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Microcosms in a World Apart



Because of the pertinence and timeliness of Dr. Abelson's viewpoint, your Editorial Committee is pleased to include here the following editorial from Science, the periodical of the American Association for the Advancement of Science, Vol. 165, No. 3896, August 1969.

Our cities are sick, and their condition grows worse. Morale has deteriorated under the impact of lawlessness, pollution, and the ugliness of the environment. Obsolete, the cities are fashioned in accord with the realities of a century ago. The long-range solution is to build cities of radically new design. However, that is a task of a generation or more, and the crisis is now. We must look for measures that can be implemented quickly. In this search we can learn from the examples of other peoples who have also faced overcrowding.

The visitor to European cities sees much that could with advantage be adapted here. Consider, for example, the Tivoli in downtown Copenhagen. In a park-like area of moderate size are ponds and waterfowl, together with music, theater, dining, dancing, and amusement concessions. The Tivoli is fenced in, and there is a nominal admission charge. With security, the solid citizens of Copenhagen can relax and enjoy their holiday outings.

Another such area, perhaps even more desirable, is the Palmengarten in Frankfurt. Located near the middle of the city, it features botanical displays of extraordinary variety and beauty. The park is small by American standards. Yet skilled landscaping makes it seem larger than it is. Inside its boundaries one has the impression of being in a world apart. There are

ponds, wooded paths, grassy glades, and flower gardens—a delightful spot for a stroll or relaxation in the sunshine. Moreover, there are microcosms within the world apart. In one small greenhouse is a marvelous collection of orchids. Near it is another building housing a great variety of cactuses. Yet another greenhouse contains huge tropical pond lilies. In a larger glassed-in space are luxuriant palm trees; at one end of the big room there is a waterfall with a fish pond beneath it. The enveloping greenery and the sounds of falling water combine most agreeably to lift the spirit.

In Europe, beauty is not confined to a few parks. At the typical crossroads, instead of billboards there are carefully tended flower gardens. Indeed, there are flowers almost everywhere, even at the airports.

The traveler returning from Europe is greeted with brutal ugliness. What a miserable welcome! Yet it is a fair sample of what he is likely to see in most cities. Pitifully little thought and energy have been devoted to bringing beauty to urban centers. Yet the opportunity is often available. Consider the Mall associated with Independence Hall in Philadelphia. Its area is comparable to that of two European parks, and it occupies some very expensive real estate. The Mall has a static vista, fountains, and some benches frequented principally by derelicts. For refreshment one may buy pretzels from street vendors. In contrast, one of the most attractive features of the Society Hill section of Philadelphia is a tiny 18th-century garden located a few hundred meters from Independence Hall. This plot, tended by the Pennsylvania Horticultural Society, is frequently replanted, so that every few weeks it provides a different display. Though small, the garden is excellent in the quality and variety of its planting, and it pleases many passersby.

This country has park facilities whose value as real estate totals multibillions of dollars. We are not getting our money's worth, and it is time that constructive thought and effort were devoted to making it possible for the majority of our citizens to enjoy what could be achieved in the way of spirit-building recreational facilities.

PHILIP H. ABELSON

Editor, *Science*

American Association for the
Advancement of Science

Introduction

*The history of the modern garden strawberry, *Fragaria* × *ananassa*, dates back to 1766. It is a cross of the wild strawberry of Virginia (*Fragaria virginiana*) and the wild strawberry of Chile (*Fragaria chilensis*). It was first recognized in France by a precocious lad of nineteen, Antoine Nicholas Duchesne.*

*The earliest strawberries were pale red in color with a brown or yellowish cast. Their perfume resembled that of the pineapple. Originally, the Dutch named this the "pineapple strawberry" because of the pineapple shape and aroma, thus the name, *ananassa*.*

The strawberry has come a long way since 1766. It has always been a highly popular home fruit. In his article, Mr. Stevenson offers an authoritative account on the latest techniques in growing strawberries for the entire country, including recommendations on disease and pest control.

For those who want to know what strawberries to plant in their areas, suggested varieties are listed in an appendix.

—THE EDITOR



A young lawyer, who chose instead reporting for the *Cincinnati Enquirer*, bought a new home in 1938 and planted dozens of fine azaleas around it. Every one of them died. Determined to find out why, he started an intensive study of horticulture. He soon became a successful and enthusiastic gardener.

Tom Stevenson began writing about gardening for the *Baltimore News American* in 1943. Later, the *Washington Post* started publishing his gardening column for "green thumb" people in the National Capital area. Today, he writes about gardening for the *Washington Post*/*Los Angeles Times News Service* which presently serves some 280 daily newspapers with a total circulation of about 30,000,000.

Long popular with gardeners in the United States and Canada, he answers an average of 1,000 garden inquiries a month. His enthusiasm for practical gardening has also found its way into several books: *Garden Handbook for Maryland*, *Gardening for the Beginner*, *Pruning Guide for Trees, Shrubs and Vines*, and *Lawn Guide*.

He is a long-time member of the Society and serves on its Editorial Committee.

STRAWBERRIES—

and How to Grow Them

TOM STEVENSON

Luscious, vine-ripened strawberries are hard to beat. Many people look forward to them year after year. But it is becoming increasingly difficult to buy top quality fresh berries and the prospects are that it will get worse. Getting labor to pick the fruit is the main problem.

The best solution is to grow your own. Many gardeners are doing it successfully. However, my mail (about 1,000 letters a month) has indicated two out of three of those who try, get skunked. This seemed strange for something supposedly so easy to grow.

I dug into it, to some considerable depth, and talked to a number of strawberry experts, including Dr. George M. Darrow and Dr. Donald H. Scott, two of the top strawberry men in the world,

both of them U. S. Department of Agriculture researchers at Beltsville. Dr. Darrow, now retired, is the author of a very fine book, "The Strawberry," published in 1966 by Holt, Rinehart and Winston, and available through AHS.

Dr. Darrow and Dr. Scott were immediately interested in this article and we had some lively discussions on strawberries. Both said that you can get a very rewarding crop of strawberries *if you follow a few rules carefully*. Disregard any one of the rules—and the results are likely to be disappointing.

Culture

The big idea is to grow a strawberry plant with a lot of leaves. Flower buds are initiated in leaf axils and the more



PHOTOS, U. S. DEPARTMENT OF AGRICULTURE

Fig.1. 'Redchief' strawberry with fruit from matted bed, mulched with straw.



Fig. 2. Hill system with triple row, using the variety 'Pocahontas'. On right, planted November 15. On left, planted March 15 of following year. Photographed May 8.

leaves there are in the fall, usually the more flower clusters there will be in the spring.

For example, a two-leaf plant (in autumn) may produce one small flower cluster and end up with three to five strawberries, while a plant with 50 leaves may provide more than a quart of fruit, the yield depending on the variety.

What must one do to get a 50-leaf plant? Is it practical for the average gardener? What are the reasons behind the rules?

Here are the rules:

- *Buy certified (disease and insect free) plants of June-bearing varieties.*
- *Pinch off the flower buds the first year to keep them from bearing fruit.*
- *Cut off runners as they develop.*
- *Do not allow weeds to compete with the strawberry plants.*
- *Keep the plants free of insects (aphids and mites are the worst offenders).*
- *Water the strawberries during dry weather. They need about an inch of water every week during the growing season.*
- *Fertilize as needed during the sum-*

mer but be careful not to over-fertilize, especially with nitrogen. A general recommendation is impossible because of the wide differences prevailing in different soils.

- *Mulch the plants for winter protection.*
- *Make a new planting every year and depend on each planting for only one crop.*

Each gardener will have to judge for himself whether it is practical to follow the rules. It may take an iron will to pinch off the blossoms the first year. That is the Waterloo for many gardeners. It will take time and effort to control weeds and insects, but it can be done.

Pot Method

One limiting factor may be lack of space in the garden. There is a solution, to some degree, of this problem by using a method which will also make it easier to follow the rules.

Grow strawberries in 8-inch clay pots, one plant per pot, using sterilized soil. Plant them about June 1 (plants from cold storage can be purchased then) to keep them from becoming potbound during the summer. Sink the pots in the

ground about nine inches apart, to reduce the need for watering. Full sun, of course, is necessary. Pinch off blossoms the first year and remove all runners. If aphids or mites appear, lift the potted plants and dip the tops in an insecticide or miticide solution. This would be much easier and more effective than spraying. Water and fertilize when necessary. Weeds should not be a problem. Mulch for the winter. Each potted plant may produce up to a quart of berries. If birds try to take the berries, it is easy to protect them with netting. Make a new planting every year.

Just imagine the conversation piece it would make to use a potted strawberry plant loaded with ripe berries as a center piece on the table! Imagine the pleasure of eating the fruit!

Two dozen potted plants could be grown in an area of about 20 square feet, and the same area could be used over and over, year after year. Yank out the old planting as soon as the harvest is over and put in a new one.

Pots would be much better than a strawberry barrel or a strawberry pyramid. It might be a profitable venture to start potted strawberry plants and sell them to the public in mid-summer for fruiting the following spring. Lots of people probably would be glad to pay the higher cost for already-growing, potted plants to avoid the trouble of starting them. Others probably would find it more fun to start from scratch and do it themselves.

But remember, don't plant them in pots before early June because if it is done sooner they are likely to become potbound, and that would seriously affect the yield of fruit the following spring.

What to Grow

Two kinds of strawberries can be grown in home gardens, everbearing and June-bearing. In general, everbearing varieties are not recommended for areas south of the Mason-Dixon line because yields and qualities of berries are quite low. Farther north, the everbearers do

better, yielding more berries of better flavor. June-bearing varieties form flower buds in the short days and cool temperatures of late summer and early fall, while flower buds of everbearing varieties are initiated mostly during long days. Everbearing varieties can be permitted to bear fruit in late summer and fall the year of planting (flower buds are removed until June and then allowed to mature). June-bearing varieties should not be allowed to bear fruit the first year.

Getting Quality Fruit

The removal of blossoms from newly planted strawberry plants is a *must*. Producing flowers and fruits slows down the effort of the plant to become established. The planting should be de-blossomed two or three times at seven to ten day intervals.

"Blossom removal is more beneficial in the establishment of vigorous plants than almost anything else that can be done," said Dr. Scott. "Without blossom removal one cannot hope to get good fruit-producing plants. There will be fewer leaves, fewer flower clusters and fewer berries."

Full sun is best for growing strawberries. They may tolerate partial shade but cannot endure competition for soil moisture by the roots of trees and other plants. Even the competition of rooted runner plants can be very damaging.

If late spring frosts are frequent in your locality, choose a site on ground slightly higher than the surrounding areas. There is less danger of frost damage on the high ground because cold air drains to the adjoining low ground. Ordinarily a site that slopes gradually is preferable to one that slopes steeply, since a gradual slope is less liable to soil runoff.

Select a site that slopes toward the south if you want the crop to ripen as early as possible; select one that slopes to the north if you want to delay ripening. Strawberries on southern slopes ripen several days sooner than those on northern slopes.

Matted-Row Method

Two systems are commonly used by gardeners for growing strawberries. One is the matted-row system and the other is the hill system.

In the matted-row system, strawberries are planted 18 to 24 inches apart, runners are encouraged to develop early in the growing season the first year and trained so that a matted row is formed with plants spaced about six inches apart. Runners should be removed later in the season because plants formed then produce few flowers and little or no fruit.

Hill Method

The best for the average home gardener probably is the hill system and the removal of all runners. Plant the strawberries about one foot apart in the row, with rows one foot apart. Keep the runners removed from the mother plants throughout the life of the planting. Fruit is produced entirely by the original plants. The hill system calls for more plants and more work, but usually will provide more fruit, sometimes of higher quality.

Weed Control

Weeds can be a problem. Soil fumigation prior to planting can help tremen-

dously with weed prevention by killing seeds that may be in the soil. Either methyl bromide, vapam, or mylone can be used. Early fall is the most suitable time although spring treatments have been very successful. The use of methyl bromide requires a kit with injector and plastic cover, and should be handled only by those who are experienced with it. No special equipment is necessary with vapam and mylone. *Read the directions on the label carefully and follow them closely.*

Herbicides that can be used during the summer for weed control may not be practical for gardeners. Consult your county extension agent about this.

Use of black polyethylene plastic can provide excellent weed control for strawberries grown in the hill system. It is easy to use. Plant the strawberries in the normal method. The bed should be raised or mounded two to three inches above the garden level. Roll out the plastic over the plants. Place soil on edges of the plastic to hold it down, then cut a slit just large enough to get each plant through. Holes punched in the plastic with an ice pick will let water through.



Fig. 3. Crossing strawberries to produce new varieties inside a screened house to prevent contamination from insects.

Fertilizing

Strawberry plants that are growing vigorously and have dark-green leaves throughout the summer probably need no fertilizer. If the soil is of doubtful fertility, apply and rake in two quarts (five pounds) of 5-10-10 fertilizer or something similar per 100 feet of row at least one week ahead of planting.

