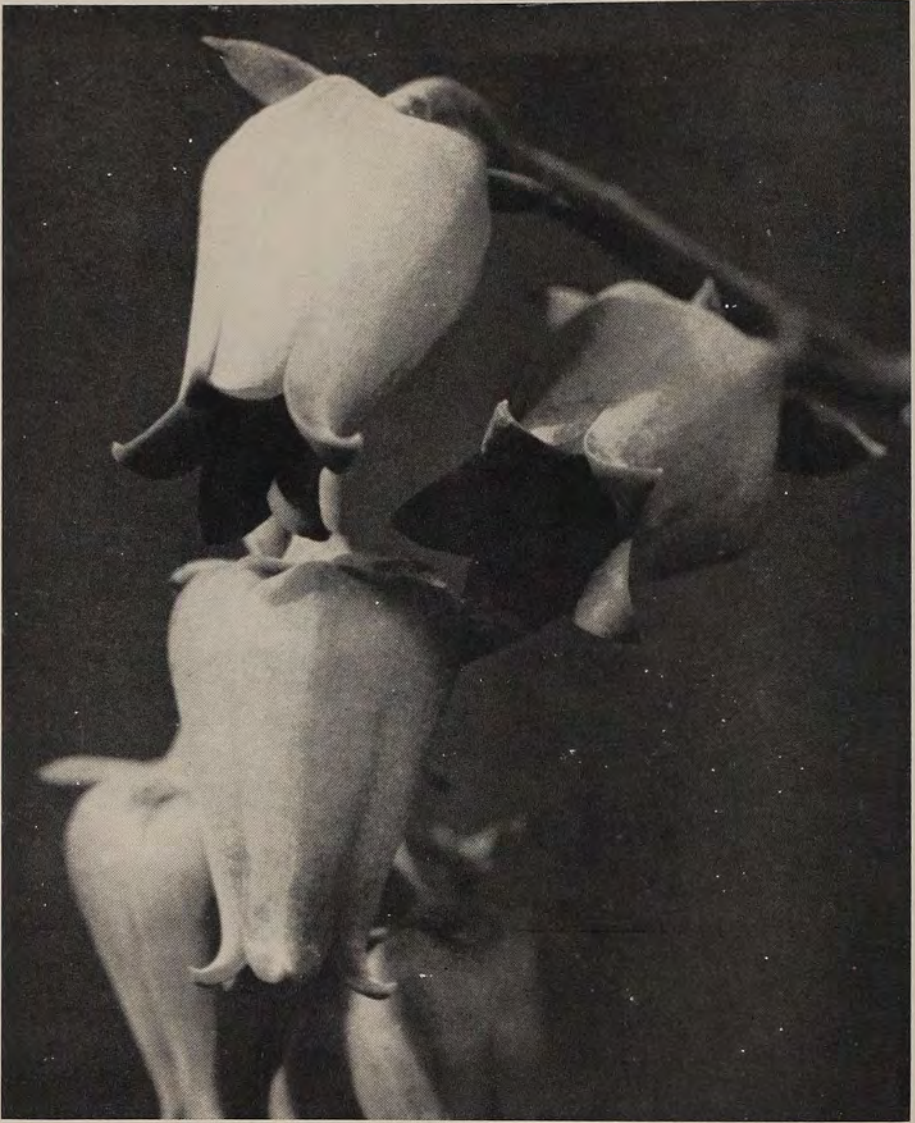
Echeveria harmsi, grafted onto
Sedum praealtum (Top, left)

Echeveria nuda, epiphytic
with orchids (Top, right)

Echeveria strictiflora from
Brewster County, Texas (Bottom,
left)

Echeveria subrigida, in Mexico
(Bottom, right)





ERIC WALTHER

*The flowers of **Echeveria potosina**, which could have served as the model for a Grecian vase—so perfect is their outline*



ERIC WALTHER

Echeverias decorating steps in the garden of Mrs. Forbes at Ross, California

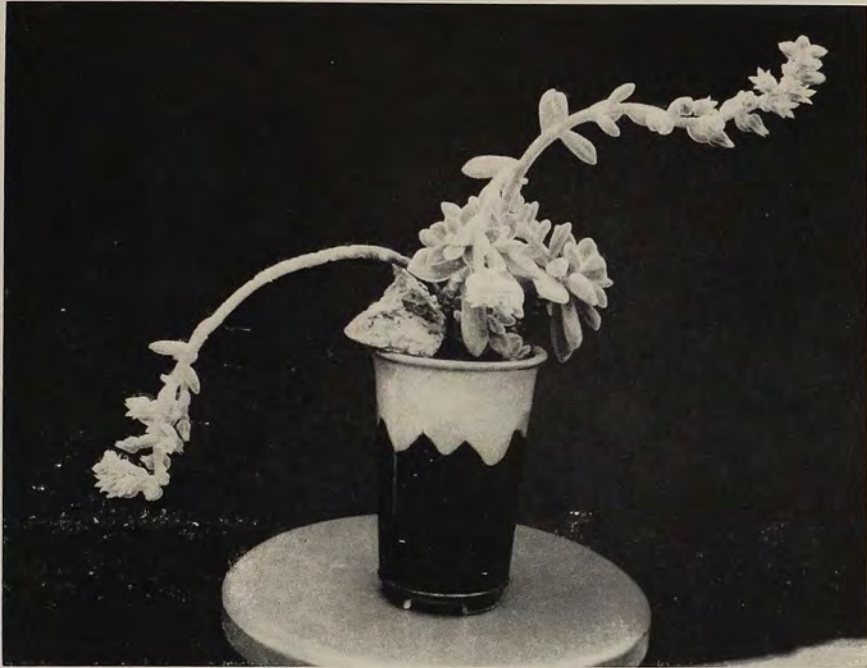


Echeveria 'Victor'

Echeveria grandifolia



ERIC WALTHER



Echeveria pulvinata

Echeveria runyoni var. 'macabeana'

ERIC WALTHER

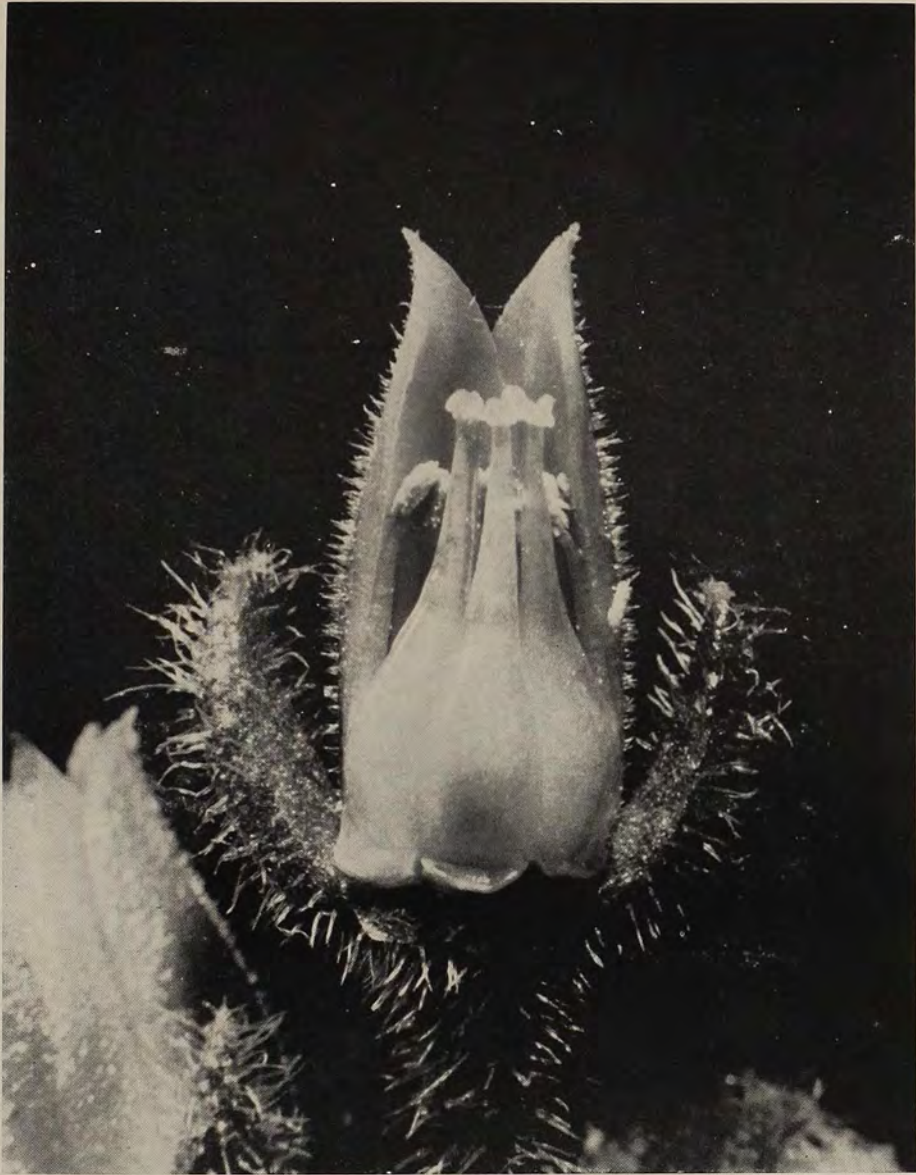




Echeveria glauca

Echeveria purpusorum





Echeveria setosa, enlarged interior view of corolla

ERIC WALTHER



Echeveria derenbergii

COTYLEDON COCCINEA.

Tab. 17c.



A. J. Cavanilles del.

M. Gombosi sculp.

ERIC WALTHER

Echeveria coccinea

The first true *Echeveria* species cultivated in Europe, described in 1793.
 (From a drawing by A. J. Cavanilles, *Icones*, 1793, Tab. 170)

*A California rock garden featuring all sorts
of Echeveria species and hybrids*

ERIC WALTHER





CLAUDE HOPE

Daphne odora

Daphnes

CLARENCE VANHOUTEN*

Few gardeners can resist growing the Garland Flower or Rose Daphne (*Daphne cneorum*) as the combination of beauty, fragrance, and refinement provides the utmost attraction to the senses. In late May or June the foot-high mounds of foliage are smothered with clusters of light pink, arbutus-like blossoms which emit a clean, sweet fragrance that must be the very breath of spring. Inasmuch as the mounds may spread to three feet or more, the flowering period is a memorable event.

The qualities of *D. cneorum* are present to a greater or lesser degree in other members of the family. The gardeners who are not acquainted with the species, varieties and hybrids of the genus *Daphne* may find the following information helpful.

Daphne cneorum is a species with many variations in stature and color. Some of these variations deviate so greatly that their relationship with the type is evident only to the eyes of the botanist.

The variety *eximia* would surpass the type plant in popularity if it were generally obtainable. This notable shrub attracts attention as the rich, red buds open into lovely deep pink stars, usually twice as large as those of *D. cneorum* itself. The leaves of this twiggy form are likewise the largest of the group.

