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ARNOLDIA



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BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 22

MARCH 16, 1962

NUMBER 1

THE MAJESTIC BEECHES

THE beeches are among the most majestic of our ornamental shade trees. They need space in which to grow — plenty of space, for with room all about them their beautiful outlines are truly superb. As a group they are tall, often wide-spreading trees. They are fibrous rooted so that their feeding roots are very close to the soil surface, hence it is difficult or impossible to get good growth from other plants beneath the spread of their branches. Actually, they are set off to best advantage if their branches are allowed to sweep the ground on all sides, and this is especially true of the pendulous branched forms.

There are about eight species hardy in the eastern United States. Three of these native of China (*F. engleriana*, *lucida*, *longipetiolata*), two native of Japan (*F. crenata*, *japonica*) and one native of eastern Europe and Asia Minor (*F. orientalis*) have little to offer as ornamentals when compared with the two commonly grown species *F. grandifolia* and *F. sylvatica*.

As a rule the American Beech is an upright growing tree, considerably taller than it is wide. On the other hand, the European Beech and many of its varieties are almost as wide-spreading as they are tall. They both have gray bark, that of the American Beech being considerably lighter. Both can be sheared and used in hedges tall or small. The most famous of these hedges, made of the English Beech, is one near Stobehill Castle in Scotland. Planted in 1746, this "hedge" is now 85 feet tall and still in pretty good condition.

The two species should not be confused as their leaves are quite distinct. The leaves of the European Beech are not as sharply toothed as those of the American Beech, and it does not sprout profusely from the base of the trunk as does the American Beech. There are no truly ornamental varieties of the American Beech but several of the European Beech. None of these, however, are suited for street tree planting because they are so large and each one needs plenty of space in which to grow properly.

[1]



Fagus — Recommended

grandifolia 90' Zone 3 Eastern North America American Beech

Native over a wide area of North America and an excellent ornamental, it does not do well under city conditions. The light gray bark is outstanding and the yellowish bronze autumn color is familiar to many. This species is differentiated from *F. sylvatica* in that the leaves have 9-14 pairs of veins and are markedly bristly or serrate all along the leaf margin, while the English Beech has only 5-9 pairs of veins and is only partially dentate along the leaf margins. The American Beech also suckers considerably more at the base.

sylvatica 90' Zone 4 Central and Southern Europe European Beech

An excellent ornamental tree with several fine varieties. The bark is slightly darker gray than that of the American Beech. This is unquestionably one of the best of the large ornamental shade trees. Many beeches in Europe have grown to tremendous size, one reported in England to be 100 feet tall with a trunk girth of 21 feet. It has been known and appreciated as an ornamental for centuries, one of the reasons why so many good ornamental varieties have been discovered.

sylvatica 'Asplenifolia' — this has fine-textured foliage with the leaves finely divided, similar to those of var. 'Laciniata' except that sometimes they are almost linear. The common name of Fernleaf Beech accurately describes its feathery foliage texture.

sylvatica atropunicea — this beech has originated at several places in Europe and possibly in this country also, accounting for the slight variation in foliage color, shape of leaves and even habit. It has been offered under the names of *atropurpurea*, *cuprea*, *nigra*, *purpurea*, *riversii*, *sanguinea* and *spaethiana*, among others. It is unfortunate that some nurserymen grow Purple Beech from seed, selecting the best and giving them "suitable" names. It would be much better if they were propagated asexually so that only the best forms would be perpetuated. W. J. Bean reports that the Purple Beech is not of garden origin, has been observed growing naturally in at least three places. One of these was a location in Switzerland where it was noted as growing in 1680. There were three trees, the survivors of a group of five which, according to the legend, had sprung up after five brothers had killed themselves. Since this variety does come partially true from seed, it is no wonder that several variations have sprung up, some brighter or deeper purple than others.

sylvatica 'Cuprea' — originated with George Loddegis in Great Britain about 1836, is actually a form of *atropunicea* with young foliage a lighter reddish bronze, giving rise to the common name Copper Beech.



PLATE I
Fagus sylvatica hedge.

sylvatica 'Fastigiata' — the Dawyck Beech, originating in Scotland nearly fifty years ago, this is definitely fastigiata in habit — one of the best trees with this general habit.

sylvatica 'Laciniata' — this Cutleaf European Beech has narrow leaves often deeply cut to almost regularly lobed. It differs from the var. 'Asplenifolia' in having wide, more regularly shaped leaves. It grows into a wide-spreading, beautiful specimen of fine texture.

sylvatica 'Pendula' — the popular Weeping Beech, of which there are many excellent specimens in this country and abroad, has several variations, some more wide-spreading than others. Only the best of these forms should be propagated asexually. It makes its finest appearance where its branches can sweep the ground.

sylvatica purpureo-pendula with pendulous branches and purple leaves — the Weeping Purple Beech.

sylvatica 'Quercifolia' — with oak-like foliage — the Oak-leaved Beech with leaves narrow and irregularly toothed.

sylvatica 'Rivers' is a purple-leaved form originating in the English nursery of Thomas Rivers before 1869, and has proved one of the most popular over the years. The young foliage is reddish but turns a deep purplish later and remains that color throughout the summer. The tree is densely compact and symmetrical — an excellent specimen.