If the planting is kept for a second year, it should be fertilized immediately after harvest. Approximately five pounds of 5-10-10 per 100 feet can be applied. If the plants are infested with insects and mites, mowing off and destroying all the leaves immediately after harvest can be helpful. Insect and disease control is the only beneficial result of such a practice, according to Dr. Scott.

Dr. Scott recommends cygon (except during the fruiting season) for aphids and cyclamen mites, and kelthane for spider mites. He urges that you consult your county extension agent, read carefully *all the directions* on the label and follow them closely.

Watering and Mulching

No crop is more sensitive to dry weather than strawberries. Most of the berry roots are within the top six to ten inches of soil and are the first to suffer from lack of rainfall. Dry weather at harvest time can reduce yields 50 per cent or more. Irrigation is also your best frost protection. Low volume sprinkling on still, frosty nights can protect blooms and young fruit down to about 24 degrees F. During the growing season at least one inch of water per week is desirable.

Mulching pays off in many ways. It lessens winter killing, reduces loss of plants from heaving, and prevents drying out of plants by providing protection from wind and sun. Pine needles, salt hay, and seed-free wheatstraw are excellent for mulching. In northern latitudes with deep ground frost a mulch of at least three inches is desirable. In areas of more moderate temperatures, about one inch of mulch is adequate.

The ideal time for picking strawberries is when they are just ready to eat. However, if they are picked before fully ripe, they can be ripened and the flavor will be about as good if sugar is added, although the size may be smaller. Be sure to remove spoiled berries from the vicinity of the plants because the rot may spread to unripened fruit.

The importance of buying certified (disease and insect free) plants of varieties suitable for your particular area cannot be over-emphasized. A variety that does well only 50 or 100 miles away may not be best for the place you live.

Selecting Varieties

Ask your county extension agent (listed under the county government) which varieties to plant. There is a strawberry specialist at most of the state universities and the county agent will have the latest information from him.

The interrelation of temperature and length of daylight largely determines how well a variety adapts to a particular area. Environment affects productivity of plants; size, flavor, and firmness of fruit; and development of diseases. Varieties adapted to the southern-most states need little or no winter rest period. They grow vigorously and form fruit buds freely during the short days and relatively low temperatures of late fall, winter, and early spring. These varieties also can withstand high temperatures during the summer.

Most northern varieties need a cold rest period. They are dormant or grow very little during short days and low temperatures. Longer days break the rest period of some varieties; temperatures below 45 degrees F break the rest period of all varieties.

Two everbearing varieties bred to withstand the low temperatures of the Great Plains, are 'Ogallala', and 'Radiance'. These varieties resist temperatures as low as 40 degrees below zero without snow cover. 'Dunlap', a non-everbearing variety, can withstand the cold, dry winters of the upper Mississippi Valley.

The ripening season of strawberry varieties is influenced by climate, local weather conditions, exposure, soil, and

cultural practices. Weather affects the length of the ripening season. In cool weather, a variety that ordinarily is early or ripens quickly may be late or have a season extending over several weeks.

In California, largest acreages are near the coast where temperatures are modified by the ocean. Flower buds form normally and plants bear fruit throughout the summer in cool temperatures of the middle coastal area. Many of the same varieties produce only one crop in other areas.

Temperature greatly affects flavor of strawberries. In general, varieties grown where there are sunny days and cool nights have better flavor than those grown where there are cloudy, humid days and warm nights. The variety 'Albritton' is an exception. It develops high flavor in the warm climate of the ripening season in eastern North Carolina and southeastern United States. 'Suwannee' is another exception. It develops high flavor in both north and south.

Diseases and Pests

Strawberries are no exception in susceptibility to disease. But there is a tremendous advantage to starting off with clean (certified) plants. Using plants developed from runners in a friend's garden is not a good idea, unless they are known definitely to be insect and disease free, which is improbable. Virus free plants are available from nurseries the country over.

If your strawberry plants do show symptoms of disease or pests, however, use the handy guidelines which conclude this article. Start at the first sign of trouble and follow the guidelines carefully.

And don't let the possibility of problems discourage you. Strawberries are an exceptional fruit; the ripe, luscious berries are a gustatory experience that's hard to beat and few joys of gardening can top that of picking fresh strawberries from plants you have grown yourself. Try it!

GUIDELINES

for Disease and Insect Control in Strawberries

TOM STEVENSON

Virus Diseases

Several viruses infect strawberries. Most strawberry virus diseases are a combination of two or more of these viruses (a virus complex). Viruses are disease-causing agents so small they cannot be seen, even through a microscope. Though one virus or even certain combinations of viruses may not cause the plant to show obvious symptoms or noticeable loss of vigor, their

presence in the plant does weaken it. Most of the viruses are spread from plant to plant by aphids. However, virus free strawberries can become infected after they are planted if virus infected plants are near and strawberry aphids are present.

In areas where virus diseases have been a problem, it is important to apply insecticides in early spring and fall to prevent a buildup of



Fig. 4. Root-knot disease caused by the root nematode which lives in the tissues and destroys much of the root system. Note the absence of root growth beyond many of the swellings. The root-knot nematode causes far less serious injury than the meadow nematode which causes brown areas rather than knots. In Florida the sting nematode which shortens the roots to about 2 in. is so serious that all fields are treated before planting.

Fig. 5. Red stele in roots at left and center; roots at right normal. Note dead tips on roots at left. Roots in center are split lengthwise to show reddened core. Roots at right are split to show normal white center.



winged aphids on new plantings. Ask your county agent which insecticide to use. Insects have developed resistance in some areas to some of the old standbys.

Root Diseases

Red stele, verticillium wilt, black root-rot and nematode infection are the major root diseases of strawberries. Red stele and verticillium wilt are caused by fungi. The cause of black root-rot is not known. Most of the damage by nematodes is caused by two types that enter the roots to feed.

Red Stele. This is the most serious of the root fungus diseases. It was discovered in Scotland about 1920 and appeared in the United States about 1934. It attacks plants during late winter and spring, does not persist in soils in the South or in well-drained soils in any area, is common throughout the northern two-thirds of the country, and has been found as far south as Georgia and Arkansas.

Strawberry plants infected with red stele are stunted. They wilt in dry weather. Often they die just before the fruit starts to ripen. In

diseased plants that do not die symptoms disappear during warm summer weather. These plants may recover and produce a few worthless berries, but symptoms usually recur in the late fall or the following spring.

At present there are no chemical or cultural treatments effective against red stele. The only practical remedy is to plant red stele-resistant varieties. There is no practical treatment or crop rotation that will rid the soil of the fungus, and the fungus can persist for years once the soil becomes infested.

Only strawberries (and possibly loganberries) are subject to attack by the red stele fungus disease.

Resistant varieties of strawberries grown on red stele-infested soil should be rotated with other crops. If a resistant variety is grown continuously on infested soil there is a chance that a new, more virulent race of the fungus, to which the variety is not resistant, will appear. The chance that this will happen is reduced, but not removed, by crop rotation.

Verticillium Wilt. The fungus that causes verticillium wilt lives from year to year in the



Fig. 6. *Verticillium* wilt is a major fungus disease of the strawberry where tomato, potato, and relatives have been grown, especially in northern U.S., the Pacific Coast states, and southern Florida. The plants may wilt all at once as here or more gradually with the outer leaves first and finally the entire plant.

soil. It occurs throughout the United States. Symptoms appear about the time the fruit begins to ripen. Outer leaves wilt and dry at the margins and between the veins; they become dark brown. Few, if any, new leaves develop. Plants appear to be dry and flattened. Severely affected plants collapse, sometimes abruptly. Less severely affected plants are unproductive. In the East less severely affected plants usually recover and produce normally the next year. In the West affected plants usually do not recover.

To prevent *verticillium* wilt, in the East, do not plant strawberries where tomatoes, peppers or potatoes have been grown within two years. In the West, do not grow susceptible strawberry varieties on land that has a history of having been planted to tomatoes, peppers, potatoes, cotton, okra, melons, eggplant, mint, apricot, almond, pecan, cherry, avocado, roses, or cane fruit. The *verticillium* wilt fungus has been known to persist in the soil in the Pacific states for more than ten years. Fumigation of the soil with chloropicrin, frequently with methyl bromide added for weed control, has given good results.

Pests

To reduce losses caused by strawberry insects and related pests, plant only virus free and aphid free stock.

Isolate new patches as far as possible from existing plantings. Use a crop rotation in which strawberries are planted to follow a different, clean-cultivated crop grown the year before.

Strawberries should not follow corn, weeds, or grass; they should not be planted on land that has grown strawberries during the previous three years. Keep down weeds and grasses. Clean culture is an important measure because many insects feed and breed on weeds and prefer grassy fields. Plow under strawberry fields immediately after the last harvest.

Leaf aphids usually occur on new shoots and buds in the crown of the plant. When numerous they move to the undersides of leaves. They are most numerous in spring and fall and almost disappear during hot, dry summer weather. Their chief damage is the spreading of virus diseases.

Root aphids are found on the undersides of leaves. They are also found on roots where they have been carried underground by ants. Only the eggs survive subzero temperature in the northern states, but all forms survive milder winters in southern states. Infested plants lack vigor, have smaller, pale leaves, and produce immature, or dry fruits. Aphids may weaken or kill new plants before they become established.

Cyclamen mites are not visible to the naked eye. They feed on young, expanding leaves in crowns of plants, and cause severe distortion, stunting, and bronze discoloration, and sometimes kill the leaves. They feed on flower buds, causing distortion of the fruit. Usually, infested plants become unproductive within a season.

When established, the cyclamen mite is difficult to control. You may prevent damaging

infestations from occurring by planting only uninfested or treated plants. Cyclamen mites may be killed by hot, dry summers in the South. Sometimes they are kept under control by predatory insects.

Spider mites are barely visible to the naked eye. They generally form webs on the undersides of leaves. During favorable weather, they complete a generation in ten days to two weeks, making it possible for mite populations to increase rapidly. They pass the winter on strawberry plants, or on weeds in or around old strawberry fields.

Spider mites feed on the undersides of leaves and suck out plant juices. Injured foliage turns

yellow, and develops rusty brown blotches. Plants may become stunted, and yield may be greatly reduced. Spider mites have many natural enemies that often keep them in check, but sometimes heavy infestations follow warm, dry weather in spring. Examine undersides of leaves frequently during the dormant and spring season. Look for the tiny mites and signs of their webbing. It is important to begin mite control early before heavy infestations are well established.

Avoid the spray materials used to control aphids and other insects which kill the predators of spider mites without damage to the mites themselves.



Suggested Strawberry Varieties for Home Gardens in the United States

D. H. SCOTT

The list of recommended varieties is necessarily large because some varieties perform better than others within the regions. Differences in elevations, in temperatures, and in day length influence the performance of the varieties. Also, some of the varieties have been grown for many years and are preferred by gardeners and others are relatively new varieties that gardeners will want to try. Some varieties ripen early, some late. Some varieties are sweet, others are tart. Hence, the long list.

The regions are designated as follows (see map):

- I. Southeastern and Gulf Coast
- II. East-central coast
- III. Northeastern
- IV. North central
- V. South central
- VI. Plains and Rocky Mountain states
- VII. Northwestern
- VIII. California and Southwestern
- IX. Alaska

I. Southeastern and Gulf Coast

Albritton	Headliner
Blakemore	Pocahontas
Dabreak	Suwannee
Earlibelle	Tioga
Florida 90	

II. East-central coast

Earlidawn	Redchief
Fairfax	Redglow
Guardian	Redstar
Midland	Sunrise
Midway	Surecrop
Pocahontas	Suwannee

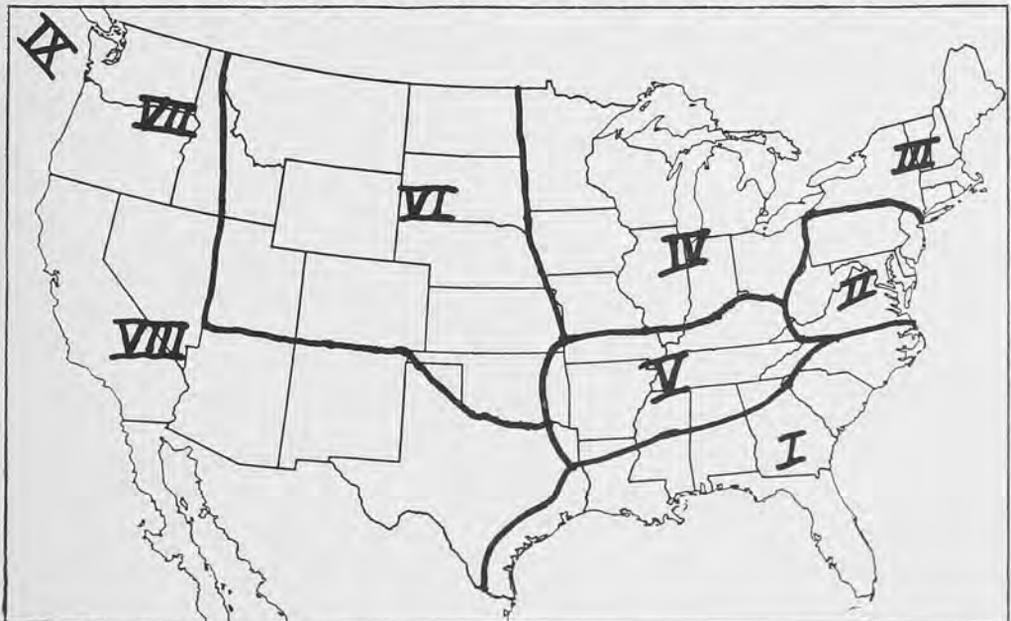
III. Northeastern

Catskill	Jerseybelle	<i>Everbearers</i>
Earlidawn	Midland	Gem (Superfection)
Empire	Midway	Geneva
Fairfax	Raritan	Ozark Beauty
Fletcher	Redstar	
Fortune	Robinson	
Gala	Sparkle	
Garnet	Surecrop	

IV. North central

Badgerbelle	Redglow	<i>Everbearers</i>
Catskill	Robinson	Gem (Superfection)
Cyclone	Sparkle	Ogallala
Dunlap	Surecrop	Radiance
Midway	Trumpeter	Rockhill
Redchief		

Strawberry varieties for home gardens by regions.