The variety *verloti*, an enigma even to the taxonomists, is a plant apparently with good and not so good forms which vary depending on the locality where collected. Fortunately, the form grown

here rivals the variety *eximia* in color and size of blossom. It may be recognized by the bluish cast to the foliage and the long, slender, pointed leaves.

It is difficult to describe the variety *cashmiriana* as it should be seen to be appreciated. This Himalayan plant, although similar to the species, has distinction which cannot be defined. The writer has a great deal of affection for the refinement to be found in this plant.

For those who like foliage variation there is the form *variegata* with green, white-rimmed foliage, otherwise same as the type.

The varieties noted above attain the approximate physical dimensions of *Daphne cneorum* and bloom profusely.

There are two interesting micro-forms of *D. cneorum* particularly suitable for the rock garden. The variety *alba* has milky white blossoms covering a plant seldom more than three inches high and up to a foot in diameter. This plant seems to appreciate any extra care it may receive. The very rare form *pygmaea* is perfectly prostrate and up to eight inches across. The delightful rose-pink blooms, about two weeks before the type, appear to be springing out of the ground.

Daphne striata is a species close to *D. cneorum*. Those who have grown this plant consider it an inferior *D. cneorum* with a mean disposition, but, as it is a rare plant, perhaps no one has discovered the secret of growing it well. The writer has not been particularly successful in advancing plants beyond the seedling stage.

The daphnes listed below deviate considerably from those of the Cneorum Group. Most form an upright trunk with much larger and generally thicker leaves. The individual blossoms and flower clusters are also larger although not so numerous.

*Mr. VanHouten is production engineer at the Stromberg Carlson Company in Rochester, New York. His home is in the nearby town of Fairport. Besides Daphnes, he specialized in alpine plants, Hepatica varieties, Viola species, and forms of *Aquilegia scopulorum*.

About the end of March the fat bud clusters of the Balkan Daphne (*Daphne blagayana*) anxiously await a warm sun to show their defiance of the elements by expanding into creamy white balls of delicious fragrance. As it likes to layer, the appearance and well being of this sprawling Daphne will be improved by placing fairly heavy stones over the bare branches which will usually encourage the plant to layer without further provocation. By this method the bare branches are protected from the summer sun and winter whipping, a condition the plant may not tolerate.

Daphne collina soon follows *D. blagayana* with lovely lilac-rose bloom. It is a free blooming, upright shrub to two or three feet but does not seem to be reliably hardy, although reliable in all other respects.

Daphne collina var. *neopolitana* follows the same habit but is slightly more open and has dark purplish rose blossoms. It is a fine plant but cannot quite cope with the winters here in western New York. It should be noted that this plant and *D. collina* itself winter well in the cold frame and both would survive most years outside with some protection.

Daphne sericea is often confused with *D. collina* but may be identified by the rather narrow, pointed leaf whereas *D. collina* has a broader, slightly rounded leaf. *D. sericea* has pale pink blossoms somewhat later in the season and grows very slowly.

The acute leaves aid in distinguishing *Daphne tangutica* from *D. retusa*. The leaves of *D. tangutica* are shinier and greener than the dull olive green of *D. retusa*. Both form sturdy tree-like bushes to three feet with deep rose to purple flowers often touched, and sometimes dominated, by white. The dull leaves of *D. retusa* and wrinkled trunk add years to its appearance.

In contrast, the shining, needle-like dark green leaves of *Daphne arbuscula* form a neat eight-inch dome often a foot across covered with large lilac rose flowers which have a crystalline glow. In or out of bloom it is extremely attractive and should be in every rock garden. A second, less spectacular blooming can usually be counted on.

Probably the most exasperating and, as may be expected, one of the loveliest Daphnes is *D. petraea* (syn. *D. rupestris*). This little shrub is not too difficult to grow but to flower it with any degree of freedom is a real gardening accomplishment. The large rosy pink blossoms, accentuated in size as the plant seldom exceeds six inches in any direction, can completely hide the small, shiny, dark green foliage. The plant must be handled with extreme care as the branchlets are so brittle. For this reason it is best to winter this Daphne in the cold frame as strong winds, heavy wet snow or fallen branches could cause irreparable damage. Keep shaded if wintered in a frame as the bright sun on a mild day can dry out the previously formed flower buds and prolong the plant's reticence to bloom. The few plants commercially available are usually grafted on *D. mezereum* as it would take many years for an own-root plant to attain similar stature. The variety *grandiflora* has larger, deeper colored flowers and for this reason is preferable to the type.

A mature specimen of the Olive Daphne (*Daphne oleoides*) may be anywhere from six inches to two feet tall. This nicely shaped shrub has rather small, fugacious white flowers with little fragrance.

Daphne aurantiaca is probably the only good yellow flowering member of the genus. The golden yellow blossoms are borne in a raceme, rather than a cluster, along the arching branches in summer. It likes leaf mold and light shade but does not like to bloom here. It is probably not hardy.

Most forms of the Winter Daphne (*Daphne odora*) are winter blooming and tender. However, the variety *gmelini* winters successfully in the cold frame, forming buds in November which open during the first warm spring days. The rosy purple flower clusters have an intense, sweet perfume and last surprisingly well despite the erratic weather. The plant has an easy going disposition and the large shining leaves are an added attraction.

The above Daphnes are all evergreen species and varieties. *Daphne mezereum* is the most popular of the deciduous species. Coming into bloom in early spring,

the combination of fragrance and color will dispel the gloom of any dull, cold day. The leafless branches may have blossoms of pink, purple, crimson, white, or any intermediate color. The flower clusters hug the branches quite closely, which leaves the impression that someone had fastened them there. This shrub grows to at least four feet but is often spindly rather than bushy.

The small white blossoms of the Alpine Daphne (*Daphne alpina*) give little indication that this unobtrusive plant makes the garden so enjoyable. Seldom exceeding twelve irregular inches, it is difficult to believe the daphne can scent such a large area. This deciduous plant may delay spring growth or lose its grey-green foliage by mid-summer yet manages to return to normal the following year.

Daphne genkwa is lovely and graceful with airy, lilac colored flowers and soft green foliage. Leafmold and shade help to keep it happy. Unfortunately the plant is not reliably hardy here.

Various hybrids have been discovered as the natural distribution of many Daphne species overlap. None seem to excel their parents although *Daphne* × *thauma* (*D. petraea* × *D. striata*) bears quite a resemblance to the illustrious *Daphne petraea* and certainly blooms more readily. The blossoms are pale to deep pink, depending on the growing season, with a dark throat. The plant is slightly taller and more open than *D. petraea* and has a pleasant temperament.

Some of the garden hybrids are extremely valuable. *Daphne* Somerset owes its popularity to the fragrant pinkish flowers which are borne on branches which may exceed five feet in a relatively short time. *Daphne burkwoodi* has the same parents, *D. cneorum* and *D. caucasica*, and is identical for gardening purposes.

Daphne mantensiana combines the vigor of Somerset with the deep rose blossoms of *D. retusa*. In appearance it is exactly as one would expect such a hybrid to be. The mixed parentage confuses the plant so that it cannot decide whether to remain evergreen or become deciduous. In any case, new growth will start in early spring. It is a splendid, shapely shrub to three feet.

Daphne Leila Haines forms a close mound only four inches high but quite often two feet across. In May the slender, pointed leaves are hidden by the wonderful cerise blossoms bursting from vermilion buds. The compact, prostrate growth helps to keep the roots cool in summer and lessens the possibility of foliage burn in winter, which may account in part for the plant's admirable disposition. *Daphne cneorum* var. *verloti* is undoubtedly one of the parents of this hybrid which is one of the nicest Daphnes.

The Daphnes described above are generally regarded as the most attractive of a lovely genus. All are delightfully fragrant. Although other species are sometimes available which may grow more readily, most are either scentless or small flowered and lack the distinctions of those enumerated above.

Daphnes have been considered both temperamental and capricious by some gardeners. While it must be admitted that these plants certainly have a mind of their own, their frame of mind will improve immensely if good drainage and a cool root run can be provided. The drainage problem can be corrected by soil or sub-soil composition and/or situation. As practically all Daphnes like full sun, the cool root run creates a paradox. A healthy plant of the Cneorum Group provides its own soil coolness due to the low stature and compact, rather dense foliage. If a plant becomes spindly or barren in the center, a mound of leafmold and sand over the center and bare branches in early spring will encourage new growth. Some authorities recommend shearing back to five or six inches after blooming to stimulate growth from the center, but this can prove risky if hot, dry weather follows, in which case the plant will require careful shading and watering. The upright species like the company and shading which any non-rampant, dwarf perennial will provide for their root system. Most violas (not violets), *Phlox subulata*, and the lower growing heaths and heathers do an excellent job. Placing the Daphne on the shady side of a larger plant will also cool the soil sufficiently. Care should be taken, however, that the branches do not overhang as the drip is disliked in summer and detested in winter.



G. HAMPFLER

Daphne genkwa

Daphnes cannot be considered fussy regarding the soil in which they are grown. In common with most plants, they prefer a sandy loam, a commodity found more often in catalogs than in gardens, although the average garden soil will satisfy if adequate drainage has been provided. An annual spring top dressing is not a necessity but the Daphne will show its appreciation of this little thoughtfulness.

There are five methods used for propagating Daphnes. The simplest and easiest way to add a few plants of the Cneorum Group is to top dress the center and watch for new growth with its own root system, which if carefully removed from the parent plant and grown on, will make a fair sized plant in three years. Layering is a similar process which may produce many more plants. In July shoots of the current season are placed in a mixture of sand, peat and leafmold for a minimum depth of one inch with part of the shoot protruding above the soil. Before securing in position with a forked peg or stone, the portion of the stem below soil level should be given a full twist or slight cut to encourage rooting. The twist is preferable but requires secure anchoring as the shoot should be upright to produce a shapely plant. A stone or large hairpin will suffice for the cut stem type layer. The layer should root the next year and the following spring may be separated from the parent and moved elsewhere. Even if extra plants are not required, the layering process benefits the plant as the root system has been increased and can tap a new source for food.

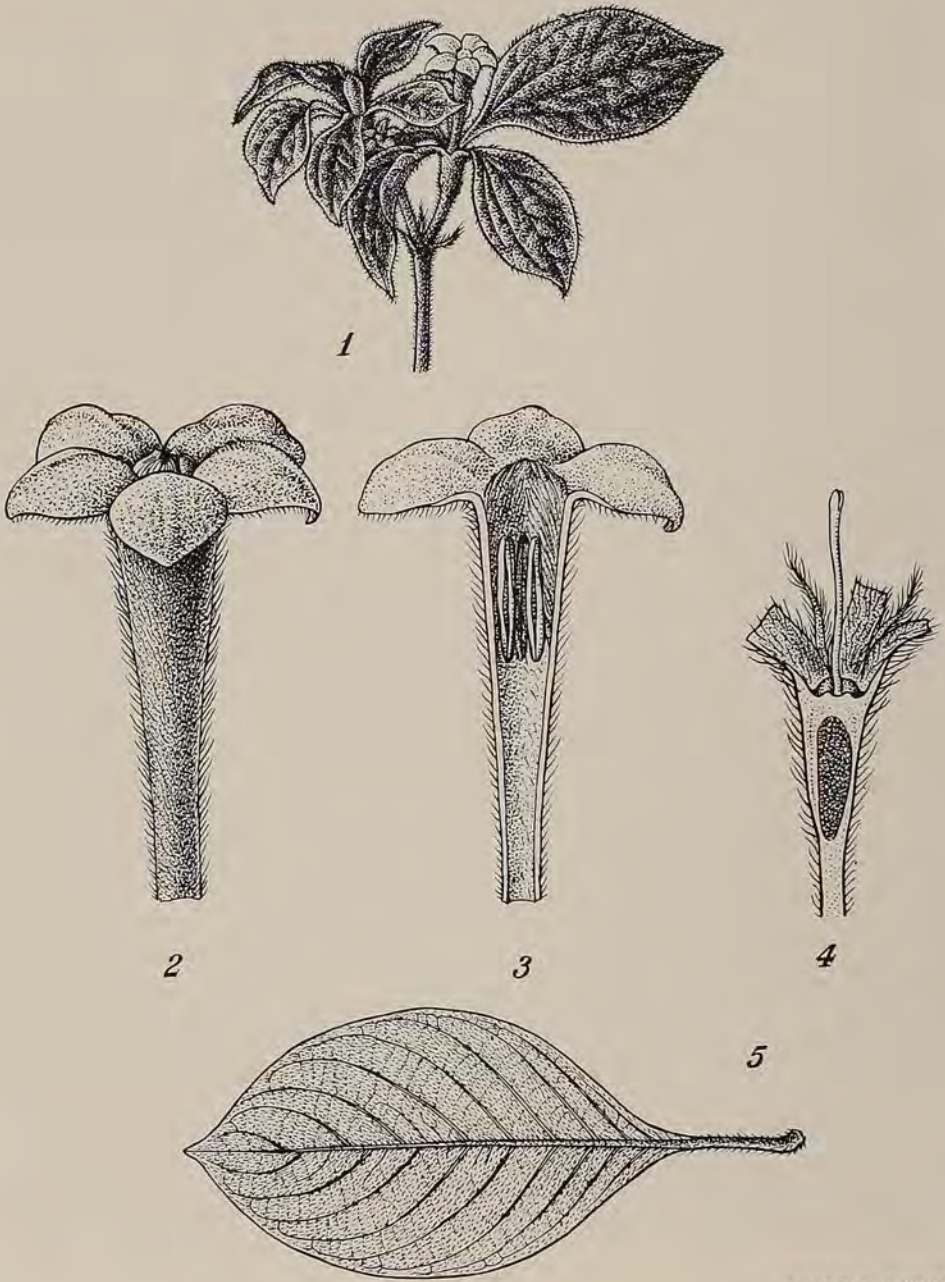
All Daphnes may be propagated from cuttings although this may often be a slow and erratic operation. Three to four years are required, for a cutting to mature. Firm wood of the current season's growth gives the best results in most cases. The Cneorum Group cuttings should be ready by mid-July, the others, one to three weeks later.

Grafting is often employed to increase the slow growing kinds mainly because a saleable plant can be obtained in a shorter period of time than by the other methods. As most gardeners do not possess the proper facilities for grafting, it would seem advisable to leave this process with the commercial growers. *Daphne mezereum*, *D. laureola*, and *D. acutiloba* are usually employed as the understock as seed is available and the seedlings grow quite rapidly.

It is much easier to grow the seedlings than obtain the seeds of most kinds. The Cneorum Group seldom sets seed and the upright species cannot be considered generous in their natural means of increase. Gardening societies and seed catalogs can often supply seed of *Daphne mezereum*, *D. retusa*, *D. tangutica*, *D. oleoides*, and *D. alpina*.

Seedlings and cuttings require at least cold frame protection the first winter, and further, shifting to larger pots or permanent position must be done in spring or fall only. Established plants in the garden should be moved only as a last resort.

When happy, many of the daphnes bloom sporadically in late summer and autumn—not profusely, but just enough to cherish the thought of a lovely plant.



RICARDO C. AGUILAR

Mussaenda 'Luz'

1. Inflorescence showing five enlarged bractlike calyces, deep rose colored, flowers bright yellow with red hairs at the center (X1). 2. Enlarged flower (X4). 3. Cross-section through corolla (X4). Longitudinal section of ovary and pistil (X4). 5. Leaf (X1).

Cultivated Philippine Mussaendas

MONA LISA STEINER

Two outstanding *Mussaendas* have been cultivated in the Philippines in recent years, which by far surpass all other known *Mussaendas* — *Mussaenda philippica* var. *Aurorae*, and a hybrid *Mussaenda* 'Luz.' It is not surprising that the Philippine Islands should produce fine *Mussaendas*, the country harbors eighteen species, all of them endemic with the exception of *M. macrophylla*.

The genus *Mussaenda*, RUBIACEAE, with about sixty species, distributed over Africa, Malaysia, and Polynesia, is fairly well known to horticulturists through two species, *M. erythrophylla* and *M. luteola*, now recognized as *M. flava*. Sometimes the widely distributed *M. frondosa*, found in Malaysia and Polynesia, is cultivated as an ornamental of inferior quality. All *Mussaendas* are characterized by a calyx which expands one lobe into an enlarged petaloid appendage, usually brightly colored, white, red, or yellow. The two Philippine *Mussaendas* develop further, however, and extend all five calyx lobes into large, showy sepals. Another factor which makes these *Mussaendas* very valuable is the unusually long blooming period. These shrubs continue to flower almost throughout the year; only between January and March are they generally less floriferous than during the rest of the year.

All *Mussaendas* are shrubs with opposite leaves. Flowers range from white, yellow to crimson and develop in terminal cymes. The calyx tube is oblong and turbinate and the outer segment petaloid. Filaments are very short, five, attached to the tube, and anthers are linear. The ovary is two-celled with thread-like style and two linear stigmas. Fruits are berries or five-parted capsules, the berries are ellipsoid, often coarsely lenticelled; seed are minute and pitted.

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Key to the Cultivated *Mussaendas* in the Philippines

1. All calyx lobes extended into leafy sepals
 2. All sepals white; flowers bright, orange, about 1.5 cm. in diameter; throat not hairy
 1. *M. philippica* var. *Aurorae*
 2. All sepals deep rose-red; flowers about 2.5 cm. in diameter, yellow; entrance to throat very hairy
 2. *M. 'Luz'*
 1. Only one calyx lobe extended into leafy sepal
 2. Leafy sepal red or pink
 3. Sepal crimson; inflorescence and young branches covered with red bristle-like hairs; flowers 2.5-3 cm. across, very hairy, yellow with red center
 3. *M. erythrophylla*
 3. Sepal pink; inflorescence velutinous; flowers 1.5-2.5 cm. in diameter, pubescent
 4. *M. 'Alicia'*
 2. Leafy sepal white or yellow
 3. Sepal white, hanging; tall shrub; flowers 1.5 cm. in diameter, corolla lobes acute, ridged in the middle
 5. *M. philippica*
 3. Sepal lemon yellow, stands out horizontally; low, compact shrub; flowers about 2 cm. in diameter; lobes rounded with triangular design in each lobe
 6. *M. flava* (*M. luteola*)

1. *Mussaenda philippica* var. *Aurorae*. (Type specimen burnt in 1945, neotype deposited in the Herbarium of the National Museum, Herran, Manila, Steiner No. 1743, Apr. 13, 1959.) Doña Aurora, as the shrub is locally called, is probably the finest contribution of the Philippines to horticulture. The large, multiple sepals and bright orange, star-like flowers overshadow the soft, velvety leaves. The greater part of every branch is cov-

ered with the gleaming white, hanging "leaves," which are beautiful day and night. White flowering plants are not only showy in themselves, but also bring out the other colors of neighboring plants more strongly. Since white is a color which stands out most strongly at night, white flowering plants are greatly in demand for gardens where entertaining is done out of doors. Since living is moving nowadays more and more into the garden, any tropical plant which provides white color throughout the year is therefore in great demand. No wonder that Doña Aurora has become one of the most popular ornamental shrubs in the Philippines.

Doña Aurora is a woody shrub with opposite, elliptic ovate, deep green leaves, paler on the lower side, pubescent, tip abruptly acute, base attenuate, blade 8 to 15 cm. long, 5 to 8 cm. wide, petiole 1 to 2 cm. long. Stipule 1 on each side of the stem, lanceolate about 6 mm. long. Inflorescence in terminal cymes, whole inflorescence pubescent, all calyx lobes extended into white, ovate sepals, usually 3 larger than the other two. Sepals persist over a period of more than two weeks. They are about 5 to 8 cm. long and 4 to 6 cm. wide, and the white petiole is 1 to 2.5 cm. long. Corolla orange, about 1.5 cm. in diameter, corolla tube 2 to 3 cm. long, 2 mm. wide in the lower part, 3.5 mm. in the upper part, pale green. Corolla lobes pubescent on the lower side, glabrous, ovate, acuminate, greenish at tip. Anthers 8 mm. long, linear, attached 8 mm. below the throat of the flower. Style 7 mm. long bi-fid. This natural variety does not produce seeds here, except one mutant form.

This ornamental shrub is a comparative new-comer, which has been cultivated only since 1930. It was first collected in July 1915, at the foot of Mt. Balonbulo (Tuñguñgin), on a solitary hill near the College of Agriculture, Los Baños, by forester Calixto Mabesa. He sent the plant to E. D. Merrill, then director of the Bureau of Science, who identified it as *M. philippica* based on a small portion of a twig, without seeing the actual living plant. This plant, however, was never cultivated. Later in 1930 Hugh Curran found the same variety in sitio Buot, Makiling National Park, Laguna, at an altitude of about a hundred meters close to the site where the variety was found for the first time. The

plant was dug out and planted in the Forestry Nursery of Los Baños. On September 10, 1938, during the Inauguration of the Quezon Institute, this plant was officially named "Doña Aurora" after the wife of the first President of the Philippines, Doña Aurora Quezon. It was then described by Mamerto Sulit in the *Philippine Journal of Forestry* [Vol. 2, No. 1, 1939, pg. 35-41] where also the history as given above was stated. It was immediately a much demanded shrub, but since the plants are sterile, propagation was slow. All plants that are now cultivated are derived asexually from this wild variety, therefore a clone since sexual reproduction is impossible. It appears that Doña Aurora is a polyploid form of the common species, *M. philippica*.

Doña Aurora generally can not be propagated from ordinary cuttings and most plants have been propagated by marcotting or layering. The bark is scraped off to the cambium layer, where the woody portion begins, and this wounded portion is covered with moss or soil. For a cover coconut husk or sac cloth is used to retain the marcotting humid. Teodoro Delizo experimented with numerous plants and found that inarching consistently gave better results than marcotting. Inarching requires only forty-five days, marcotting fifty-five to a hundred days. He also states that roots usually dry out while the marcot is still attached to the parent tree. The wounded area, besides, is an easy source of infection and when transplanted roots are easily attacked by fungi and insects. Budding has also been tried, but is least effective. Mr. Delizo showed that inarching gave a hundred per cent results, marcotting, forty-seven; and budding, twenty-nine. [T. Delizo, *Phil. Journ. of Forestry*, Vol. 3, pg. 471, 1940.]