V. *South central*

Albritton	Sunrise	<i>Everbearers</i>
Blakemore	Surecrop	Gem (Super-
Earlibelle	Tennessee	fection)
Citation	Beauty	Ozark Beauty
Pocahontas		

VI. *Plains and Rocky Mountain states*

Cyclone		<i>Everbearers</i>
Dunlap		Ogallala
Trumpeter		Radiance

VII. *Northwestern*

Columbia	Northwest	<i>Everbearers</i>
Hood	Puget Beauty	Quinault
Marshall	Siletz	Rockhill

VIII. *California and Southwestern*

Fresno	Shasta	<i>Everbearers</i>
Salinas	Tioga	20th Century
Sequoia		Rockhill

IX. *Alaska—Central*

Pioneer

Alaska—Coastal

Matared
Midka
Susitna

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Cephalotaxus—

Source of Harringtonine,

A Promising New Anti-Cancer Alkaloid

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and RICHARD G. POWELL²

The plummyews (*Cephalotaxus*) are yew-like evergreen trees and shrubs. The genus includes seven species native to southeastern Asia from Japan and Korea to Taiwan and Hainan, and west through China to northeastern India.

Two species are in cultivation in the United States, *C. harringtonia*, (Fig. 1 & 2) of which there are several varieties (one often listed as *C. drupacea*), and *C. fortunei* (Fig. 3). The cultivars are shrubs up to about 20 feet in height; most have broad crowns. The linear and pointed leaves are spirally arranged or in two opposite ranks. The upper surface is dark shiny green with a conspicuous mid-rib; the lower surface has a broad silvery band on either side of the mid-rib. These bands are made up of conspicuous white stomata arranged in numerous distinct lines. Leaf length is variable, from about one inch in varieties of *C. harringtonia* to three or four inches in *C. fortunei*. The leaves are about one-eighth to one-sixth inch wide.

The "fruit" is olive-like, about one inch long, with a fleshy outer coat, an inner woody shell, and a smooth surfaced kernel with two cotyledons.

Cephalotaxus fruit superficially resemble those of *Torreya* but the latter



PHOTO, ARNOLD ARBORETUM

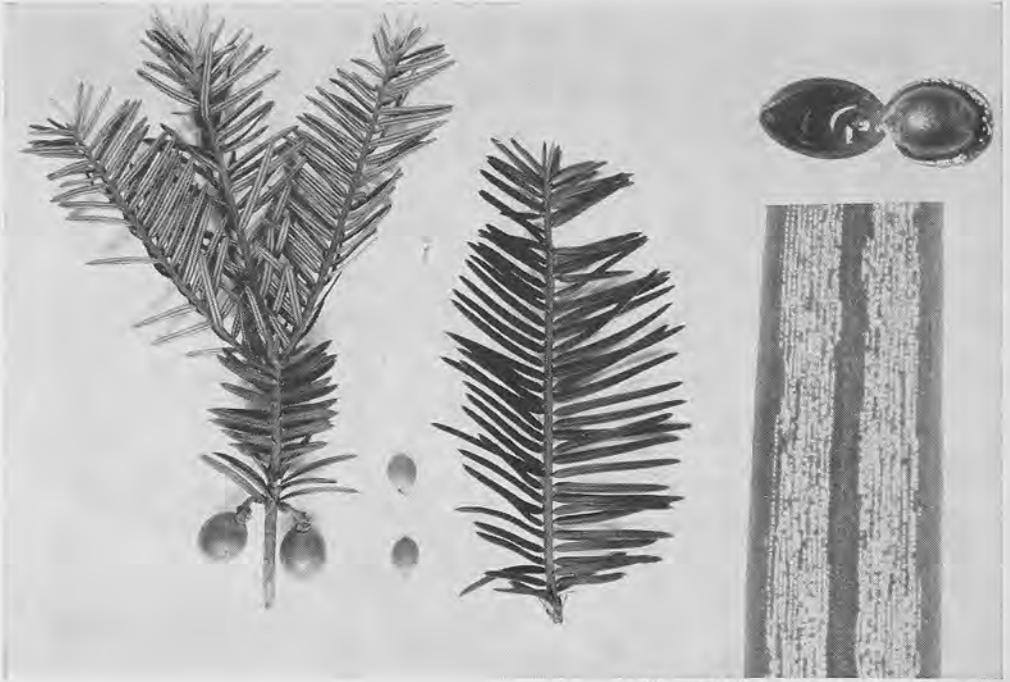
Fig. 1. Japanese plummyew (*Cephalotaxus harringtonia* var. *drupacea*), an evergreen shrub about 6 ft. high, at the USDA Plant Introduction Station, Glenn Dale, Maryland. This photograph was made in 1955. The plant is now about 7 ft. high, but the lower branches have been severely pruned to provide material for chemical research.

have a deeply wrinkled kernel. The leaves are similar to those of *Torreya* and *Taxus*. *Torreya* leaves can be distinguished by the narrower, brownish stomatic bands, a mid-rib that is not distinct on the upper surface, and their spiny point. *Taxus* leaves can be distinguished by their pale green stomatic bands.

Extracts of *Cephalotaxus* have demonstrated significant activity against leukemia in laboratory mice. One of the principal active constituents is a new alka-

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PHOTO, U.S. DEPARTMENT OF AGRICULTURE

Fig. 2. Japanese plumyew composite photo showing (left to right) terminal branch with immature fruit and view of lower leaf surfaces; young seed; terminal branch with view of upper leaf surfaces; mature fruit (upper right) with seed exposed (1x); and enlarged (12x) view of lower leaf surface (lower right) illustrating white bands of stomata that are characteristic of the genus. (Mature seed photographed in September 1951, other material photographed from fresh specimens collected in early July 1969.)

loid, harringtonine. It was isolated and has been partially characterized by chemists at USDA's Northern Utilization Research and Development Division in Peoria, Illinois.³

A sample of *C. harringtonia* seed was received in 1960 for testing in the USDA oilseed screening program, a cooperative botanical-chemical effort within the Agricultural Research Service to discover seed oils that differ significantly from the usual vegetable oils, such as cotton seed, peanut, and soybean. An aqueous extract of the seed was subsequently submitted for testing in the anti-tumor screening program of the Cancer Chemotherapy National Service Center of the National Cancer Institute. This extract showed promising activity against lymphoid leukemia L-1210, currently regarded as the most reliable test system for predicting similar clinical activity in man. This test system is predictive not only for leukemia but for solid cancers as well.

³ R. G. Powell, D. Weisleder, C. R. Smith, Jr., and I. A. Wolff. Harringtonine, a tumor-inhibiting alkaloid from *Cephalotaxus harringtonia*. Abstracts of Papers, 158th National ACS Meeting, New York, September 7-12, 1959.

A seed sample of *C. fortunei* was screened for anti-tumor activity in 1963 and was also active against L-1210.

Cephalotaxus is the second genus of conifers that produces substances which show activity against L-1210. A different anti-leukemic alkaloid was isolated from stem bark of Pacific yew (*Taxus brevifolia*) and has since been identified in roots, stems, and leaves of other species of yew. *Cephalotaxus* appears more promising, however, because the active principle occurs in much higher amounts and the plants appear to produce other alkaloids with similar activity.

Research is continuing at the North-



PHOTO, ARNOLD ARBORETUM

Fig. 3. Chinese plumyew (*Cephalotaxus fortunei*) Western Szechwan Province, China, photographed by E. H. Wilson during his 1907-1909 expedition.

ern Laboratory to complete the determination of the chemical structure of harringtonine. It is now known that it is related to cephalotaxine, an alkaloid isolated from *Cephalotaxus* in 1963 by chemists at Ohio University.⁴

Alkaloids occur in all parts of *Cephalotaxus* but they are concentrated in the kernel of the fruit. Crude alkaloid extracts were obtained from roots, large stems, twigs, and leaves of several varieties of *C. harringtonia* and from twigs and leaves of *C. fortunei* in amounts of

approximately 0.10 to 0.70 percent. This compares with a yield of approximately 0.80 percent from the seed of *C. harringtonia*. Harringtonine makes up only 6 percent of the crude alkaloid extract or 0.05 percent of the original fruit sample. While this yield seems small, it is relatively high in comparison with that of many other anti-cancer agents of plant origin.

Harringtonine recently passed its first important hurdle when it was cleared for preclinical pharmacological evaluation. It will now be tested in dogs and other animals to determine possible adverse side effects and appropriate doses for administration to human patients.

It now appears unlikely that harringtonine will be adaptable to chemical synthesis. The plant is likely to provide the only practical source. Fortunately, the alkaloid is obtainable in fairly good yield. Since it is related to cephalotaxine, which occurs in larger amounts, a partial synthesis from cephalotaxine is a possibility.

An appreciable quantity of harringtonine will be required for preclinical pharmacology and for clinical trials that, hopefully, will follow. While seed are the best source of the drug, they are difficult to obtain. *C. harringtonia* var. *drupacea* is native to the mountain forests of Japan, from central Honshu to Shikoku and Kyushu. Commercial seed dealers in the United States formerly obtained seed from Japan but have been unable to obtain supplies from that country for several years. Current supplies of seed come from Europe, especially from cultivated plants in Italy, but the supply fluctuates from year to year and in some years there is little if any seed produced. This seems also to be the case in Japan where in 1968 the plants failed to produce any appreciable quantity of seed. We continue to try to develop sources of seed, and even small amounts are welcome, but it is evident that we are likely to be dependent on vegetative material for future supplies of the drug.

We are now making a survey of nurseries in the United States to locate major sources of *Cephalotaxus* in this

⁴ W. W. Paulder, G. I. Kerley, and J. McKay. The alkaloids of *Cephalotaxus drupacea* and *Cephalotaxus fortunei*. *Journal of Organic Chemistry* 28:2194-2197 (1963).

country. The purpose of our survey is two-fold. First, we must develop an immediate source of plant material to provide adequate amounts of the drug for research to be conducted in the immediate future. Secondly, we need to identify the *Cephalotaxus* germ plasm now available in the United States, and to determine which domestic sources will provide the greatest yield of the drug.

The seven-fold fluctuation in yield of crude alkaloids suggests that production of alkaloids by *Cephalotaxus* may vary from one species or variety to another. It may also be dependent on other factors such as soils or geography, age of plants, part of the plant tested, or season during which samples are collected. We hope to locate large nursery stocks that are descended vegetatively from older plants in the same area, then set up an evaluation program to determine the best sources of harringtonine. Plants will be purchased from one or more locations three or four times during the year to determine the effect of season of collection. Hopefully, we will be able to sample nursery grown stock of various ages and older parent plants as well. Nursery grown plants will be separated into samples of roots, large stems, twigs and leaves to determine the relative yields of alkaloids in each part. Individual plants will be sampled to determine the yield from plant to plant and, to the extent that collections at different locations can be traced to the same introduction,

samples will be procured to assess the effect of soils and geography.

This assessment will be accomplished by bio-assay in mice rather than by chemical techniques. While the latter are more accurate, the former are less time-consuming, and will permit assessment of a greater range of material. This evaluation will follow the pattern of our evaluation of *Camptotheca acuminata*,⁵ source of another anti-leukemic alkaloid. The *Camptotheca* evaluation demonstrated that the principal active constituent was most abundant in the roots and wood, and least abundant in the twigs and leaves. This evaluation also indicated that age of plants, season of collection, and location had little effect on biological activity and, presumably, on yield of the active constituent.

We welcome information from nurserymen and other readers on sources of nursery stock or of older plants, especially those that produce good crops of fruits. Information on origin of the plants, fruiting patterns, and growth rates will be helpful. Appropriate information can be sent to R. E. Perdue, New Crops Research Branch, Plant Industry Station, Beltsville, Maryland 20705.

We are interested in any species or horticultural varieties that may be available.

⁵ R. E. Perdue, Jr., M. E. Wall, J. L. Hartwell, and B. J. Abbott. Comparison of the activity of crude *Camptotheca acuminata* ethanolic extracts against lymphoid leukemia L-1210. *Lloydia* 31:229-236 (1968).

Oriental Plane Cultivated in the United States

FRANK S. SANTAMOUR, JR. AND
FREDERICK G. MEYER

The true oriental plane (*Platanus orientalis* L.) a native of southeastern Europe and western Asia, has long been considered a rare plant in cultivation in this country. However, because of widespread confusion in the nomenclature of the plane trees, the names "oriental" or "*orientalis*" are still used by some nurseries in describing plants that do not belong to the true species.

The cause of the confusion is the London plane, *P.* × *acerifolia*, a heterogeneous group of hybrids or hybrid derivatives of a reputed natural cross between *P. orientalis* and the native American sycamore, *P. occidentalis*. The London plane is one of the most widely used shade trees in urban areas of the United States. While it may be that the first form of this hybrid originated in the Oxford Botanic Garden about 1670,

as deduced by Henry and Flood (1919), it is also possible that other hybrids arose spontaneously in several countries at about the same time. In any event, their lack of familiarity with the American species led many European botanists to consider the hybrids as varieties or forms of the oriental plane. When the first London planes were imported into North America, they too were called *P. orientalis*.

Li (1957) has provided a thorough account of the historical aspects of plane-tree cultivation. He also noted the occurrence along city streets of individual trees which could be identified as oriental planes. Such trees should be regarded as advanced generation segregates of the hybrid London plane that have inherited many of the characteristics of *P. orientalis*. The common usage of open-pollinated progenies of London planes for city planting has resulted in trees approaching both parental species in many characters, as well as an abundance of intermediate types.

Because of interbreeding among London plane introductions and backcrossing of the hybrids to *P. occidentalis*, our city plane trees also exhibit a wide range of susceptibility to the anthracnose disease. Sycamore anthracnose, also known as twig or leaf blight, is caused by the fungus *Gnomonia veneta*. Another name

Leaves from seedlings of (left to right): *Platanus occidentalis*, *P. orientalis* × *occidentalis*, and *P. orientalis*. About one-third natural size.

PHOTO, UNITED STATES DEPARTMENT OF AGRICULTURE



Respectively Research Geneticist and Botanist; U.S. National Arboretum, Corps Research Division, Agricultural Research Service, U.S. Department of Agriculture, Washington, D. C. 20002.

for the sexual stage is *Gnomonia platani*, while the asexual stage on leaves is known as *Gloeosporium platani*. Himelick (1961), and Neely and Himelick (1963) have found that disease symptoms, the most apparent of which is the dying back of young twigs in the spring, are most severe during periods of cool weather following bud break. This disease is currently a primary deterrent to more widespread planting of plane trees in the North.

Walther (1935) was among the earliest to note variation in anthracnose susceptibility among London planes. He observed that, in San Francisco, California, the more resistant trees tended to resemble *P. orientalis* in leaf characters. However, other resistant trees may be quite intermediate in leaf type. Thus, the conflicting published statements about the anthracnose resistance of the London plane and the oriental plane can be traced to the hybrid origin of the trees. All authorities agree, however, that our native *P. occidentalis* is generally highly susceptible.

With the expansion of research in the project on Cytogenetics, Breeding, and Evaluation of Shade and Ornamental Trees at the U.S. National Arboretum in 1967, it was decided to give high priority to the genus *Platanus*. Since the planes are among our most widely used street trees, there is considerable opportunity for selection among the various urban tree populations. Furthermore, there is a need in the genus for genetic improvement of several growth characteristics, including disease resistance and tolerance of air pollutants.

We were fortunate in having, at the Arboretum, 16 sexually mature trees of *P. orientalis*. The original geographic source of our trees was Duzce, Asku Deresi, Turkey, growing at an elevation of about 450 feet. The collection, introduction, and distribution of the seed from which these trees were grown was arranged by F. G. Meyer in 1954, while he was associated with the Missouri Botanical Garden. The availability of these trees at the National Arboretum has enabled us to make some meaningful observations on this species, and util-

ize them in genetics and breeding research.

We have also become interested in the actual extent of cultivation of the oriental plane in the United States, and sent inquiries to more than 25 botanical, horticultural, and forestry institutions throughout the country for information on their experience with *P. orientalis*.

Most arboreta in the eastern United States, north of Washington, D. C., have attempted to grow *P. orientalis* on several occasions (up to 15 different clones at the Arnold Arboretum). The plants usually survived long enough to be planted out from the nursery. However, after several years, most of these died before reaching flowering age. Some institutions also have young plants on their grounds at the present time. Two trees, still in the nursery of the Monroe County (New York) Department of Parks, are the exception to this pattern. These trees, 12 and 15 feet in height (November, 1967), were grown from the same seed collection as the National Arboretum trees, and they are producing fruit.

This seedlot has also given rise to five plants at the University of Washington Arboretum. The largest tree (about 45 feet tall in 1967) fruited for the first time in 1964. The only other institution that reported fruiting trees was the Los Angeles State and County Arboretum, where an individual obtained in 1954 produced its first fruit in 1965.

While it is evident that the oriental plane is rare in cultivation, it is also apparent that one major seed introduction has proved its adaptability in warmer regions of the country.

The trees of *P. orientalis* at the National Arboretum (Washington, D. C.) are growing rapidly (largest tree 44 feet in height), and have not been injured by cold weather. However, the growth habit of the trees is not especially good. Most of the trunks show a pronounced sweep and a few are multiple-stemmed.

The rather limited area of the country in which the oriental plane appears to be hardy will certainly be a limiting factor in the direct use of this species for street and ornamental planting. But

the species should be most useful in other ways. Our observations in Washington, D. C., as well as those in Seattle, indicate that the trees are highly resistant to sycamore anthracnose. Furthermore, preliminary studies indicate that they are also more tolerant of air pollution than many progenies of *P. occidentalis* or London plane. With controlled hybridization of the best oriental plane with the hardiest native sycamore, we should be able to develop disease-resistant, pollution-tolerant, cold-hardy cultivars adaptable to a wide range of climatic and site conditions.

It is interesting to note that in the 300 years since the chance occurrence of the London plane, there has been no published report on an attempt to create hybrids between *P. orientalis* and *P. occidentalis*. In the spring of 1968, F. S. Santamour, Jr., made reciprocal crosses between the two species, and we should soon have a new generation of "Lon-

don" planes for further experimentation.

Acknowledgments

We would like to thank the directors and personnel of the various institutions surveyed for providing us with information on the cultivation of the oriental plane in several parts of the country.

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Japanese Plants in the Botanic Garden of Gothenburg

TOR G. NITZELIUS

The Botanic Garden of Gothenburg, which was opened to the public 50 years ago, is beautifully situated in a landscape typical of the west coast of Sweden. This large area of 300 acres has a varying topography, with wooded hills and valleys, small lakes and brooks. The terrain, setting, soil, and other factors are highly favorable for the cultivation of a multitude of plants. The climate is comparatively mild and the precipitation is moderate, with maximum rainfall during late summer and autumn. The average annual temperature is about 45°F (33°F in February and 63°F in July). The lowest temperature recorded since 1900 is -4.8°F. During late winter the ground is often snowless and desiccating winds predominate. The climatic conditions on the whole somewhat resemble those in Boston, Massachusetts, although the winters are milder and the summers cooler.

In one of the best situated and sheltered valleys in the Botanic Garden a special section has been established for the planting of Japanese trees, shrubs and perennials. It was initiated in 1952-53 after a collecting trip to Japan by the late Professor Bertil Lindquist, director of the Garden, and the author. Purpose of the trip was to gather hardy and otherwise useful original plant material for horticultural testing. Gradually the collections have been increased, by Professor Lindquist's second trip to Japan, in 1959, and by generous gifts from Japanese institutions and colleagues. About 300 species and cultivars of trees, shrubs, and herbs have been planted in the course of 15 years. The



PHOTOS GOTHENBURG BOTANIC GARDEN

Fig. 1. Stone steps across the small pond. To the left, *Rhododendron japonicum*, originally collected not far from Nikko, central Japan. Shrub in upper right is *Kalopanax septemlobus*.

valley is not a garden of typical Japanese design. It should be considered a demonstration garden for Japanese plants, laid out in "woodland garden" style in an environment vividly reminiscent of an eastern Asiatic mountain area. It has been my opportunity to follow the plantings from the beginning and I should like to make some observations on the more interesting specimens growing there.

Botanical Garden, Gothenburg, Sweden.

Conifers

Two of the firs, *Abies veitchii* and *A. homolepis*, which are at home in central Japan, can be considered hardy in most parts of southern Sweden and along the southern parts of the Bothnian coast. The first is quite common and popular owing to its beautiful habit and the needles, which are conspicuously white beneath. The latter is less known, although it shows extraordinary beauty as an adult, single tree. It is rather sparsely branched and has a broad, cedar-like crown.

Outstanding also is the "Aomori-todomatsu," *Abies mariesii*, which has a narrow crown and regular whorls of branches. This fir seems to be especially suited for smaller gardens, when planted together with rhododendrons or deciduous trees and shrubs. It is at home in northern and central Honshu and is probably represented by several hardier forms. Plants grown from seeds collected on Mt. Hakkoda in North Honshu, where the climate is humid, have proved

unsatisfactory in Gothenburg. Therefore, races from colder and drier parts of central Japan (Mt. Norikura and Yatsugadake in Nagano prefecture, Mt. Fuji in Yamanashi prefecture, and Mt. Nantai in Tochigi prefecture) are being tested.

The Sugi, *Cryptomeria japonica*, which is cultivated all over Japan except in the northernmost parts, is doubtless the most beautiful of all Asiatic conifers. It attains a height of 150 to 180 feet and has a perfectly straight trunk with reddish bark and a rather narrow cylindrical crown. The needles are sickle-shaped and show some resemblance to those of the *Sequoiadendron*. This species is said to occur spontaneously in several parts of Japan, a claim which is difficult to prove, as the tree has been planted by the millions as an important forest tree.

Fig. 2. The northern slopes of the valley are covered with *Rhododendron metternichii* and *R. brachycarpum*.





Fig. 3. *Rhododendron aureum* has a short but intensive flower season in May.

In Yakushima, the southernmost island, where it no doubt grows spontaneously, very old and huge trees exist. Some of them are said to be more than 1,000 years old.

Among the introduced conifers the *Cryptomeria* is rare in the parks of southern Sweden, but here and there a few trees have been planted, some of them now being 45 to 60 feet high. In the Japanese valley and in the Arboretum of the Gothenburg Botanical Garden some young trees grow, representing six different localities in the central and northwest parts of Honshu. At the moment it is difficult to judge their hardiness and adaptability. In my opinion, when the plants have attained a reasonable size, the judgment will be on an individual rather than a collective basis. A high altitude type from Tateyama in Toyama prefecture (altitude 4,800 feet), however, resisted temperatures as low as approximately -13° F without signs of damage, during the winter of 1965-66.

The Japanese yew, *Taxus cuspidata*, is perfectly hardy in south and central

Sweden and also in the southern part of the Bothnian coast (lat. 63° N), where normally only Siberian conifers (*Abies sibirica*, *Pinus cembra*, and *Larix* spp.) occur in the parks and gardens. The Gothenburg Botanical Garden has a quite fast- and straight-growing form of *Taxus cuspidata* from Yamabe in C. Hokkaido, introduced in 1952. A beautiful 9 to 12 foot high, dark-needled young specimen from this derivation grows in a shadowed corner of the Japanese valley.

Quite a number of hardwoods have been successfully planted in the Japanese valley. Among the most interesting trees are fine specimens of *Kalopanax septemlobus*, *Magnolia obovata*, *M. kobus* var. *borealis*, *Stewartia pseudocamellia*, and *Juglans ailanthifolia*. The genus *Prunus* is represented by: *P. sargentii*, *P. serrulata* var. *pubescens* (*P. jamasakura* f. *pubescens*), *P. serrulata* var. *spontanea* (*P. jamasakura*), *P. maximowiczii*, *P. incisa*, *P. nipponica*, *P. pendula*, *P. pendula* var. *ascendens*, *P. grayana*, and *P. ssiori*. The Sargent cherry (*P. sargentii*) appears to be extraordinarily well suited as a park tree because it is hardy and floriferous. *Prunus nipponica* is a low tree or shrub with a coarse trunk and early flowering. It is an

interesting addition to small gardens. *Prunus ssiori*, which belongs to the *Padus* group, sometimes starts to develop its reddish leaves before the end of the winter season, in March-April. However, plants survived unharmed a night of 19.4° F temperature. The white flowers are borne on long, upright and often reddish spikes in May-June and are as beautiful as the red and blackish fruits in August-September which remind one of small grapes.

About 20 cultivars of Japanese cherries have been planted and more are being planned. The very large- and single-flowered, white 'Tai-Haku' and the charming double and soft-pinkish 'Hokusai' are among the best. Most common in Swedish gardens is the double pink 'Kwanzan'.