In spite of these experiments the most commonly used method of propagation is still marcotting, since inarching and layering are little known practices in the Philippines.

Lately with the discovery of root hormones and other methods of propagation Doña Aurora can be multiplied successfully by young, soft green cuttings. The College of Agriculture, Los Baños, has acquired some "misthouses," where a fine mist is dispersed over these cuttings in regular intervals of three or five minutes, according to the setting of the



Mussaenda philippica var. 'Aurorae,' or Doña Aurora, all branch ends covered with gleaming white sepals.

Special form of Doña Aurora with narrow curled-in sepals.



automatic faucets. The writer has not succeeded in starting Doña Aurora from tender cuttings under normal condition. At present plants of Doña Aurora are available almost everywhere in the Philippines and are comparatively inexpensive.

Since the plants are almost continually blooming, special care must be given to keep them vigorous and floriferous. The plants require loose and rich soil, mixed with compost and manure. They should be fertilized about twice a month and chemical plant food should be alternated with organic fertilizers. Good drainage is very essential for healthy development—Doña Aurora is one of the first plants which succumbs to standing water during the rainy season. Full sunshine is also necessary for its development, half shade induces spindly growth and less flower production.

After one or two years the shrubs have a tendency to become lanky and tall and have to be cut down. The best time to prune this plant is in December, when the blooms are at their lowest capacity. They should be cut two or three feet from the ground to insure bushy growth. In the Philippines, we place some flowering Bougainvillea pots next to the pruned Doña Aurora to avoid a bare look. Around March the fleshy leaves unfurl and soon afterwards numerous white sepals and orange flowers appear. A second pruning is not recommended.

Aphids and mealy bugs seem to love the tender and juicy leaves of Doña Aurora. They multiply rapidly and must be sprayed as soon as they start to develop. Aphids and mealy bugs are usually noticed through the numerous ants which immediately appear as soon as the aphids and mealy bugs develop. Aphids are milked like cows by the ants. Also various green caterpillars roll up the young leaves and devour large portions of them in a short time. We find that malathion, resitox, or endrine are most effective insecticides against the pests of Doña Aurora. Spraying has to be done once a week if infestation of the plant occurs.

Doña Aurora is an ideal tropical shrub for well tended gardens. It can not be left alone, however, for any considerable time without watering; the fleshy, tender leaves can not withstand long periods of dryness. Spraying has to be done at regular intervals. Doña Aurora is there-

fore not recommended for public parks and grounds if proper attention can not be given to the plants. It is a glamorous plant, but delicate and requires a great deal of care in order to be at its best. The lower portion of the plant, about one or two feet above the ground, is often bare. It is, therefore, best to grow Doña Aurora behind border plants or low perennials.

Unfortunately, cut flowering sprays are not lasting for any considerable time, the white sepals droop soon and Doña Aurora can not be used successfully for flower arrangements. Only in low or floating composition are the white, leafy branches attractive for any considerable time.

2. *Mussaenda Luz*, new hybrid (*M. erythrophylla* × *M. philippica* var. *Aurorae*). Type specimen deposited in the Herbarium of the National Museum, Herran, Manila; lectotypes sent to Kew, Leiden, and Harvard. The hybrid was produced by Discoro Umali, director of the breeding station of the College of Agriculture, University of the Philippines, Los Baños, Laguna, Philippines.

Hybrid inter parentes intermedia quinque sepalis roseis supra et albis subter. 5-9 cm. longis et 4-5.5 cm. latis, floribus aureis, petalis, 2.5 cm. latis in centro villosis. Folia et caules pilosa, calyces et petala cum rubris capillis, ibidem rami juniores.

This shrub is a new star rising in our ornamental plant world, which promises to become just as celebrated and popular as Doña Aurora. Plants are still rare and expensive, but with modern methods of plant propagation Doña Luz, too, should soon be available to the average gardener. It is a cross between the multiple, white Doña Aurora and the red, hairy *M. erythrophylla*, combining all the good characteristics. Plants are more hairy than Doña Aurora, the five sepals are deep-pink and the flowers larger.

Mussaenda Luz shows a number of variations, as it is to be expected in a series of crosses. At present only one variety is being sold commercially in Manila, but in the experimental garden of the breeding station in Los Baños several variations are being cultivated. The following characteristics are found on the now commercially distributed cultivar, which is being propagated suc-

cessfully in Manila and sold under the name Doña Luz. [According to the *International Code of Nomenclature for Cultivated Plants*, Article 21, the word "Doña" has to be dropped, because it contains a form of address and shows a series of names beginning with the same initial word and therefore is inadmissible. In common usage, however, *Mussaenda*s are named after First Ladies, and these common names are applied all over the Philippines.]

The strain sold as *Mussaenda* Luz, or Doña Luz is a shrub 1.5 to 2.5 m. high with opposite leaves, 6 to 14 cm. long and 4 to 9.5 cm. wide. Petiole is 0.7 to 2 cm. long, blades are elliptic-ovate, acute, base attenuate, veins indented, pubescent, paler on the lower surface, hairs along the veins, reddish. Bract at the base of younger leaves about 1.2 cm. long, with bifid apices split 6 mm., lanceolate, ciliate along the edges, hairs reddish. Inflorescence more spreading than Doña Aurora, and flowers often open before the sepals are completely expanded, earlier than in the related variety Doña Aurora. Inflorescences in terminal cymes, all five sepals into leaf-like blades, deep rose above, whitish underneath with pinkish veins, pubescent, ciliate at the margin. Corolla about 2.5 cm. in diameter, more deep yellow, not orange as in Doña Aurora. Corolla tube is 2 to 2.5 cm. long, 2.5 mm. wide at base, about 3.5 mm. in the upper part. Corolla lobes mostly ridged in the middle, acuminate at tips, lower side of corolla lobes covered with long yellowish hairs, covering the entrance to the flower.

Other strains have rounded bases of leaves and rounded corolla lobes, also the size of the flowers is variable, and its hairiness.

Besides the Doña Luz numerous interesting seedlings are cultivated in Los Baños from the same cross. Some are whitish, but the sepals are narrow and strongly curled, others have large rounded sepals, curled-in at the tip, not along the side. In some seedlings only one sepal is strongly enlarged, and it is deep

red as in *M. erythrophylla*, but the inflorescence is more spreading, and more colored sepals are produced. At present a series of plants are almost ready to bloom. Dr. Umali expects them to have all calyces enlarged as in Doña Aurora, but deep crimson red colored. This would be the most valuable strain, and it is hoped that at least one plant will turn out with five dark red sepals on one flower.

For many years horticulturists were dreaming of a red Doña Aurora, and Dr. Umali tried to succeed in crossing Doña Aurora with *M. erythrophylla*. First the wild species *M. philippica* was crossed with *M. erythrophylla*, which resulted in the first cross of Doña Alicia. Later he crossed Doña Aurora with Doña Trining or *M. erythrophylla*, but what is cultivated now under the name of Doña Luz is the result of various back crosses. No names have been given to the various strains and they are not being cultivated so far, except in the experimental nursery of Los Baños. Some would be very worthwhile to cultivate. Doña Luz is named after Mrs. Luz Magsaysay, wife of the late President Ramon Magsaysay.

Doña Luz is in habit and growth similar to Doña Aurora. Plants appear to grow slightly faster than those of Doña Aurora and the foliage is closer set. From a comparison of about four dozen plants of the California Nursery on Buendia, Manila, plants of Doña Luz are more compact and leaves appear to be at closer distance. Marcottings of Doña Luz about three feet high are less floriferous than those of Doña Aurora of the same age. All Doña Luz in Manila are marcotted, while cuttings are used in Los Baños for propagation but only in the misthouses.

Culture is very similar to that of Doña Aurora, but it appears that Doña Luz blooms also well in half shade, more so than Doña Aurora. Diseases are almost identical with those of the Doña Aurora, but the plants seem to be slightly less susceptible to them than Doña Aurora.





Mussaenda 'Alicia,' a hybrid with one single enlarged calyx lobe, pink

Mussaenda philippica the wild species

Mussaenda erythrophylla with crimson colored single sepal

Mussaenda flava with yellow sepals

Mussaenda 'Luz,' a hybrid with deep rose colored sepals



3. *Mussaenda erythrophylla*

The mother plant of all Philippine hybrids is a shrub from tropical West Africa, which was introduced here from Singapore around 1915. It has never become a very popular shrub in the Philippines and appears seldom robust and vigorous. This shrub is a real showpiece, however, in the more humid atmosphere of the Los Baños nursery, one hour's drive from Manila. The shrub has a tendency to be lanky and somewhat loose-branched, only few flowers are usually formed on the end of the branches. Seldom more than three leafy appendages are developed on one branch end. The flowers are larger than those of the other *Mussaendas* and the center is bright crimson. The indented veins of the more rounded and somewhat re-coiled sepals give it often a quilted appearance. The whole plant is more hairy, particularly the young branches and the whole inflorescence. Stems and leafveins are covered with red hairs, similarly calyx and corolla lobes, particularly the entrance of the corolla is covered with long red hairs.

Leaves are ovate with slightly cordate base, acute apex; they are 8 to 14 cm. long and 6 to 8 cm. wide. The bright-red expanded calyx lobe is deep red above and paler underneath, 6 to 8 cm. long and 6 to 7 cm. wide, ovate or rounded, base slightly cordate. Calyx 12 to 18 mm. long, corolla tube 2.5 cm. long, lobes 2.5 to 3 cm. in diameter, each lobe ridged in the middle.

Doña Trining, as this plant is locally called after Mrs. Trining Roxas, wife of former President Manuel Roxas, has similar cultural requirements as Doña Aurora, but the plants seem to be able to flower and grow well even in half shade.

4. *Mussaenda Alicia* new hybrid (*M. philippica* × *M. erythrophylla*). Type specimen deposited in the Herbarium of the National Museum, Herran, Manila, April 14, 1959, Steiner 1739, lectotypes sent to Kew, Harvard, and Leiden.

The hybrid also was produced by Dioscoro Umali, director of the breeding station, College of Agriculture, Los Baños, 1952.

Hybrida cum uno sepalo roseo, omnes alterae partes similes Mussaenda 'Luz.'

Doña Alicia was the first hybrid produced in the Philippines by Dr. Umali. He crossed the fertile wild *M. philippica* with the hairy *M. erythrophylla*, which has one enlarged, dark-red sepal. The result was a more hairy plant than kahoy-dalaga, or *M. philippica*, with one pink and enlarged sepal, also the flowers are larger and more hairy. The plant has a more lanky appearance than the other crosses, and is generally inferior to Doña Luz.

Shrubs 8 to 10 feet high, leaves ovate, acute, base rounded, about 11 cm. long and 7 cm. wide, calyx lobes about 9 mm. long, hairy, particularly along the edges; reddish hairs along young stems and inflorescence. Enlarged sepal about 5 to 6.5 cm. long, 4 to 5 cm. across, pubescent. Corolla lobes about 1.5 to 2.5 cm. across.