Rhododendrons

The evergreen Japanese species of *Rhododendron* deserve special mention,



Fig. 5. *Lilium cordatum* var. *glehnii* flowers at the end of June.



Fig. 4. *Rhododendron aureum*, flowers creamy yellow.

I believe. For Scandinavian gardens, where the rather harsh climate is a strong factor in the choice of species, *R. brachycarpum* seems to be especially well adapted as a basic shrub. Among the Asiatic species it can compete in hardiness with the North American, *R. catawbiense*, which has always been the most planted in Sweden. The natural distribution of *R. brachycarpum* covers the northern half of Japan, and recently was discovered on two mountains of the southern island of Shikoku. It also occurs in Korea up to the sometimes almost solidly frozen Yalu River, on the borderland of Manchuria. It is a variable species as to hardiness. In the Japanese valley at Gothenburg several geographical forms from different parts of the natural habitat are under cultivation. The least hardy form comes from Mt. Hakkoda in Aomori prefecture, northern Honshu (often described under the rejected names, *R. fauriei* or *R. fauriei* var. *rufescens*) has burned leaves almost every winter, although carefully protected. It shows a markedly early vernal development of the shoots. Plants from Mt. Fuji, Yatsugadake, Mt. Asama, in central Japan, seem to be perfectly hardy in most parts of central and southern Sweden, even without protection. Shoot growth starts two to three weeks later than in plants from Mt. Hakkoda—



Fig. 6. *Stewartia pseudocamellia* is a small, very floriferous tree.

which is important, as they rarely or never are affected by late spring frosts. All of our plants have either pinkish or white flowers. A most interesting, very hardy form of *R. brachycarpum* in the Gothenburg collections came originally from central Korea via the Mustila Arboretum in southern Finland. It differs remarkably in size from the plants found in central Japan. Cultivated plants in Finland are over 15 feet high, with larger leaves and comparatively large flowers, which are white with green markings. This Korean form will be described as *R. brachycarpum* subspecies *tigerstedtii*, after its introducer, the late Mr. C. G. Tigerstedt, founder of the famous Mustila Arboretum.

For the milder parts of Sweden, *R. metternichii*, from central and southern Japan, is very useful because of its great variation in habit, leaf form, flower size, and intensity of pink flower color. The form from central Japan, with five petallobes has been in cultivation in The Botanical Garden for at least 30 years. It is very floriferous. Flowers open carmine and slowly fade to soft pink. Other forms recently introduced from southern Japan have flowers with seven petallobes. One of our plants resembles *R. makinoi*, with long narrow leaves. When propagated in sufficient quantities, it will be distributed as cultivar 'Hikoyama'.

The gem of the Japanese *Rhododendron* collection is doubtless *R. aureum*, or *R. chrysanthum*, as it is still known to many. It grows spontaneously in northeast Asia, including eastern Siberia, northern Korea, and the northern half of Japan. The Gothenburg form, which is healthy and floriferous, was collected in 1952 during my stay in the Daisetsu mountains of central Hokkaido at 6,000 feet altitude. The color of the flowers is light creamy-yellow. Apparently the rather cool climate of western Sweden suits this species, since it is hardy without protection in southern and central Sweden and probably even further north.

Japanese herbaceous plants

Several species and cultivars of Japanese perennials grow in the Japanese valley. The most beautiful is *Glaucidium palmatum*, which came from different parts of Japan. It has an exceedingly elegant appearance with palmate, light green leaves and large, somewhat nodding, softly blue or violet, poppy-like flowers. A huge specimen (it grew 12 feet in 3½ months) of *Polygonum sachalinense* and masses of the large-leaved *Petasites japonicus* give an almost subtropical effect to parts of the Japanese valley. The "O-uba-yuri" or "old woman's lily", *Lilium cordatum* var. *glehnii*, was collected in 1952 in central Hokkaido and has flowered every year since then. The bulbs were located in volcanic, porous soil to a depth of almost 1½ feet, but in cultivation they prefer to grow just beneath the surface. The flowers are not as beautiful as the Chinese form of the plant; it attains a height of almost six feet. The plant is completely hardy here, therefore the Japanese variety is worth cultivation in northern districts. Other interesting genera are *Iris*, *Hosta*, *Arisaema*, *Paeonia* and *Cacalia*, all represented by several species. Very elegant and useful are *Cacalia adenostyloides*—about 1½ feet high, with 4-inch wide, reniform leaves and small white flowers in narrow panicles—and *C. nikomontana*, about 2½ feet high, with larger, reniform leaves and small pinkish flowers in flat heads.

Lantana Camara—A Prize and a Peril

RICHARD A. HOWARD

In some areas of the world, *Lantana camara* has been declared a noxious weed and, by law, must be destroyed, with heavy fines assessed to land owners who do not comply. The plant was introduced in each area as the handsome ornamental it is, but has escaped from garden cultivation to occupy acres of agricultural land and to dominate roadsides in Africa, Australia, and Polynesia. Although the plants originally cultivated may have had only a few spines on the stems, the forms that have escaped are invariably densely covered with sharp recurved prickles so that the thickets make almost impenetrable barriers. Methods of control have ranged from manual eradication, to the use of heavy machinery such as goose-foot rollers, to chemicals, and to biological warfare when insects capable of destroying the plants have been found.

One of the unusual stories of biological control of weedy plants is that involving *Lantana camara* in Hawaii. The plant had escaped from cultivation, and with the spiny form predominating, had become an economic liability on lands used for agricultural purposes. In 1902, it was discovered that a scale insect was killing some of the wild plants in Mexico and an expedition was sent there to purposefully introduce other insects which might also feed specifically on *Lantana*. These included a seed fly (*Opiomyia lantanae*) which attacked the flowers and fruit, and several insects which destroyed the leaves, including a cerambycid (*Aerenicopsis championii*), a lace bug (*Teleonemia scrupulosa*), and a leaf miner (*Cremastobombycia lantanella*), among others. The success experienced in partially controlling the spread of *Lantana camara* in Hawaii has led other governments in Fiji, India,



Fig. 1. A colorful poster issued a few years ago by the Natural Resources Board of Northern Rhodesia (now Zambia).

and Australia to obtain the same insects, and others, in their battle against *Lantana*.

As an Ornamental

By contrast, the horticultural use of this native plant of tropical America has been completely different. *Lantana camara* was first seen by the Dutch explorers of Brazil in 1636-1644, and the first record of its cultivation is in the botanical garden in Leiden, in the Netherlands, in 1687. In the following cen-

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PHOTOS BY AUTHOR

Fig. 2. *Lantana montevidensis* grown as a cascade plant on a rock wall at Cap Martin, French Riviera, France.

tury explorers of many nations collected specimens and sent seeds to Europe so that the plant was cultivated in the famous gardens at Hampton Court, Eltham, Kew, and the Chelsea Physic Garden. *Lantana* is easily propagated from soft wood cuttings and as a young plant grows well. It flowers profusely through the summer months, even in temperate areas. The appeal of the plant is in the many brightly colored, rounded and compact clusters of flowers which are accentuated by deep green foliage.

According to the clones, *Lantana camara* have flowers which open and remain one color, or open one color and characteristically fade to other tones. Within the flower cluster there can be several colors evident when the corolla lobes are of one hue and the eye and corolla tube another. Flowering of a single cluster occurs over a long period so that the outer flowers may be faded,

the middle ones in full bloom, and the inner ones in bud—representing three stages of development and three different colors. Apparently color forms can be crossed easily; the seedlings show a degree of variability in color which can be selected and perpetuated by vegetative propagation. The fruits when formed are small globes of color which also change with age from white or green to blue or shining jet black. The fruits are attractive to birds, a fact which accounts for its frequent escape from cultivation. Variegated leaf forms are known and the intensity of green color and variations in leaf texture enhance the individual plants.

Nurseries in Belgium, England, France, and Germany vied in the 18th and 19th centuries in introducing and naming many different forms of *Lantana camara*. The firms of Lemoine, Bull, Veitch, Bruant, Henderson, Chaté Ferrand, and Vilmorin were among the leaders in advertising this plant, and several horticultural societies awarded certificates and medals to developers of outstanding cultivars. At the turn of the last century most American nurserymen stopped offering named clones of *Lantana* and subsequently offered only mixed colors. More recently nurseries, particularly on the west coast, have again selected distinctive color and growth forms and applied cultivar or fancy names to the plants. Many of these plants have proven to be hardy in the Gulf States and Florida, while cuttings of these can be used to produce summer flowering annuals for northern gardens. The stock can be perpetuated in a greenhouse in the north and propagated in February for out-of-door culture in New England. Although wild forms, possibly escaped plants, are known in the area around Miami, the plants, or at least the modern cultivars, do not seem to escape elsewhere in the United States. Clearly, it will never again be tolerated as an introduced ornamental in the tropics.

Liberty Hyde Bailey, in his manual of cultivated plants, lists three species, two of which are frequently cultivated at

the present time. *Lantana montevidensis* is the correct name for the trailing species which lacks prickles and has rose-lilac to purplish pink flowers, although a white-flowered form is known. This species was originally sent by Sellow from Montevideo, Uruguay, to horticulturists in Europe. Kurt Sprengel described the plant first in 1825 as a *Lippia*, which he called *Lippia montevidensis*; while the horticulturists Link and Otto, at the Berlin Botanic Garden, named the plant *Lantana sellowiana* in 1826 in honor of the collector. The Swiss botanist, Briquet, correctly accepted the older specific name by which it should be known today. *Lantana montevidensis* is used extensively in hanging baskets or as a terrace or bank planting where the stems can cascade.

Lantana camara is of uncertain origin but occurs as a well behaved native shrub—usually without many, if any prickles—in the islands of the West Indies, in Central America, Mexico, and in South America. The spiny form, which is so troublesome in Hawaii, India, Ceylon, Australia, and tropical Africa, has been called a distinct species or regarded as a variety or a form. The genetic studies of the variation in a few plants of *Lantana camara* indicate that there are plants which are self-fertile, and others which do not produce pollen, i.e., are male sterile, which can produce fruit when supplied with pollen from other plants. There are also several other plants capable of producing viable seed without pollen.

Lantana camara and *Lantana montevidensis* can be crossed to produce hybrids of different habits and color forms. Recently the group name, *Lantana* × *callowiana*, was designated by the Monrovia Nursery, Azusa, California as "an entirely new species produced from the hybridization of *Lantana camara* and *Lantana sellowiana*, retaining only the finer characteristics of each." The name was first used in their 1952-1953 catalog (p. 44) as *Lantana callowiana aurea* 'Goldrush' (patent pending), and again the following year (Cat. p. 43, 1953-54) as *Lantana* × *callowiana*



Fig. 3. *Lantana camara* as a well-trimmed shrub which flowers profusely in the full sun, at Miami, Florida.

'Goldrush' (plant pat. no. 1211). The hybrid was later used as one parent for the cultivars 'Confetti', 'Cream Carpet', 'Dwarf Pink', 'Spreading Sunset', 'Spreading Sunshine', and 'Sunburst'. *Lantana* 'Goldrush Improved' is a "selected clone of *L. 'Goldrush'* that shows an improved form over the original plant. *Lantana* 'Tangerine' was derived by selfing the hybrid 'Goldrush'. It is probable that *Lantana camara* in the wild has also crossed freely with other species, and it is easy to understand the kinds that developed readily in Europe when it is remembered that the source plants came from various places in the West Indies, Mexico, and South America to be grown together in small gardens.

Lantana under cultivation is a difficult group to consider horticulturally, but some slight order can be maintained by following the suggestions of Liberty Hyde Bailey and Harold M. Moldenke. Both men have published their recommendations on the classification of the plants under cultivation.

Lantana is a large genus in tropical America. Moldenke has listed 31 species and varieties occurring outside of cultivation in Argentina and 68 in Brazil. Alain, in his recent treatment for the flora of Cuba, recognizes 17 species and varieties for that island. Perhaps the most common wild species the traveler will see is a sea-coast shrub in the Caribbean area, *Lantana involucrata*. This plant is occasionally offered by



Fig. 4. *Lantana camara* grown as a standard and planted outdoors in the summer, at Niagara Falls, Canada. The bedding plants with contrasting colorful foliage include *Achyranthes*, *Coleus*, and *Begonia*.

nurserymen for planting in tropical areas exposed to salt spray. The shrub has rounded leaves which are almost corrugate and are rough pubescent on the upper surface. The clusters of pale pink or lilac flowers are interspersed with conspicuous bracts, and the fruits are a bright cherry-red. The plants make an attractive ornamental when grown in a northern greenhouse and pruned frequently to retain a compact form.

Throughout its range most of the species of *Lantana* are regarded as semi-medicinal plants. The common names of "sage" and "wild oregano" indicate the fact that an odor can be associated with the plant. Young leaves are often used as a tea or are steeped in hot water used for bathing.