This is again a variable group, some strains have a pointed corolla, others rounded corolla lobes, also the size varies. All the hybrids have in common the single pink enlarged sepal and the lanky growth.

This first hybrid was named after Mrs. Alicia Quirino, wife of the second President of the Philippines, who was killed during the war by the Japanese. The hybrid gained popularity in the first few years, where it was acclaimed at some flower shows. Yet its sprawling habit and open branching, comparatively few flowers and colored sepals never let it become a very popular ornamental plant. It can not be compared with the far superior Doña Aurora. Only here and there a few plants are surviving.

Its treatment and propagation is very similar to that of the Doña Aurora and Doña Luz. It requires only more frequent pruning. After the first pruning it is wise to repeat cutting after the new branches are about ten inches long to insure very bushy growth. Regular watering, fertilizing, and cultivating are very essential. It is propagated by marcotting and inarching. Seeds are rarely formed.

5. *Mussaenda philippica* is a wild species commonly encountered from northern Luzon to Mindanao and Palawan in thickets and secondary forests at low and medium altitudes. It is surprising that the very diverse *M. frondosa* with its several varieties, such as var. *glabra* and var. *rufinerva* distributed from Malaysia to Polynesia, should not be present in the Philippines. The writer has compared several herbarium species of *M. frondosa* outside the Philippines with our *M. philippica*, but could not find any differences, besides the normal variation of a widely distributed species. Even E. D. Merrill was doubtful if the species is really endemic and stated that it may only be a form of *M. frondosa*, and conspecific with it. Unfortunately, the original description of *M. philippica* is not available here at present and the writer is therefore not in a position to revise the identification for the time being. *M. philippica* is a spreading tall shrub or small tree with slender branches and membranaceous leaves, green above and paler underneath, minutely pubescent. The leaves are oblong-ovate, base rounded or obtuse, petiole about 1 to 2 cm. long and 5 to 8 cm. wide. Bracts are 4 mm. long, simple, lanceolate. Flowers in terminal pubescent cymes. Calyx is 7 mm. long with four of the teeth as long as the tube and one enlarged into a white, leaf-like ovate appendage, with acute tip, 4 to 8 cm. long, 2.5 to 3.5 cm. wide, petiole about 1.5 cm. long. The corolla is yellow, pubescent, corolla tube about 2 cm. long and the spreading corolla lobes about 1.5 cm. in diameter, acuminate, yellow. Fruits are ovate, about 1.5 cm. long with grayish lenticels.

Kahoy-dalaga, as this shrub is locally called, is hardly worth cultivating and can not compare with any of the other cultivated species or hybrids.

6. *Mussaenda flava* (Synonym *Mussaenda luteola* (nomen illegal) according to *Beknopte Flora van Java*, R. C. Bakhuizen v. d. Brink, Jr. 1956.)

It is a smaller and more compact shrub about 1.5 m. tall. Horticulturists like this plant; it is neat and floriferous, like all the other *Mussaendas* blooming more than nine months in profusion, mainly from March to December. The enlarged sepals are lemon yellow and the flowers bright orange. Unlike the other *Mussaendas* it is not delicate, less attacked by diseases than the others, and therefore does not require constant care.

Leaves are thin, elliptic, 5 to 12 cm. long, 4 to 5 cm. wide, lanceolate, with attenuate base and acuminate tip, glabrous with the exception of the shortly pubescent seven veins. Branches slender, young portions shortly pubescent. Flowers cymosely clustered, calyx hairy, normal calyx lobes 3 to 5 mm. long, the elongated sepal 3 to 5 cm. long, 2.5 to 3.5 cm. wide, elliptic, acute tip, lower side shortly pubescent, also along the veins, petiole about 1 cm. long. Corolla slenderly tubular, 3 cm. long, 1 to 2 mm. wide, corolla lobes yellow with orange center, 1.8 to 2.2 cm. in diameter, lobes rounded, each lobe with a triangular design. Fruits apparently not produced here, said to be 5-valved capsules. It is native to tropical Africa.

The other seventeen species of *Mussaenda* in the Philippines are somewhat similar to *M. philippica*, some have a larger single sepal, such as *M. philippinensis*; *M. multibracteata* has a very spreading inflorescence, which is densely hirsute, calyx is 2 cm. long, and the foliaceous calyx lobe is broadly ovate, broader than the other species. *M. anisophylla* is growing in middle and high altitudes, characterized by the unequal size of the opposite leaves; the whole plant is hairy. For hybridization purposes some highland *Mussaenda* might help in the hybridization to achieve plants for the subtropical zone or higher altitude.

Of all the *Mussaendas*, Doña Aurora and Doña Luz are the most magnificent new additions to tropical gardens and will soon become part of our pantropical ornamental plant world.

Blackspot and Powdery Mildew of Roses

JOHN G. PALMER and T. J. HENNEBERRY*

Among the fungus diseases that afflict roses, blackspot and powdery mildew are the most serious and widespread. Blackspot defaces foliage and causes early and commonly severe defoliation. Flower production is reduced and an increasing loss of plant vigor occurs if defoliation remains unchecked. Mildew deforms and discolors developing shoots, leaves, and buds and discolors the mature structures. Mildewed leaves of some varieties fall early.

The fungus *Diplocarpon rosae* Wolf causes blackspot and another fungus, *Sphaerotheca pannosa* (Wallr.) Lev., causes rose mildew. These two species of fungi require very different environmental conditions for the germination of their spores, infection, and the production of disease symptoms. These differences are important in determining when sprays or dusts should be applied to control them. A brief review of the conditions favorable for the development of blackspot and mildew may lead to a better understanding of the fundamental requirements for control of these diseases. Studies are constantly being made of these fungi and their controls.

The two-celled spores of the blackspot fungus are spread over short distances in drops of water, by wind, and on passing animals. The spores must be wetted before they will germinate. Water droplets accrue on rose plants during rainfall, by condensation, and in watering. Spores touched by water may germinate if evaporation of the water is not too rapid or the temperature too high or too low. They germinate best at 79 degrees Fahrenheit, and not at all as low as 55, or above 91. Because the spores are heavy and sink rapidly in water, infection occurs mainly through the upper epidermis of leaflets, rachis, petiole, or stipule of the expanding leaf. Infection of grow-

ing stems probably takes place in the axils of buds or leaves along the lower edge of droplets of water or where the mucilaginous spores have stuck. Petals and sepals may also be invaded.

The spores of the powdery mildew fungus germinate best when the relative humidity ranges between 95 and 99 per cent. There is no germination below 75 per cent relative humidity, and germination is poor between 75 and 95 per cent, at 100 per cent, and in standing water. The range of temperatures which are optimum for both germination of the spores and subsequent infection is 65° through 75 degrees. The light, short-lived, wind-disseminated spores infect through all surfaces of aerial portions of the plant.

In almost every instance a fungicide prevents a potential infection rather than cures an established one, and for absolute protection complete coverage of all aerial shoots at all times would be necessary. This can not be achieved. Good control of powdery mildew is mechanically more difficult than good control of blackspot. Since spores of the powdery mildew fungus germinate at high relative humidities only, there are no droplets of water to collect a spottily distributed protectant for redistribution to spores alighting between spots of the fungicide. Young, infection-prone, unprotected canes, leaves, and buds develop on most roses throughout the frost-free season. Therefore, not only must a successful spray program include the dusts or sprays for control of each major pest and fungus pathogen, but sprays or dusts must be regularly and consistently applied throughout the growing season. During conditions favorable for blackspot one application per week should suffice unless frequent rainfalls or waterings remove the protectant. Sprays or dusts to prevent powdery mildew must be applied more often and with more attention to coverage of undersides during periods most favorable

*Pathologist, Crops Research Division, and Entomologist, Entomology Research Division, respectively, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland.

for infections. Applications may not be needed at all during prolonged periods that are unfavorable for development of powdery mildew (temperature of 90 degrees or higher and/or a relative humidity at or below 75 per cent).

To reduce the number and expense of sprays, the ingredients that will control most of the pests and diseases may be mixed, and a multi-purpose spray or dust applied. The components must be checked in advance, however to be sure that none of them react with or degenerate in the presence of any other active ingredient or its diluent (wetttable powder or dust). If possible the individual material or the compounded materials should be checked for effectiveness and for injury to the roses under local conditions. A mixture of one selection from each of items A, B, and C, in Table 1, will control the sucking and chewing insect and mite pests of roses. Each of these pesticides is compatible with each of the fungicides in item D.

Our experimental data indicate that phaltan and maneb control blackspot best and that in addition phaltan is the most effective preventive for powdery mildew. Of the reports from many areas in the United States where formulations containing phaltan have been used by amateur and commercial growers, only one has attributed injury to roses by phaltan. Current formulations of phaltan leave a white residue which is less conspicuous when a spreader such as Triton X-100 is used. In addition to those fungicides listed, zineb, ferbam, or captan at two pounds per hundred gallons will also control blackspot. It is not advisable to add phaltan to a mixture containing another fungicide for control of powdery mildew, since phaltan will react with ferbam and carriers of other fungicides may reduce its efficiency. If powdery mildew develops, a separate, thorough spraying of all affected organs of the plant with actidione PM according to the instructions on the package will eradicate evidences of the fungus in thirty-six to forty-eight hours. In many varieties and species the red color in young tissues will be accentuated, and the young canes and leaves will harden when this chemical is used. If the infection is severe, foliar reddening and yellowing will begin to develop approxi-

mately three days after spraying with actidione PM, and in some varieties a strong wind will defoliate sprayed plants as severely as unsprayed ones. When plants of a blackspot-resistant, powdery mildew-susceptible species were regularly sprayed with either phaltan or actidione PM, total growth and color of the plants was best with actidione PM after six months of treatment. An evident increase in number of breaks from buds occurred when the spray contained actidione PM. There was no apparent retardation of growth from this larger number of breaks which would account for the increased total growth after six months. Plants sprayed with phaltan without a spreader or sticker were very dark green and smaller but had lost fewer leaves. Control of powdery mildew was excellent with both actidione PM and phaltan. A mixture of these fungicides sprayed on plants discolored leaves, increased breaks from buds, and stunted growth.

Control of a splash-disseminated organism like blackspot should be improved by removal and burning of fallen leaves and canes during the growing season and after first frost, by pruning just before growth in the spring to remove dead and infected canes which should be burned, and by application of a fungicide to the canes at that time. These steps should decrease the initial amount of the pathogen in spring and retard the buildup during summer of spore-bearing sources.