Lantana selections are easily maintained in cultivation. The mature fruits germinate readily and the plants can be shaped to a standard at an early age and trained to an erect form with the support of a pole. Plants respond well to pruning and usually flower from the new growth. Some specimens have been used for topiary work by appropri-

ate pruning. Cuttings made from young growth following heavy pruning form roots readily with a medium strength root hormone, or more slowly without it in a mixture of sand and soil. Mist propagation of 4-inch cuttings is swift. Crosses between selections are made easily, and since the stamens are attached to the corolla these can be removed as a unit to reveal the stigma. Several pollinations may be required in an inflorescence to secure a full head of fruit. A single seed—or rarely, two—is developed from the fruit and no pretreatment is required for seeds which have been stored. Plants will grow in any kind of soil and do best in full sunshine. Plants are susceptible to frost in the north and must be taken indoors before frost.

Key to Varieties of *Lantana camara*

Flowers primarily white.

Flowers opening with the corolla lobes white and the tube yellow. In age, the tube also becomes white. Stems without prickles.

var. *alba* Mold.

Flowers opening with the corolla lobes white or slight pink-tinged, with a bright-yellow eye. In age the flowers become bluish or uniformly pink. Stems stoutly armed with prickles.

var. *nivea* (Vent.) Bailey

Flowers opening orange, changing to red or scarlet. Plants practically unarmed.

var. *camara*

Flowers open yellow.

Flowers open a bright yellow and darken only slightly. Stems practically unarmed.

var. *flava* (Medik.) Mold.

Flowers open yellow and change conspicuously.

Stems spiny with recurved prickles.

All flowers open yellow to orange and change to pink or rose; habit semi-climbing; stem conspicuously armed with stout recurved prickles.

var. *aculeata* (L.) Mold.

All flowers open yellow to

orange and change to a bright red; branches not scrambling.

var. *sanguinea*
(Medik.) Bailey

Stems hairy or bristly but without recurved spines.

Outer flowers open yellow and turn saffron, crimson, or brick-red; inner flowers open yellow and change to orange; stems with some long bristle-hairs.

var. *mista* (L.) Bailey

Outer flowers open pale yellow (often almost white) with an orange eye and become all pink.

var. *mutabilis*
(Hook.) Bailey

Descriptions of varieties and cultivars of *Lantana camara* in the United States from H. N. Moldenke, "A resumé of the Verbenaceae, Avicenniaceae, Stillbaceae, Symphoremaceae, and Eriocaulaceae of the World as to valid taxa, geographic distribution and synonymy." Mountain-side, N.J. 1959.

Variety *camara* is the type variety of the species and requires no authority. In

Fig. 5. *Lantana camara* has escaped from cultivation and dominates this pastureland and hillside on Maui, Hawaii.



the original description in 1753, the works of several earlier authors were cited, and it is not clear if any botanist has selected a specimen to represent this taxon as a lectotype. Linnaeus distinguished this species from one he called *Lantana aculeata* by the lack of spines.

Variety *aculeata*. Harold Moldenke reduced Linnaeus's *Lantana aculeata* to varietal status. No one has self-pollinated either of these plants and carefully observed the offspring to determine whether the spiny characteristic is consistent. The available genetic data is too unsupported by good observations on the color of the flowers to permit any conclusions on the basis of chromosome numbers. It is possible that the rampant spiny form with scrambling branches is of a different genetic stock.

Variety *alba*. Dr. Moldenke has supplied the description of this plant, which differs from var. *nivea* in having young flowers with white corolla lobes and a yellow tube which also becomes white with age. The name appears to be used only in this resumé. No description or basionym is given. Moldenke indicates var. *alba* is cultivated in New York State but no specific location is given.

Variety *flava*. Named by Medikus as a species from plants described and illustrated by Dillen in *Hortus Elthamensis*. The text accompanying the colored plates of the edition of 1732 indicates that the plant came from Brazil and has

yellow or yellow-orange colored flowers which do not change noticeably with age.

Variety *mista*. Described by Linnaeus as *Lantana mista* in his *Systema Naturae* in 1767, based on the description and illustration published by Dillen for the plant growing at Eltham. Dillen indicated that the plant probably came from Hispaniola and that the flowers were orange and yellow, becoming red with age. Bailey reduced the species to varietal status.

Variety *mutabilis*. W. J. Hooker supplied the description and name for this plant, first described in Curtis's *Botanical Magazine*. The plant had flowered in the Glasgow Botanical Garden but its origin from the wild was not stated. The flowers are described by Hooker as being yellow with a deeper orange eye, fading first to pink while retaining the orange eye, and eventually becoming all pink. The original description does not agree with more modern reports of the flower color of plants recognized under this name. In the cumulative index to the *Botanical Magazine*, the plant Hooker called *Lantana nivea* var. *mutabilis* is said to be *Lantana camara* var. *rotundifolia*. Regrettably, that varietal name cannot be located elsewhere in the literature.

Variety *nivea*. Ventenat supplied the original description of this plant as a species of *Lantana* which differed from all others in its pure white flowers. The illustration indicates a plant of loose structure with conspicuous and abundant recurved prickles on the stem. The plant was grown at the garden of the Empress Josephine at Malmaison from seed sent by the English nurserymen,

Lee and Kennedy. The origin from the wild is not stated.

Variety *sanguinea*. Medikus does not indicate the origin of this plant at Mannheim which he described as having flowers which become a bright red color. Moldenke indicated that the plant was growing in New York but he does not give a locality. No nurseries currently list this plant.

Lantana crocea. This is presently recognized as a species or as a variety of *Lantana camara* in some of the horticultural literature; it is now considered by taxonomists to be synonymous with *Lantana urticaefolia*. This species with golden flowers originated in Jamaica and differs from *Lantana camara* in the possession of glandular hairs.

Finally, it should be noted that *Lantana camara* is a poisonous plant. Doctors S. L. Wolfson and T. W. G. Solomons have reported on their experience in the *American Journal of Diseases of Children* (107:173-176, 1964) and noted in summary: "During a two-year period (1961-1962) 17 children were examined who ingested the green berries of a common plant, *Lantana camara*. Most of these children were less than three years old. Four of the children had signs of acute poisoning, and one died. The presenting syndrome resembled belladonna alkaloid poisoning.

"Any child known to have eaten *Lantana camara* should be made to vomit immediately and be rushed to a hospital emergency room for immediate gastric lavage. The child should be observed in the hospital for at least 24 hours.

"The green fruit of the plant, *Lantana camara*, is toxic to children and should no longer be considered harmless."

Philadelphia's Garden Blocks Program

Conceived by a woman of vision, knowledge, and withal, kindness, aided by capable co-workers, and developed by the deeds of hundreds of humble people, this story should be known in every city of the land. Truly an advance in horticulture, it tells eloquently of what can be done to improve the quality of life regardless of the surroundings.

—Neil W. Stuart, *Editor*



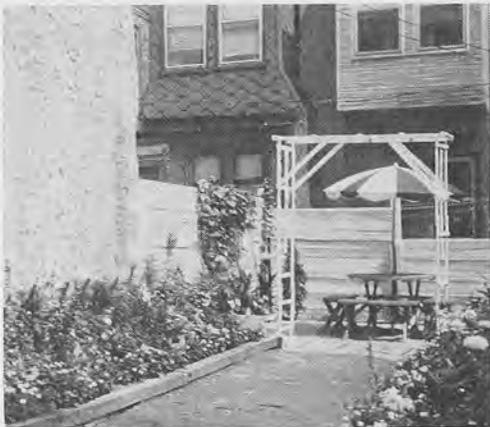
Fig. 1. A Garden Block. (A) Before planting. (B) The same street one year later.

Garden Blocks for Urban America. Louise Bush-Brown. Charles Scribner's Sons, New York. 1969. 126 pages. Illustrated. \$10.00 (Library)

"Strive to make the world a little better and more beautiful because you have lived in it." With this as a motto Mrs. Bush-Brown tells of the origin of the Garden Blocks Program in 1953 by the Neighborhood Garden Association of Philadelphia, Pennsylvania. People living in depressed or blighted areas organized by garden blocks to build and plant flower boxes (Fig. 1), to plant doorway gardens, and to create play lots and community gardens from debris-filled vacant lots. The people did this work themselves, receiving guidance as well as plants from sponsoring suburban garden clubs. The story, told in print and pic-



Fig. 2. Two proud winners in the first flower show ever to be staged in this area of Philadelphia. Who will doubt that these flowers, selected from their own gardens, mean more to them than do the thousands of flowers in a public park?



ture, including color, is an inspiring one of awakened civic pride and personal fulfillment. In making their own homes more beautiful with flowers, the residents saw other ways to make their surround-

Fig. 3. (A) A typical vacant lot, like hundreds of others throughout the city. On this block a 4-H Club was organized and chose the name of "The Happy Flowers 4-H Club." The members of this club decided to make a garden on their unpromising site. (B) They went to work. They cleaned the lot and the city removed the trash. Top soil was delivered, the garden was laid out. Money was raised to buy the umbrella table. The Happy Flowers Garden became one of the beauty spots of the area and inspired many other 4-H Clubs to undertake similar projects.

ings more attractive; they became more neighborly and interested in their communities (Fig. 2). Philadelphia's Neighborhood Garden Association established workable guide lines and inspired similar Garden Blocks programs in other U.S. cities as well as abroad.

In 1960 the Association, realizing that on its Garden Blocks there were many fine potential youth leaders, suggested to the Agricultural Extension Service that it would be glad to cooperate in organizing some urban 4-H Clubs. Their success has been a feature of the Program. At present there are 39 such Clubs with an enrollment of 714. Results of one Club's project are shown in Fig. 3.

MOLLIE H. STOCK
Reviewer

This section on weeds is a new feature of the American Horticultural Society's journal. Its editor is Dr. Loran L. Danielson, Leader, Weed Investigations, Horticultural Crops, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland 20705.

The purpose of this new service is to help Society members become knowledgeable about weeds and their control.

CONTROL OF COMMON MORNINGGLORY IN THE GARDEN

The renowned horticulturist, Dr. Liberty Hyde Bailey, loved all plants, and indeed all living things. In one of his many excellent dissertations on plant life, he described the beauty of a species of pigweed, *Amaranthus* sp. This may seem somewhat strange to the home gardener, who wages an annual battle against pigweed in his various vegetable and ornamental plantings. It is interesting that Joseph's-coat, *Amaranthus tricolor*, a relative of the pigweed plant mentioned by Dr. Bailey, is grown as an ornamental foliage plant by many gardeners.

The undisturbed natural habitats are filled with innumerable beautiful plants that contribute to our enjoyment of these areas. Many of these plants are closely related to certain domestic ones. The wild plants often lose their beauty for us, however, when they invade gardens and crop fields. One of these is the common morningglory, *Ipomoea purpurea*, a member of the morningglory family, *Convolvulaceae* (Fig. 1).

Description

Common morningglory, an annual twining or trailing plant, reaches a length of about 15 feet. Leaves are 2 to 3 inches long and alternate on the stem. Flowers are purple, red, blue, white, or variegated. It reproduces by seeds, which



PHOTOS, U.S. DEPARTMENT OF AGRICULTURE

Fig. 1. Common morningglory, *Ipomoea purpurea*. A. Root system with strong primary tap root. B. Flower with 5-lobed tubular corolla, style and stigma, and 5 stamens. C. Seed capsule. D. Seed.

are similar in shape to those of domestic morningglory. Seeds are spread to new areas by inclusion in top soil used in gardens, by wind and rain, mixed in crop and flower seeds, and by birds. Though this is a twining plant, it is not parasitic. The use of other plants for support increases its ability to compete

for light as it competes for nutrients and moisture.

Overgrowth by common morningglory destroys the aesthetic values of color, contour, and design, and retards growth of ornamental plantings. Overgrowth on such plants as beans, potatoes, melons, cucumbers, sweet corn, and others in the vegetable garden often prevents development of any usable produce (Figure 2). Common morningglory, found to some extent in all geographic areas, is most prevalent in the Southeastern United States.

Several other similar colorful twining plants belonging to this family are prevalent in most, or all, geographic areas. They include ivyleaf morningglory, *Ipomoea hederacea*, scarlet morningglory, *Ipomoea coccinea*; hedge bindweed, *Convolvulus sepium*; field bindweed, *Convolvulus arvensis*; and others. The two latter species are perennials. The control of these several species in the home garden is one of the most difficult gardening problems.

Control

Young seedling plants of the annual common morningglory can be destroyed by hand-hoeing or pulling. Perennial species are difficult to control, because of the rapid growth of sprouts from the roots and underground stems after removal of the tops.

Though the leaves give some clues, we cannot in general easily distinguish among the various morningglory species until we have examined all characters, including flowers. By the time flowers appear, it is usually too late to start an effective control program for perennial species. It is therefore necessary to plan ahead. You should plan a methyl bromide fumigation treatment of the soil, next spring before planting time, if your vegetable garden or annual ornamental beds were infested with any wild morningglory species last year. This should be done after the soil reaches about 70° F. It will involve only a few hours of work. A few days of waiting between treatment



Fig. 2. Wild morningglory seedlings emerged from the soil simultaneously with the sweet corn plant on the right and quickly twined around it. Normal leaf expansion and the normal orientation of corn leaves to the sun were prevented. The corn plant was severely stunted and did not produce any usable ears.

and planting are adequate. Methyl bromide cannot be used in established plantings of perennial vegetables or ornamentals.