In a recent study H. R. Rosen at the University of Arkansas reported that two heavy applications of captan in a season to the soil surface controlled blackspot through systemic action. A substantial part of this control probably occurred through the inclusion of fungicide as well as spores in splash drops from the soil. Experiments at Beltsville during 1957 and 1958, in which captan and phaltan were applied to the surface of the soil and then were covered with a heavy mulch, did not reduce the incidence of blackspot though the plants retained more foliage during and were larger at the end of the season. Dosages from one to five pounds per twenty-five square feet applied to the surface of the

Table 1. Recommendations for a composite spray for rose insects and diseases, 1960. Choose one chemical from each lettered group and mix the 4 selections in water.

| | Active ingredient | Formulation available ¹ | Dosage | | Per gallon Teaspoons |
|---|-------------------|------------------------------------|----------------|---------------|----------------------|
| | | | Per 100 Pounds | gallons Pints | |
| A | Lindane | 25 WP | 1 | — | 3 |
| | | 25 WP | — | 1 | 1 |
| B | DDT | 50 WP | 2 | — | 5 |
| | | 25 EC | — | 2 | 2 |
| C | Aramite | 15 WP | 2 | — | 4 |
| | | 25 WP | 2 | — | 6 |
| | Malathion | 57 EC | — | 2 | 2 |
| | | 25 WP | 1 | — | 3 |
| | | 18.5 EC | — | 1 | 1 |
| D | Phaltan | 75 WP | 1½ | — | 4½ |
| | | 70 WP | 2 | — | 4½ |

¹ WP = wettable powder, EC = emulsifiable concentrate.

soil and lightly raked in did not noticeably affect subsequent growth of the limited number of hybrid tea varieties tested. Anthracnose of roses is not controlled by soil applications of captan, according to Rosen. Powdery mildew is not controlled systemically by soil applications of captan.

Reports of applications of materials that sterilize soil or reduce the number of organisms in the soil are increasing, and frequently the only criterion for judging the soil free of such materials is an absence of injury to selective plants which are grown in the treated soil. Captan and phaltan or deterioration fractions of these chemicals were residual in the soil up to eighteen months, were absorbed by plant roots, and ultimately were assayed biologically in the leaves. Compounds containing mercury, arsenic, or lead are obviously dangerous for soil treatments. For all such materials, elaborate, time-consuming, and expensive programs must be evolved to detect and assay the compounds or their derivatives that might be detrimental if contained in plants or animals consumed for food. Captan and phaltan, being complete organics, probably decompose innocuously in the soil and in the green tissues of plants. The sciences of the development, use, and the social responsibilities for systemic pesticides are in their infancies.

Summary

The need for a spray program to control blackspot and powdery mildew of roses will depend upon climatic factors.

The duration of a program will depend upon how much risk the grower wishes to take in judging when the diseases will appear. In general a different chemical is required for the control of each disease and pest. The number of pests and diseases that are serious in each locality will determine how many ingredients will be needed. Such protectant fungicides and pesticides in the form of dusts or sprays may be applied separately, or several may be combined for a multi-purpose application. In the latter case each chemical and its diluent must have been previously determined to be compatible with each of the other ingredients. Applications to shoots must be regular and thorough when protection is desired and thorough as the need arises when eradication is sought. Selection of one ingredient from each of items A, B, C, and D in Table 1 will provide compatible materials for control of blackspot as well as the insect and mite pests of roses. For powdery mildew the protectant, phaltan, may be combined with the necessary pesticides, or the eradicator, actidione PM, may be used alone. Clean culture and careful pruning should reduce the severity of blackspot in an established planting. Heavy applications of captan and phaltan to the soil have reduced infections of blackspot. Neither powdery mildew nor anthracnose are controlled by soil applications of captan. The sciences of the development of, use of, and social responsibilities for systemic pesticides are in infancy.

A Book or Two

Your Lawn. How to make it and keep it.

R. Milton Carleton. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1959. 165 pages. Illustrated. \$3.95. (Library). AHS Members' Price \$3.36.

The author's foreward "New Day for Lawns" opens with a statement impressive enough of the utility of this book to all who have lawns or want to improve them to quote its first short paragraph: "Ten years ago much of the lawn culture material presented here could not have been put down. The research on which it is based was hardly more than a gleam in the scientist's eye. But now at last we have basic facts that will enable us to discuss grass not as an element in the diet of cattle, but grass as the homeowner grows it—in a mown turf."

To this reviewer it appears that the author has well stated the history and progress of this revolutionary decade in creating or renovating lawns in the widely differing soil and climatic conditions and the suitable kinds of grasses in various parts of this country. To be sure, it is not the first or only handbook that meets the informational needs of lawnmakers, whether large or small scale operators, and it lacks the copious illustrations that some have featured so attractively, but it seems to surpass the best rival discourses on lawns in extent and details. This includes not only the general discussion of soil preparation, choice of seed, and how and when to apply it—all basic information on building a new lawn—but it helpfully covers methods of renovating lawns, overcoming difficulties resulting from previous errors, and also the newest and most effective means for combatting lawn enemies, whether insect pests, fungus diseases, or troublesome weeds.

Doubtless exception will erupt from other lawn specialists to some of the evidence and conclusions here presented, especially where both depend on scientific observations and experiments, but even scientists seldom agree on all details. Carleton's broad experience with lawns and his practical recommendations on how best to succeed in their construction and maintenance will have few equals. His way of telling the whole story to amateur lawnmakers will not be surpassed.

F. A. W.

Daffodils, Outdoors and In.

Carey E. Quinn. Hearthside Press, Inc., 118 East Twenty-eighth Street, New York 16, New York. 1959. 204 pages. Illustrated. \$4.50 (Library). AHS Members' Price \$3.83.

New gardening books by specialists are always gratifying to see, especially about a flower as popular as the daffodil. The name daffodil as used by the author covers all species and hybrids of the genus *Narcissus*. The book though is mostly about the author's own adventures in cultivating daffodils over many years in his garden in Bethesda, Maryland. This is a how-to-do-it book about daffodil culture and kinds for American gardens, especially applicable in eastern and southern United States.

In 202 pages, author Quinn attempts to cover the field in three parts. Part 1 concerns daffodils outdoors—culture, how used in garden design, naturalizing and health. Part 2 covers daffodils indoors—in arrangements, how to dry, forcing and cool culture. Part 3 covers daffodils for the specialist—shows, proved cultivars (called varieties by the author) regional performance, and breeding. A useful appendix covers subjects of special interest to amateur daffodil growers, such as classification, public daffodil gardens, daffodil retailers, typical show programs, species and modern hybrids. Two aspects of special appeal are of the rather extensive lists of modern cultivars recommended for growing in various parts of this country and the information about daffodil diseases.

The book is illustrated with 19 excellent black and white photographs and several pages of neat line drawings. Certainly matters about culture have been well covered in this volume. The present daffodil book is the first of its kind to appear in this country in over 40 years and will no doubt be much sought by a host of daffodil admirers.

On the debit side, information about wild species and any historical approach to his subject is given small coverage. Matters about daffodil names could have been much improved. In writing about cultivated plants we would expect the author to consult the International Code of Nomenclature for Cultivated Plants. This important legal document of plantmen was ignored in the present volume. The International Rules have been brought together and approved by an international body of plantmen

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

to provide for a greater correctness and stability in plant names. This code is all too frequently overlooked by writers of popular horticultural books. Indeed, this is a pity, since consultation from a local botanist on technical matters would iron out such details and win wider support of the author's honest efforts on the part of his avid readers.

FREDERICK G. MEYER

The Gardener's World

Joseph Wood Krutch, Editor. G. P. Putnam's Sons, 210 Madison Avenue, New York 16, New York. 1959. 476 pages. Illustrated. \$8.95. (Library).

A collection of writings on plants to be read at your leisure, but in the process the reader will be learning. Selections have been made by the editor from the writings of ancient Greek and Roman authors to those of modern day. These include many who are probably better known in some other field of writing or endeavor. They are philosophers, essayists, writers, political scientists, plant explorers, travelers, plant scientists and those who have liked and enjoyed plants.

These selections have been grouped together into several sections of related topics, such as: The Pleasures of Gardening, Fashions in Gardens, The Linnaean Age, Exploring for Plants, Gardens without Gardeners, and Some Useful Plants. Perhaps your favorite author or writer has not been included but you will find many selections of great plant interest. It is the kind of book to read for enjoyment and should appeal to all who have a broad interest in plants.

C. B. L.

Sedum of the Trans-Mexican Volcanic Belt: An Exposition of Taxonomic Methods.

Robert T. Clausen. Comstock Publishing Associates, (A division of Cornell University Press), 124 Roberts Place, Ithaca, New York. 1959. 392 pages. Illustrated. \$7.75. (Library).

It is abundantly clear to the reviewer that a prodigious amount of work is behind the writing of this book. Besides three trips to Mexico during which the author studied the plants in the field, most of the species have been grown and studied intensively under cultivation and a great deal of library and herbarium work has been done in preparation of the manuscript.

Dr. Clausen is a very able taxonomist and has written a book mainly for taxonomists and for persons whose interest is the study of evolution. Though he treats the 28 native species of *Sedum* with rare thoroughness and the 7 additional cultivated species very adequately, there are over 300 species in the genus so that a very small proportion of them falls within the scope of this book. It is true that some of

the species studied are more or less extensively cultivated and that a high proportion of the rest is potentially valuable to horticulture. Most of them could only be grown indoors or in warmer regions since only one species survived a winter at Ithaca, New York, and 14 other species were found able to withstand light frost.

Excellent line drawings of species were made by Miss Elfriede Abbee and one by Miss Florence Mekeel.

Although the book will be of very limited value to horticulture, it does contribute much scientific knowledge concerning relationship, evolution, distribution, and speciation of plants.

D. G. HUTTLESTON

America's Garden Book.

James and Louise Bush-Brown. Charles Scribner's Sons, 597 Fifth Avenue, New York 17, New York. New Revised Edition, 1958. 752 pages. Illustrated. \$7.95. (Library).

Since 1939 *America's Garden Book* has served as one of the most helpful general-purpose gardening references. Joint written by a prominent landscape architect and by the Director Emeritus of the Pennsylvania School of Horticulture, it was provided original and sound advice on all major facets of the use of plants in the home garden as well as experienced and helpfully useful information on the culture and propagation of plants.

The present book is a completely revised edition with re-arranged and new subject matter presented in a modern manner on seven by nine inch pages. Enlarged photographs and line drawings are clear and attractive and include numerous additions to bring design features abreast of present-day trends.

There are fifteen chapters on the design and construction of special gardens and garden features, a similar number on the kinds of plants (including fruits and vegetables) for use in these gardens and another twelve devoted to the varied problems of soils, pests, and weed control, to the maintenance of coldframes and greenhouses. The inclusion of side information on hardiness and frost-date maps, directories of plant societies, notable gardens, etc., add to the further usefulness of this well-rounded garden reference. There is a good index.

H.T.S.

Knowing Your Trees.

G. H. Collingwood and Warren D. Brush. American Forestry Association, 919 Seventeenth Street, Northwest, Washington 6, D. C. [1955 Edition] Sixteenth Printing. 328 pages. Illustrated. \$6.00. (Library).

Conifers are described in the first 141 pages and broad-leaves in the remaining 187. Characteristics, importance and uses of the wood of 162 selected species of trees are discussed.

The excellent illustrations [more than 850] of mature trees, their leaves, bark, buds, flowers,

fruits, cones, and maps of distribution of each species are a distinct contribution to the usefulness of the book.