Garden supply stores sell methyl bromide treatment kits for soil fumigation. Specific directions and precautions for safe and effective use and storage are given on the label.

Methyl bromide fumigation not only kills morningglory species, but it also kills the seeds, roots, and other storage organs of many other perennial and annual weeds. It is one of the most effective, single, weed-control treatments that the home gardener can use.

All agricultural chemicals recommended for use in this report have been registered by the U.S. Department of Agriculture. They should be applied in accordance with the directions on the manufacturer's label as registered under the Federal Insecticide, Fungicide, and Rodenticide Act.

L. L. DANIELSON

Plant Nomenclature

The Committee on Nomenclature and Registration of the American Horticultural Society has been charged with keeping the membership informed on name changes of important horticultural plants. This is the first of a series of notes which will be prepared by members of the committee. Each note will give the correct name for a plant in cultivation and explain the reasons for the new name. A bibliography will be provided for those readers who wish more detailed information.

The correct name is essential for communication and for information storage and retrieval. For this reason we use scientific names which are understood internationally rather than local common names which vary from county to county and from language to language. While name changes may seem bothersome, each change reflects an improvement in botanical knowledge. Often for horticultural material, especially, the change results from the correct identification of a plant in the trade which was unfortunately introduced under an incorrect name. Other name changes come from in-depth studies and a new understanding of the taxonomy of the plant; the same species may have been named several times in different parts of the world and the oldest valid name must be adopted; in a monographic study it may be found that two or more species or genera must be combined or a species or genus divided; in the former case the oldest valid name is adopted, in the latter, new names are given to new taxa recognized.

We communicate about plants through their names, and for this reason information concerning plant names is important to readers of this Magazine.

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***Asparagus densiflorus* (Kunth) Jessop
—A correction for *Asparagus myersii***

Asparagus densiflorus of southern Africa, is the name to be used for the plant known in gardens and the nursery trade as *Asparagus myersii* (sometimes misspelled as *A. meyeri*). This asparagus is often grown as an attractive tub plant with erect to somewhat arching stems, 2 to 2½ ft. tall, covered with numerous short branchlets which give the stems a plume-like effect. The small white flowers are borne on racemes shorter than the branchlets. The red berries are 1-seeded, and in cultivation the seeds are said to be viable.

According to Jessop (1966), *Asparagus densiflorus* occurs mostly in coastal areas of southern Africa in the south-eastern Cape and Natal in a variety of habitats from coastal dunes to open rocky places or woods. It is an extremely variable species but Jessop found no practical way of subdividing the species. This variability is borne out by the synonyms listed by Jessop: *Asparagus sarmentosus* J. G. Baker, not Linnaeus; *A. myriocladus* J. G. Baker; *A. sprengeri* Regel. The plants which we know in the garden and nursery trade under these names, if they are correctly identified, appear sufficiently different from the plant called *A. myersii* to warrant varietal or cultivar designation.

***Asparagus setaceus* (Kunth) Jessop—
A Correction for *Asparagus plumosus***

The most widely used of the cultivated species of *Asparagus* is probably the so-called asparagus-fern, *A. plumosus* J. G. Baker. According to Jessop, Baker's well known name was preceded by an earlier name, *Asparagopsis setacea*. This species occurs in southern Africa in the eastern Cape, Natal, the Transvaal, north to Rhodesia and east into Mozambique. It occurs mostly in forests, and in open country where there is support sufficient for its scandent habit.

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On Two Species of Cultivated *Plectranthus*

Two species of *Plectranthus* have become popular as hanging basket plants during recent years. They were determined to be *P. oertendahlii* R. C. E. Fries and *P. nummularius* Briquet. Acknowledgement is made to Dr. L. E. Codd, Chief, Botanical Research Institute, Department of Agricultural Technical Services, Pretoria, Republic of South Africa, for his assistance with these determinations.

These two species of *Plectranthus*, often confused with one another in cultivation, may be distinguished by their leaves. The leaves of *P. nummularius* are green on both surfaces but very pale beneath, whereas in *P. oertendahlii* the lower surface is purplish and on the upper surface the veins are outlined with white. Plants of these two species are pictured in *Exotica* 3, page 1022. *P. nummularius*, however, is incorrectly labelled as *P. australis*.

Plectranthus oertendahlii was described in Lund, Sweden, in 1924 from cultivated material. Its origin, as well as its occurrence in the wild, is unknown according to Dr. Codd, who saw the type specimen and living material when he visited Sweden in 1966. It presumably is of South African origin, since it shows affinities to South African species of this genus. *P. nummularius* occurs in Natal.

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Clematis viticella 'Betty Corning': A New Cultivar of Merit

A summer-long bloomer, *Clematis viticella* produces a profusion of fragrant, nodding flowers. Its ease of culture, its dense but graceful habit, and its hardiness make it a highly desirable perennial climber for home gardeners and horticultural connoisseurs. Native to southern Europe and western Turkey, it is known as one of the parents of *Clematis* × *jackmanii*, a popular hybrid with many cultivars. Unfortunately, *C. viticella* is scarcely seen in American gardens, although at least 25 cultivars, superior to the wild plant, have been selected. These cultivars, which originated in Europe, warrant attention in the United States.

The first American selection, 'Betty Corning', is described below. With its bold and delightful profusion of flowers for most of the growing season, it will certainly join the Hall of Fame for blue ribbon *Clematis*.

Description of *Clematis viticella*
'Betty Corning' n. cv.

Flowers bell-shaped, nodding, fragrant, generally 3 inches across, borne singly on

pedicels normally 3-8 inches (occasionally 10 inches) long. Sepals four, petaloid, spatulate with definite claw and limb 1½-2 inches long. Limb 1¼ inches at widest point, obovate and angulate, ending in a recurved mucronate point, at anthesis twisted and turned back. Claw 1 inch long, ¼ to ½ inch wide. Margins of both claw and limb distinctly undulate and erose. The inner surface of the sepals predominantly of the Purple-Violet group (80C to 80D), with margins and apices blending into the Violet-Blue group (91A) and the Violet group (88B). The base is of the White group (155D) with claw margins blending into the Violet group (87D to 88B). The outer surface of the sepals with its frosty luster is of the Violet-Blue group (91D) at the bases, with margins and apices blending into the Violet group (88C and 88D). The three prominent ribs of the claws are of the Violet group (88C to 88D). The 90-95 stamens have white filaments and light green to yellowish anthers. The 55-65 white styles are ¼-inch longer than the stamens. The twining compound leaves are composed of up to 25 leaflets that are occasionally irregularly lobed, and under ordinary growing conditions, in full sunlight, the foliage is rich dark green with the young growth often suffused with bronzy hues.

It is a vigorous perennial climber that trains well on trellises and fences. When trained with wire to a post, it provides a spectacular dense, broad cone of summer delight.

The plant has a long flowering period. In Albany, New York, flowering begins in June and extends into September. However, in Washington, D.C., flowers first appear in early May and extend into October. *Clematis viticella* 'Betty Corning' has admirably withstood below freezing temperatures to at least -20° F in Albany, New York and Boston, Massachusetts. It is also very drought resistant.



Clematis viticella 'Betty Corning'.



Three-inch flowers of *Clematis viticella* 'Betty Corning'.

This new cultivar was first noticed as a mature plant in 1933 in a private garden on Bertha Street in Albany, New York. It was discovered, named and propagated in 1936 by Mrs. Charles Platt (Dorothy Falcon Platt), the eminent plant artist from Philadelphia, Pennsylvania. Subsequently it has been distributed by many individuals; however, this article constitutes the first published description of the plant and its name.

Voucher herbarium specimens and photographs made from the magnificent plant in the garden of Mrs. Erastus Corning II, Albany, New York have been deposited in the herbaria of the U.S. National Arboretum, Washington, D. C. and the Arnold Arboretum, Jamaica Plain, Massachusetts.

All color readings are designated from the Royal Horticultural Society Colour Chart, 1966.

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Further Notes on *Bergenia*

As a student of the genus *Bergenia* I should like to make some comments on Emily Brown's contribution to Gardeners' Notebook in the Spring 1969 issue of this Magazine.

Firstly, a 'shocking pink' *Bergenia* planted for ground cover and winter flowers is almost certainly the old hybrid *B.* × *schmidtii* of which I have given an

account in *Baileya* 9: 20-26 (1961). *B. stracheyi* is white anyway, but is not generally a good garden plant; the illustration and description of the so-called *B. stracheyi* 'Alba' suggest a plant with more rounded and more massive foliage than is usual in *B. stracheyi*, and this impression is confirmed by a dried specimen of Mrs. Brown's plants preserved in the herbarium of the U.S. National Arboretum, Washington, D.C., which has been sent to me on loan by Dr. Frederick G. Meyer. The plant is, in fact, *B. ciliata* forma *ligulata*, a plant known under the name *B. ligulata*, which is illegitimate under the International Code of Botanical Nomenclature, but which horticulturists may find it convenient to retain. Mrs. Brown's specimen appears to be the large-leaved, pale-colored form of this plant, tender in eastern England, which is grown in the temperate house here and at the Royal Botanic Gardens, Kew, and which is mentioned on page 137 of my "Revision of the genus *Bergenia*" in *Kew Bulletin* 20: 113-148. 1966. I hope that the account of the genus in cultivation which I have contributed to the second edition (1969) of the Supplement to the *Royal Horticultural Society's Dictionary of Gardening*, edited by Patrick M. Syngé, will from now on enable more people to name their bergenias correctly.

Secondly, except in annuals and biennials, cultivar names are normally applied to clones, and these do not often come true from seed; indeed, where the cultivars are of hybrid origin one may be fairly certain that they will *not* do so. This is particularly the case in *Bergenia* where, as reported in my revision, plants are highly self-incompatible, so that if the plant is selfed, hardly any seeds are formed, and if a substantial seed crop is produced, then the mother plant must have been pollinated by another clone. Therefore one can be fairly sure that Mrs. Brown will not get the true 'Ballawley' if she grows seed from that clone. Incidentally 'Ballawley' was reported to be a cross between *B. delavayi* and *B. beesiana*; as these are both synonyms of *B. purpurascens* one could regard it as a cultivar of this species, but it seems possible that

another species besides *B. purpurascens* is involved. The species of *Bergenia*, naturally, can be raised true from seed, but only if two compatible clones are allowed to cross-pollinate in isolation or are artificially pollinated in isolation. The latter method produces enormous quantities of seed; germination is good and both germination and subsequent growth are rapid. The fact that Mrs. Brown's so-called *B. stracheyi* 'Alba' have seeded so well implies that more than one clone is present, or that the plants have crossed with another *Bergenia*.

Finally, I should like to point out that crevices in vertical rock faces are a frequent habitat for *Bergenia* in nature, so the seedlings in the wall in Mrs. Brown's garden have found themselves a copy of their natural habitat.

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A Program for Plant Introduction

When a plant is moved from one part of its geographic range to another, the translocated individual often behaves differently in the new area from other representatives of the species already there, with respect to time of flowering or fruiting, expansion or retention of leaves, photosynthetic efficiency and rate of growth. This is well known.

Equally well known is the fact that many plants of the eastern United States are likewise found in the highlands of Mexico and Guatemala; among them *Acer negundo*, *Berchemia scandens*, *Carpinus carolinianus*, *Cercis canadensis*, *Cornus florida*, *Gelsemium sempervirens*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Ostrya virginiana*, *Parthenocissus quinquefolia*, *Pinus strobus*, *Prunus serotina*.

No systematic effort has been made to correlate the above data into a program for plant introduction. A program for bringing certain of the plants listed above from the southern limits of their range (Mexico and Guatemala) into the eastern United States should be initiated, for in some instances, advances in horticulture or forestry would thereby

likely be achieved. Such introductions might well be tested at the U.S. National Arboretum and other such places in this country.

Expected results from this kind of introduction program might be extension of the flowering period of *Cornus*, *Cercis*, and *Gelsemium* in the mid-Atlantic states, thus extending the length of fall coloration for *Cornus* and *Parthenocissus*; and the increase of the photosynthetic period for *Liquidambar* and *Nyssa*.

An example may be cited of one result that might be expected. Marshall C. Johnston, on December 12, 1960, collected *Liquidambar* seed in a cloud forest ca. 3500 elevation, four miles above Xilitla, San Luis Potosí, Mexico; the seed reached me via Orland E. White; we now have five seedlings from that source. These plants regularly hold their leaves several weeks after the sweet gums in this part of Virginia have dropped theirs. Finally, in December, at a temperature of about ten degrees, the leaves on the Mexican plants are blasted by cold but are retained indefinitely. For these plants the photosynthetic period seems to have been extended considerably beyond that for the native Virginia sweet gums. No comparative observations have been made on the relative time of expansion of leaves in the spring.

Whether or not the Mexican introductions grow faster can only be determined by experiment. (More rapid growth would be of economic importance.) It is obvious that by utilizing sweet gums from different geographic areas the period of fall coloration can be lengthened.