Trees from all parts of the United States are included. One could question a few of the selections but after all not all species could be selected. There is a short selected bibliography and an alphabetical index by common names. Species are not arranged alphabetically in the text.

A. A.

Chinese Flower Arrangement.

H. L. Li. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey, 1959. 125 pages. Illustrated. \$6.50. (Library). AHS Members' Price \$5.53.

This short book, very conversational in style, is charmingly written. It relates much of the ancient custom influencing Chinese flower arrangement and ancient Chinese culture so related. There are, included in Appendix I, quotations from *A Treatise of Vase Flowers* by Chang Ch'ien-tê, a book written in 1595. Also included is a list of "grading of flowers" many of which are native to the warmer sections of China, therefore not practical or available to the cooler sections of the United States. Many of the flowers so listed are common to our own gardens.

So called rules or guides for Chinese arrangements are covered in a short chapter, entitled, "Hsieh Ho's Six Canons" and upon close study, these rules, although ancient, are embodied in our modern day arrangements that feature good design. "Design and Composition" is covered in another short chapter which would seem to call for more elaborate description, perhaps setting forth how the arranger of today could reproduce a good Chinese arrangement. Several line drawings, showing how to trim branches, are included here. "Symbolism in Flowers" is a subject given some attention and is interestingly set forth.

"Flowers and Plants for Arrangements" and "Plants for Table Decoration" describe the authentic Chinese materials to use and this part of the book leans heavily toward horticultural description rather than the actual arrangement of the materials. "Vases, Pots and Trays" are described and pictured; some good photographs of rare museum pieces and some line drawings of typical Chinese containers are shown.

The photographs of arrangements are mainly from old prints and woodcuts depicting the 17th and 18th centuries. Included are some eighteen small illustrations in black and white of arrangements for today's arranger (materials and containers shown would be available to them) to note carefully including several table plants or low containers planted with landscapes utilizing dwarfed pines, junipers, maples, with the addition of stones, mosses, and in some cases small figures to complete the design.

The type and general format appear to be identical with Hedera House's first printing of this work in 1956, but the new book does add marginal subject headings, which are very helpful, and, there are quite a few new plates added.

VICTORIA K. ANGEL

Anyone Can Grow Roses.

Cynthia Wescott. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey, 1960. Third Edition. 208 pages. Illustrated. \$3.75. (Library). AHS Members' Price \$3.19.

In this thoroughly revised third edition, the author adds much new material while retaining the basic principles of rose culture, the unique charts for the identification of rose pests, and the same delightful and inspiring enthusiasm.

A list of the public gardens featuring roses has been added and a new chapter on propagating roses. Information on up-to-date insecticides, sprays and fertilizers, changes in classification are discussed and more details are given on preparing roses for exhibition. A new list of 288 varieties and species includes many new roses, with some old favorites omitted because they are no longer available. For these 288 listings, each is given the American Rose Society rating, color, fragrance, height, habit, and helpful comments.

Fuchsias for all purposes.

Thomas Thorne, W. H. & L. Collingridge, London, England. Distributed by Transatlantic Arts, Inc., Hollywood By The Sea, Florida. 1959. 175 pages. Illustrated. \$7.50.

An authoritative and comprehensive book on the fuchsias has been needed in the United States for quite some time. Mr. Thorne now generously fills this need. He was a born fuchsia specialist—his father and his father were fuchsia enthusiast—he was taught how to grow the plants, pricking out seedlings and taking cuttings at the age of six. His tuition was very thorough and he has been actively concerned with fuchsias ever since.

In the last nineteen years, Mr. Thorne has been working on fuchsia species, getting them into some sort of order and providing fair descriptions of them. In compiling the check list of fuchsias, an important feature of the book, he had to study many old catalogues and books and his work, in this connection, has led to the re-introduction of 806 (!) old varieties believed to have been lost to cultivation.

Mr. Thorne treats his subject matter in two main divisions: the first deals with cultivation; the second is an alphabetical description of species, hybrids, and varieties. In the first instance, he writes very interestingly on the origin of the fuchsia, its adaptability to various landscape and pot conditions, cultivation, propagation, hybridization, training, pests, diseases, and he recommends the numerous varieties that would be suitable for different situations.

The alphabetical list of species, hybrids, and varieties, is the only up-to-date and fully comprehensive list in existence. For each plant, it gives a rather full description of the date of introduction, the breeder, or introducer, or country of origin, the type of flowers, their color, flowering time, growth habit, hardiness, etc.

There is one color plate, 33 black and white halftones, and 5 line drawings.

The Best of Redouté's Roses.

Selected and introduced by Eva Mannering. The Viking Press, Inc., 625 Madison Avenue, New York 22, New York, 1960. 74 pages, (16 text and 29 plates). \$10.00.

The Empress Joséphine was, indeed, the most controversial of women! She arrived in France from Martinique with only a few muslin dresses and childish trinkets, spent many unhappy years in a convenience marriage; then with her inherited possessions and Napoleon's help, she indulged in every extravagant whim in an obsession to get even with the world.

Her real home was the Château of Malmaison. There, under the guidance of architects Percier and Fontaine, the interior was practically rebuilt. The gardens were next. Fortunes were spent in fashionable designs, the best of gardeners, and the choicest of plant materials. In later years her thoughts centered around the Rose and here she excelled herself, making the most glorious rose garden then known by assembling for the first time the 250 varieties known in her day.

Joséphine's achievement was unique for her day—a triumph of perseverance. She had given France a new show place and with the millions poured into Malmaison, she had reached self-satisfaction. Yet, not really. She thought of posterity, thence Pierre-Joseph Redouté.

Redouté (1759-1840) was born in Luxemborg and came to Paris at the age of 23 to complete his studies in the art of flower painting at the Jardin du Roi. He learned a new method of stipple engraving from Bartolozzi, its originator, on a visit to London in 1788. Perfecting this method, to make it suitable for the particular needs of the flower print, he reached an excellence yet unsurpassed.

His *Les Roses*, published in magnificent folios from 1817 to 1824 set the seal on his fame as the most accomplished as well as the most prolific flower painter of his time, if not of all time.

In the present volume, Miss Mannering writes of Joséphine's struggles and triumphs and of Redouté's commission as her official painter. Miss Mannering selects twenty-nine plates from the original folios as her choice of his "best" rose paintings. This selection is good. The engraver-printer (K. G. Lohse, Frankfurt am Main, Germany) has done a fine job.

There are four pages of introductory matter; 10 pages of descriptions of the roses selected (in French)—three to the page, with a matching pen and ink sketch of the flower used in the plates then, the 29 colored plates, complete with the framed depression made by the engravings. The volume measures a generous twelve by sixteen inches.

JOHN MARSHALL

Woody-Plant Seed Manual.

U. S. Forest Service, U. S. Department of Agriculture. (Order direct from: U. S. Government Printing Office, Washington 25, D. C.) Miscellaneous Publication No. 654. 1948. 416 pages. Illustrated. \$4.00. (Library).

This excellent reference book, of the Department of Agriculture, first published in 1948, is still available through a recent reprinting. No other book contains in so concise and understandable a form so much information about collecting, extracting, cleaning, storing, treating, and testing seed of woody plants. Flower development and pollination are discussed. Causes of dormancy are explained and methods of breaking dormancy suggested. The importance of provenance and seed certification are discussed.

Part I (pages 1 through 52) is devoted to general considerations. In Part II (pages 53 through 377) specific information is given about seed of 140 genera, many with several species. There are also lists of plants useful for wood production, erosion control, shelter belts, wildlife, and ornamental planting. A glossary and comprehensive index are included. The 281 illustrations [showing the exterior and longitudinal section of seeds and others the views of seedlings from a day or so out of the ground to about three months later] increase the book's value. Data are summarized in 225 Tables.

The professional nurseryman will appreciate the authenticity, and the exhaustive treatment of the subject. The amateur will find the book a treasure chest of information on what he can do with and expect from seed of woody plants.

A. A.

Design with Flowers . . . Unlimited.

Patricia Kroh. Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York, 1959. 141 pages. Illustrated. \$4.95. (Library).

"How to come upon *variation* of design with flowers and plants is the first consideration for both the novice and expert artist with flowers" is the challenging theme developed by the author. Persistence, energy, orderly thought, study, practice, and, above all, common sense, provide the ability to design. She shows clearly the close relationship among all the arts—music, painting, landscape design, interior decorating and flower design—the use of the principles and elements of design: harmony, unity, line, pattern, rhythm, texture, form, and color. The key to planning variety in design depends upon how you can handle your *knowledge* of these elements.

A good design made of plant material and flowers must have the following qualifications: balance, proportion, scale, contrast, dominance, and repetition—all essential to design perfection, and all can be achieved with the proper and extremely important use of color.

Each illustrated design (and there are 91; 21 being in color) is shown with its own line sketch; the majority of them, happily, are for the home. There are chapters on containers, their form, material, texture, color; equipment and mechanics necessary for good design structure; plant conditioning; planning, arranging and transporting exhibits for shows wherein simplicity and *distinction* are predominant characteristics of these competitive arrangements; and selection of garden and roadside material

for home arrangements, making effective use of bloom, berry and foliage. At the end is a list of flowers and some shrubs grouped for color and season. The reviewer recommends Miss Kroh's work as an interesting textbook, either for self-study or for a teacher's use.

The author, who studied *ikebana* in four of the leading schools in Tokyo, devotes one chapter to "Design With Flowers—East and West," emphasizing the necessarily different approaches to this art.

"Learning the principles of design simply means knowing the standards by which your art is judged, so that you may be the better judge of it yourself."

M. C. LANCASTER

Plant Growth Substances.

L. J. Audus. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, New York. 1959. Second Revised and Enlarged Edition. 554 pages. Illustrated. \$10.00. (Library). AHS Members' Price \$8.50.

Since the dawn of agriculture one of man's principal aims has been the promotion and control of plant growth. This book presents the physiological background of the use of plant growth-regulating substances in agriculture and horticulture. For the sake of the layman and nonspecialist the language has been kept as nontechnical as possible. It surveys all the varied uses to which these substances have been put in recent years—for example, the control of weeds by selective weed-killers, the regulation of fruitset, the control of pre-harvest drop of fruits, the promotion of rooting in cuttings and the regulation of dormancy and of flowering.

The Second Revised and Enlarged Edition has been added in the series of Plant Science Monographs (Published: *Alfalfa, Coconuts, Eucalyptus, Hops, Mango, Peanuts, Pineapple, Tomatoes, Wheat* and some 12 other titles) being edited by Nicholas Polunin and published by Leonard Hill (Books), Limited, London, England.

Camellias in the Huntington Gardens.

Observations on Their Culture and Behavior and Descriptions of Cultivars.

William Hertrich. The Huntington Library, San Marino, California. 1959. Volume III. 366 pages. Illustrated. \$10.00. (Library).

The third and final volume of *Camellias in the Huntington Gardens* describes and illustrates over two hundred additional *Camellia japonica* cultivars. Many of these are recent introductions by the camellia hybridizers. Presented for the first time in this volume are sixty-three plates and descriptions of *Camellia sasanqua* and its allied species *hiemalis* and *vernalis*, newest rivals to the *japonica* in popularity.

In view of the increasing demand for the versatile *sasanqua*, only those cultivars which have proved themselves adaptable to a variety of

landscape techniques are included. Supplementing this section is a short history of *Camellia sasanqua* and allied species, tracing their introduction from the Orient into England and America, and to the Huntington Botanical Gardens.

In this volume, the source of the plants is included, giving the known origins of the cultivars. This information, included by popular demand, is most helpful to the historian as well as to the camellia fancier wishing to purchase newly introduced varieties, or perhaps an old variety lost by most nurseries through lack of a demand from their public.

As was done in the companion books, the present one is edited in four-page series—the first left hand page gives the descriptive data, observations, and behavior for three cultivars; then the following three pages have full page illustrations (black and white) of these three cultivars.

The production is elegantly executed and the text is written with the same high standards established by the author in the other volumes.

Using Wayside Plants.

Nelson Coon. Hearthsides Press, Inc., 118 East Twenty-eighth Street, New York 16, New York. 1960. Third Revised Edition. 254 pages. Illustrated. \$3.95. (Library). AHS Members' Price \$3.36.

AHS members may refer to the January 1958 issue of this magazine for a full review of the first edition of this volume "privately" published by the author in 1957. He writes on how to identify and use wild plants of roadside and woodland, for food, medicine, and nature craft.

It is pleasing to know that the demand has caused the commercial publisher to purchase the type and engravings and to release this present edition. Very minor changes were made.

Perennials in the Garden for Lasting Beauty.

Charles H. Potter. Criterion Books, 257 Fourth Avenue, New York 10, New York. 1959. 271 pages. Illustrated (40 in color). \$6.95. (Library).

While it is true that Perennials have been the subject of a great many books, this one is up-to-date in methodology and approach. There are two sections as is the usual division of such a book, the first dealing with Growth and Care of Perennials and the second, A Complete Guide to Raising Perennials. The latter section, which is the "heart" of the book, deals with specific perennial plants. These are listed alphabetically by scientific name and for each the discussion covers Popular Species, How to Use Them, Cultural Tips, Propagation Methods, and Special Diseases and Pests to Guard Against.

The whole book is easy reading, conservative in recommendations, and is illustrated with charts, diagrams, and 40 colored plates of individual perennials. If you require a book on Perennials, this one will surely fit the need. The Society member will do well to consider the purchase of this text.

The Gardeners' Pocketbook



U.S.D.A.

Magnolia wilsoni

Magnolia wilsoni is one of our more beautiful reminders of the journeys of Ernest H. Wilson in the Orient. This magnolia was first seen by him during a trip to western Szechuan, China, in 1904. Four years later Wilson introduced it into cultivation. He described it as a straggly deciduous tree growing to twenty-five feet high in the wild. This magnolia is rather common in moist woods and thickets at altitudes of six to seven thousand feet. The flowers are borne in moderate profusion and are of such striking beauty that one wonders why the trees are found so infrequently in our gardens. Only nine nurseries are listed as offering this species in the *Plant Buyer's Guide*, 1958.

Magnolia wilsoni is characterized by branchlets which turn dark brown, almost purple, at maturity and is certainly the darkest of all magnolias. The flowers are white, pendent, and fragrant. The peak of flowering [in the Washington, D. C., area] is reached in late May or early June, but scattering flowers are produced for some time after the main blooming period has passed. The mature flowers are about four inches across,

with obovate petals and a cluster of raspberry-red stamens surrounding the green carpels. The leaves are broadly elliptic and more or less pointed at the tip.

The writer has seen two plants growing close together in Silver Spring, Maryland; one is in a semi-shaded, moist location, has made the best growth, and is perhaps twice as large as the one in a more sunny-location.

Propagation is by seed and grafting. Occasionally, a cutting will root, but with limited chances for survival. *M. wilsoni* probably can be layered, but like other deciduous Asiatic magnolias, it is difficult to propagate vegetatively. A further word of caution: like all Asiatic magnolias, it must be carefully transplanted, avoiding damage to the fleshy roots near the surface of the soil.

It may be that with increasing interest of gardeners in rare species, the future of *M. wilsoni* is promising. For the present, however, this species remains in horticultural obscurity—only another entity in the long list of plants collected by Ernest H. Wilson in his wanderings through the high mountain forests of China. JOHN L. CREECH, *Agricultural Research Service, U.S. Department of Agriculture, Crops Research Division, Beltsville, Maryland.*

Pumice Rock

An extremely light grey "rock" has come into quite wide use in California during the past few years. It has been called glass rock, sponge rock, or "feather rock" but probably pumice rock would be the most accurate name. This is a true pumice quarried in Mono County in east central California and is retailed at many nurseries and garden supply centers. The rock is made up of a fine froth of grey glass-like material and because of the sharp edges of the broken "bubbles" it must be handled very carefully. It varies somewhat in weight and texture due to the difference in the size and amounts of the bubbles, but usually the weight is around 15-18 lbs. for a cubic foot block.

One interesting fact about this material is the ease with which it can be shaped and excavated for planting. Almost any piece of iron can be used to bore or chip holes in this rock and when a suitably shaped hole is made, no arrangement for drainage is needed. Water immediately drains through and over-watering is no problem.

This rock is ideal for succulent plants of almost any type. Sempervivums do beautifully and the many offsets root into the surface to form a solid mat. Drought resistant plants and alpinas that need "sharp drainage" also thrive in many cases. Lewisias grow beautifully when planted in pockets on a chunk of this rock. A feeding program is simple as any soluble fertilizer placed on the upper surface dissolves into the rock on watering.

Oddly enough, some trees grow well in this rock. A Japanese maple planted in a pocket of a piece of rock 10-12 inches in diameter has grown happily for two or three years and is 18-20 inches high. It confines its roots to the interior of the rock and shows no tendency to send its roots into the ground. Dwarf junipers and the small conifers also grow happily in this rock. Haberlias and ramondias seem very content in this rock, growing and flowering to perfection. The excellent drainage precludes over-watering and again feeding can be done regularly. A light potting mixture is used in planting these.

Tender succulents do equally well in this material and in a rather small piece a number of plants can be grown. The lightness of the rock makes it easy to

shift to different quarters in summer and winter. Rapid drainage makes the likelihood of damage from heavy rain or watering not so great as with ordinary methods.—FREDERICK W. COE, *San Anselmo, California*.

Rutherford Hybrid Azaleas

The Rutherford Hybrid azaleas are reputed to be tender and were originated for greenhouse use. Nevertheless they will grow well out of doors in climates which are subject to several degrees of frost. Here in the Sacramento Valley of California they have taken down to 25 degrees Fahrenheit without injury.

These Rutherford hybrids are an excellent group of evergreen azaleas, mostly of medium height, although a few will reach 5 or 6 feet. L. J. Bobbink, a fairly rapid grower, has reached 6 feet with us after 20 years of growing. It is a comparatively late bloomer with hose-in-hose, frilled, lilac blossoms which shade lighter toward the center.

The flowers of the Rutherfords are of all types, single, semi-double, and double with many hose-in-hose. Some are very fragrant although the majority are almost scentless. Colors are in the same range as the Kurumes, from white to crimson. Although the blossom sizes are not as large as those of the Belgian hybrids they are considerably larger than most of the Kurumes. They are borne in trusses and remain in good condition for weeks, regardless of weather conditions.

Bloom time for these azaleas ranges from early winter, with Early Wonder as an example, to Mrs. A. M. Mueller a reddish violet, April bloomer. The heaviest bloom of the group comes in March and early April. Although most of the colors are in the deeper shades there are a number of good whites, early or late. Delight is a lovely shade of shrimp pink but the plant is not quite as vigorous as most of the others. Constance, a single pink, which is ruffled and frilled, is a universal favorite, attracting attention wherever grown.

The growing habit of the Rutherfordianas is compact, with good foliage and innumerable flower heads. They require little pruning, mostly a matter of trimming off old flower heads.—MRS. R. G. STAPLETON, *Oroville, California*.



JOHN ROBINSON

Rutherford Hybrid 'L. J. Bobbink'



JOHN ROBINSON

Rutherford Hybrid 'Constance'



G. HAMPLER

Pycnostachys dawei

Two Uncommon African Members of the Mint Family

Two very worthwhile African members of the mint family are notable for adding bright blue color to the greenhouse in winter. They are *Pycnostachys dawei* and *Coleus thyrsoideus*. Both are easily cultivated and long lasting. Though well known and commonly cul-

tivated in Europe, they are apparently rarely grown in this country and certainly deserve to be better known.

Pycnostachys dawei is an upright herb 4-6 feet in height with lance-shaped, medium green leaves. The inflorescences are dense, terminal spikes 3 inches long by 1½ inches in diameter. The RHS Cornflower Blue 742/1 flowers are borne in a ring which moves up the inflorescence as the season progresses. They



C. HAMPFER

Coleus thyrsoides

remain in flower from 5 to 7 weeks and make good cut flowers.

Cuttings root very easily and should be taken in early July. Any good potting soil with bone meal added is suitable. For bushy plants they should be pinched back 3 or 4 times before mid-October and may be fed every 2 to 3 weeks until spikes appear. They do best at a night temperature of 60°. After flowering they should be severely cut back to stimulate growth for cuttings.

Coleus thyrsoides is a spreading herb 2½ to 3 feet tall with ovate, toothed gray-green leaves. The inflorescences are compound racemes 6 inches long. The flowers are slightly lighter (RHS Cornflower Blue 742/2) than the *Pycnostachys dawei* and last from 6 weeks to two months. Propagation and cultivation are the same as for *Pycnostachys*. —D. G. HUTTLESTON, *Longwood Gardens, Kennett Square, Pennsylvania*.



G. HAMPFLER

Magnolia coco

This species of magnolia is certainly a rarity in cultivation if, for no other reason, than lack of a source from which to obtain it. It comes from a region rarely thought of as a home for magnolias, namely Java; and this would be an excellent second reason for its lack of cultivation in the open. One plant has, however, been growing for a half dozen years in a sheltered spot in a garden north of San Francisco. Certainly it cannot be considered a hardy species, but the small size of this plant and the profuse bloom makes it worth while if only as a tub plant.

This species branches from the base in much the manner of *Magnolia stellata*, but there the resemblance stops. The shining evergreen leaves are eight to ten inches long but do not have the usual brown or tan undersurface as in

Magnolia grandiflora. Several stems on the plant have reached better than one-half inch in diameter but in height none are over two and a half feet. Flower buds are formed on the new growth and open throughout warm weather. The urn-shaped flowers are white, drooping, and very sweet scented. Usually four to six flowers will be open at one time between late Spring and early Fall.

This species is difficult to propagate and although possibly under mist cuttings may root more easily, the usual methods of rooting cuttings are not successful. It is possible to graft this species on *M. grandiflora*, but even then only a small percentage "take."

As a tub plant this should be valuable even in the colder parts of the United States as it can be kept in a frost-free light position during the winter months.—FREDERICK W. COE, *San Anselmo, California*.



DAVID GRIFFITHS

Opuntia camanchica