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The Swedish Red Waterlily —*Nymphaea alba* f. *rosea*

For those who delight in tracing things to their likely beginnings, a visit to Lake Fagertärn in Tiveden, Sweden, would be exciting. Lake Fagertärn can



PHOTOS BY AUTHOR

***Nymphaea alba* f. *rosea* growing in Lake Fagertärn, Sweden.**

be reached by car in about four hours from the city of Gothenburg.

There, growing and maintaining itself since it was first reported in 1856, is *Nymphaea alba* f. *rosea*, one of the reported parents of many of our hardy waterlilies grown today that have red in them.

I have not personally been able to verify any other known place where *Nymphaea alba* f. *rosea* is to be found in its original natural habitat, except in Lake Fagertärn. This rare plant was later reported in 1882 from Lake Krok tjarn, and then again in 1919, from Lake Lillsjön, two small lakes near Lake Fagertärn.

As already mentioned, *Nymphaea alba* f. *rosea* was first found in 1856 in Lake Fagertärn, Sweden and described by C. Hartman in 1861 in his "Handbook on Scandinavian Flora." Shortly afterwards, the collecting of this plant began by private collectors. Alert hybridizers began using *Nymphaea alba* f. *rosea* to create new hardy horticultural forms for the garden.

Lake Fagertärn was at one time privately owned by a factory. In 1905 the owner, Carl Sahlin, put the lake and its waterlilies under permanent protection so that today no one may in any way harm the lake or remove any of its rare contents.

T. Lagerberg, in "Vilda Vaxter i Norden", 3rd revised edition (1957), states that not only *Nymphaea magnifica*

(= *Nymphaea alba* f. *rosea* × *candida*) but quite a number of the red-flowered forms which nowadays are to be found in the nursery catalogs under various names also certainly derive from Lake Fagertärn.

In the *Standard Cyclopaedia of Horticulture* by L. H. Bailey, revised edition (1950), H. S. Conard mentions the Swedish red waterlily of Lake Fagertärn and states that about 15 named red waterlilies must be classed as forms of *Nymphaea alba* f. *rosea*.

Conard mentions especially *Nymphaea alba* var. *froebelii*, *Nymphaea* 'Gloriosa', and *Nymphaea* 'Atropurpurea'.

Conard further mentions a long list of hybrids of the Swedish red waterlily from Lake Fagertärn with *Nymphaea tetragona* and also with *Nymphaea mexicana*.

It is interesting to note that the American *Nymphaea odorata* is also known in a red-flowered form, *Nymphaea odorata* f. *rubra*, from which hardy hybrids have been derived. And rather recently, a red colored form, *Nymphaea candida* f. *rosea*, has been found in both Norway and Finland.

Nymphaea tetragona has also produced a red form in nature, as reported from Finland, named *Nymphaea tetragona* f. *colorata*.

Those to whom I am indebted for help include the personnel of the Gothenburg Botanical Gardens, and particularly, Dr. Carl Fredrek Lundeval, curator at the Museum of Natural History in Stockholm.

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Lake Fagertärn, Tiveden, Sweden, home of *Nymphaea alba* f. *rosea*.

**The Endemic Flora of Tasmania—
Parts I & II**

Winifred Curtis and Margaret Stones. Ariel Press, London, England. Part I, 1967. 70 pages. Part II, 1969. pp. 71-142. Folio illustrated. Each part \$45.00.

The magnificent paintings found in this monograph put it into a class with the great "flower books" of the 18th and 19th centuries. Although this is a major work, changes in taste and the more critical needs of today's society result in less demand than formerly for this kind of work. Nevertheless, the need for detailed information on the world's plant resources, especially from remote areas, fully justifies such monographs as this. As Dr. George H. M. Lawrence aptly states in Part I, "There is a very definite place and an undeniable need in today's literature about plants for works abundantly and expertly illustrated with colour-plate reproductions. A market for the right work does exist."

Lord Talbot de Malahide of County Dublin, Ireland, who sponsors every aspect of the work, has taken the chance that a good market does exist. We can only hope the public will support and appreciate the value of the publication. The paintings have been executed with great skill by Margaret Stones, an Australian artist, now working in England. She is well known for her paintings in Curtis's *Botanical Magazine*.

Part I of the monograph contains 23 plates in 6-color litho offset, illustrating 38 species. The plates are folio, 16 x 11¾ inches in size. Printing is lavish and there are wide margins on each page. It opens with a Preface by Lady Casey, "Genesis" by Lord Talbot de Malahide, "The Colour-Plate Book of Today" by Dr. George H. M. Lawrence, "The Flora of Tasmania" by Sir George Taylor, and Introduction and text by Winifred M. Curtis. The color plates were skillfully done in Germany, and the Ariel Press in England has done an outstanding job of printing and binding.

The flora of Tasmania consists of about 1,200 native flowering plants, of which some 200 are endemic to the island state. Apart from one or two species of *Eucalyptus*, representatives of the unique Tasmanian flora are little known in cultivation outside of Australia. Few can travel to see these distant plants, but one can gain some impression of the plant life through the water-color paintings in this book, and one's interest in

growing some of the plants will no doubt be stimulated. The flora shows North Temperate, Malaysian, sub-Antarctic, and Australian affinities, and there are affinities with the flora of Chile and Tierra del Fuego in South America. For example, in the genus *Encryphia*, three species occur in Australia and three in South America.

To this reviewer the descriptions often seem a little too brief, and the ecological notes might have been expanded with some profit to gardeners as well as to botanists. Cultural notes are lacking in Part I, but in Part II Lord Talbot provides some good notes on cultivation based upon his own experience in Ireland and that of gardeners in Tasmania and Australia. The maps on the inside front and back covers of each volume are most useful, with the native habitat marked for each plant illustrated.

The finished work, when completed within a few years, will consist of 5 parts and 200 color plates. By all odds, this is a magnificent book and a modern classic in its field.

FREDERICK G. MEYER

Pioneering With Wild Flowers

George D. Aiken. Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632. 1968. 208 pages. Illustrated. \$8.95. (Library)

Senator George D. Aiken has written about the native plants, mostly herbaceous, that are found in the northeastern states, or perhaps farther south at higher elevations. He first published this book in 1935 when he operated a nursery in Vermont which specialized in native plants. The work has not been available for many years and has been revised by a commercial publisher. This edition is well illustrated by colored and black-and-white photographs by Charles Johnson.

Following the general discussions of culture, propagation, and soils, the chapters are arranged somewhat on the basis of plant relationships, e.g., the orchids, wild lilies, trilliums; or devoted briefly to a single plant such as the trailing arbutus or fringed gentian; or they may carry titles which indicate plant grouping according to their environment, for instance: Flowers of the Field; Roadside Neighbors; Ponds and Streams.

Each plant description may include a discussion of where the plant grows and what others may grow near by, what are its striking features, and in many cases, horticultural

suggestions on its culture and garden value.

This book is a good reference for those interested in growing native plants and also those who merely want to know more about our native wild flowers. It is not a book for identification.

CONRAD B. LINK

The Care and Feeding of Trees

Richard C. Murphy and William E. Meyer. Crown Publishers, Inc., 419 Park Ave. South, New York, N.Y. 10016. 1969. 164 pages. Illustrated. \$5.95. (Library)

This creation evolved from the collaboration of a New York public relations man, who acquired tree problems along with home ownership, with a professional tree surgeon-landscaper. (Judging from the planting plan on page 22, "landscaper" is merely a courtesy title.) The purpose of the book is to ". . . give easy-to-understand information about the care and raising of trees ". . . and to ". . . enable the layman to know more about his trees, have a greater appreciation and understanding of them, and . . . help him to perform routine tree-care chores himself. . . ."

The authors appear in some cases to have sacrificed depth and accuracy for popularization, e.g., their fanciful analogy of trees as living, breathing creatures with digestive tracts and other mammalian qualities; and their suggestions of not-recommended practices, such as putting a layer of peat at the bottom of a hole in which a tree is to be planted.

Aside from these few inaccuracies, the pages of text contain much useful information for the homeowner, together with illustrative figures, as well as frequent injunctions on safety and do's and don'ts for the actual performance of operations. Almost a dozen charts offer specific guidance on various aspects of tree care. Line drawings of leaves intended for identification are not drawn to scale and offer little but shape. The chart on insect and disease problems is

even less specific. Perhaps the best advice in the book is on when to seek the services of a qualified tree expert.

WILLARD WITTE

Wild Flowers of Martha's Vineyard

Nelson Coon. Dukes County Historical Society, Sponsor. Nelson Coon, Publisher. Vineyard Haven, Massachusetts, 1969. 170 pages. Illustrated. \$3.95. (Library)

Nelson Coon, whose garden writing is familiar to AHS members, has compiled this attractive small book which is basically a listing of plants reported to grow on the island of Martha's Vineyard. Many of the species are illustrated by black and white line drawings, sketches, and reproductions of old prints of varying quality. The book could not itself be used for identification but may be a useful supplement to a field guide or taxonomic key. Plants are listed by family with a few comments or anecdotes about each family. Some of the more interesting or conspicuous genera and species also merit comments.

In addition to the plants described, several other chapters will appeal to those with a general interest in the natural history of the island. These include a chapter on birdlife contributed by a local authority, a brief history of the island with information on the use of native plants by the Indians and colonists, edible plants of the present day, notable island trees, and seasonal scents.

Mr. Coon's compilation will undoubtedly be of greatest interest to those who live on Martha's Vineyard or visit there regularly, but it is also a good example of the type of popular study which could be written for other geographically or ecologically distinct areas. I am sure that regional studies such as this, written for the amateur, can contribute to a greater appreciation of our common natural heritage. Such an attitude benefits us all.

ROBERT L. BAKER

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The American Horticultural Society

THE DAYLILY HANDBOOK

With more than 12,000 named daylilies now available and some 800 new cultivars appearing each year, *The Daylily Handbook* is a 'must' for lovers of *Hemerocallis*. Published jointly by the American Horticultural Society and the American Hemerocallis Society, this volume is the most comprehensive book ever produced on the daylily. Thirty authorities on *Hemerocallis* contributed its 19 chapters and 5 appendices. Subjects covered are history of the daylily, the species, cultivars, developmental anatomy and physiology, breeding of diploid daylilies and miniatures, tetraploid daylilies, selecting and evaluating, introducing and registering, propagation, culture and diseases, and many others. The appendices list hybridizers, growers, breeders of tetraploid daylilies, recommended cultivars by climatic regions, and the all-time great daylilies. Edited by Dr. George M. Darrow, fruit specialist for the U. S. Department of Agriculture for 40 years, now a distinguished breeder of *Hemerocallis* and other award-winning ornamentals, and Dr. Frederick G. Meyer, research botanist in charge of the herbarium of the U. S. National Arboretum and editor of the Society's *American Horticultural Magazine*, 232 pages. 32 pages of color photographs. 60 black and white photographs and drawings. Paperback (only) \$4.40.



THE DAFFODIL HANDBOOK

Delightfully informative for the amateur gardener and an acknowledged necessity for the professional, *The Daffodil Handbook* is comprehensive in treatment and international in scope. The list of its 27 authors is a veritable Who's Who of the daffodil world. In 25 interesting chapters they present complete know-how for growing outstanding daffodils—and enjoying it. Included are garden guides, instructions on planting, structural and growth factors, soils, nutrition, hybridizing, cultural practice, pest and disease control, facts on hardiness, groups of unique daffodils, lists of breeders and trade sources, and a wealth of botanical and historical information on this well-loved garden star. The editor is George S. Lee, Jr., former president of the American Daffodil Society and recipient of its Meritorious Service Medal. 240 pages. 56 black and white photographs and drawings. Paperback—\$3.40. Cloth-bound—\$4.90.



THE PEONIES

Written expressly from the point of view of, and for the use of, horticulturists and gardeners, *The Peonies* handbook introduces the reader to a multitude of beautiful plants. Both the herbaceous peonies (Section I), and the tree peonies (Section II) are covered in depth by a committee of distinguished authors, each writing from a lifetime of experience in growing these superb plants about which so little is generally known. Its scope includes chapters on description, culture, propagation, checklists of varieties, lists of growers, botanical classifications, pests, diseases, breeding, history, and a comprehensive bibliography. It provides authoritative and enjoyable reading for the amateur, the professional grower and the scientist alike. Its editor is Dr. John C. Wister, *director emeritus* of the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College and internationally known for his brilliant work with lilacs, peonies and other ornamentals. 220 pages. 60 excellent black and white photographs and drawings. Paperback—\$3.90. Cloth-bound—\$5.40.





Cover illustrations

Front—Strawberry 'Midland.' A high quality home garden and local market variety for northeastern United States.

Back—Below, a pistillate plant of beach strawberry (*Fragaria chiloensis*) on the California coast. This, crossed with the meadow strawberry (*Fragaria virginiana*) by Duchesne in 1766, produced our modern cultivated strawberry (*Fragaria x ananassa*).

Back—Above, Strawberry 'Gem' (also sold as 'Superfection'). A standard everbearing variety for all of northern United States.

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