sylvatica 'Rohani' with purple leaves very similar in shape to those of var. 'Laciniata.'

sylvatica 'Roseo-marginata' — purple leaves with an irregular light pink border. This tree, of course, lacks its full complement of chlorophyll; hence it is more difficult to grow than the others. In full sun the delicately colored leaf margin may burn to brown, so it should be grown in a slightly shaded situation. At best it can only be considered of interest while small.

sylvatica 'Rotundifolia' — the Roundleaf Beech, originating in Woking, England, about 1872, is one of the best of all these varieties. The leaves are rounded, only $\frac{1}{2}$ - $1\frac{1}{4}$ inches in diameter. The tree in the Arnold Arboretum has been growing since 1903 and is now 50 feet tall, with a branch spread of 42 feet. The branches are horizontal but turned upward at the end, making a dense, beautifully branched pyramidal tree. This particular tree has the trait of holding its leaf buds shut until nearly two weeks after those of all other *F. sylvatica* varieties are fully open. This variety should be grown a great deal more than it is.



PLATE II

Fagus sylvatica 'Pendula.'

sylvatica 'Spaethiana' is the most recent addition to this group of forms, originating in the Spaeth Nurseries of Germany a few years ago. The Dutch nurserymen offering this form claim that it keeps its deep purple color throughout the entire summer. The Arnold Arboretum has only one small plant, so it is too soon for us to say whether it makes an ornamental superior to the variety *atropunicea* itself.

sylvatica 'Tortuosa' — the seventy-five-year-old tree in the Arnold Arboretum is 18 feet tall and about 36 feet in diameter with a flat top similar in general outline to that of *Tsuga canadensis pendula*. Because of its very slow growth and unique picturesque habit, there is not a great demand for this plant.

Fagus — Not recommended

crenata — branching is very open, not good for this reason. Tree in Arnold Arboretum is 2 feet in trunk diameter and 50 feet tall.

engleriana — no better an ornamental than the native American Beech.

grandifolia caroliniana — similar in most respects to species.

grandifolia pubescens — similar in most respects to species.

japonica — an upright branched tree, with leaves the same size and shape as those of *Betula lenta*. Nothing especially unusual about it.

longipetiolata — no better than recommended species.

lucida — makes a poor ornamental.

orientalis — a fine specimen in the Arnold Arboretum with a $2\frac{1}{2}$ foot trunk. However, although the leaves are slightly larger than those of *Fagus sylvatica* it seems to be more open and has no greater ornamental value.

sieboldii — synonym for *F. crenata*.

sylvatica atropurpurea — synonym for *F. sylvatica atropunicea*.

sylvatica albo variegata — poor foliage.

sylvatica 'Cristata' — an unattractive variety, slow growing, leaves clustered and somewhat curled or contorted.

sylvatica crispa — synonym for *F. sylvatica* 'Cristata.'

sylvatica dentata — received by the Arnold Arboretum from Holland in 1903, but it turned out to be *F. sylvatica* 'Laciniata.'

sylvatica grandidentata — a tree of this name has been growing in the Arnold Arboretum since 1912.

sylvatica heterophylla - synonym for *F. sylvatica* 'Laciniata.'

sylvatica incisa - synonym for *F. sylvatica* 'Laciniata.'

sylvatica 'Latifolia' - leaves broad and large, nearly entire; actually no better an ornamental than the species.

sylvatica 'Luteo-variegata' - poor colored foliage.

sylvatica macrophylla - synonym for *F. sylvatica* 'Latifolia.'

sylvatica nigra - synonym for *F. sylvatica atropunicea*.

sylvatica purpurea - synonym for *F. sylvatica atropunicea*.

sylvatica - 'Quercoides' - differs little from recommended varieties.

sylvatica sanguinea - differs little from recommended varieties.

sylvatica 'Tricolor' - leaves with white variegations, pink margin. This does not look well except possibly for a short time in the spring when the leaves unfold. In the full sun, the leaves tend to burn and turn brown, especially along the pink margin. If grown at all it should be planted in partial shade.

DONALD WYMAN

1962 Spring Program of the Arnold Arboretum



FIELD CLASSES

Spring Field Class in Ornamental Plants Instructor: Dr. Donald Wyman

Arnold Arboretum at Jamaica Plain. The class will meet in front of the Administration Building (inside the Jamaica Plain Gate) at 10 A.M. for a two-hour period. Dr. Donald Wyman will lead the class in a study of the trees and shrubs growing in the Arboretum, as they come into flower. In case of rain the meetings will be held indoors.

Five meetings. Friday mornings, 10:00-12:00, April 27-May 25. Fee \$2.00

Field Botany I Instructor: Mr. Peter Green

Case Estates at Weston. The class will meet by the large barn at 135 Wellesley Street in Weston at 2 P.M. for a two-hour period. Mr. Peter Green of the Arnold Arboretum staff will conduct the classes in a study of the cultivated and native plant materials growing on this hundred-acre tract. The group will meet rain or shine.

Five meetings. Tuesday afternoons, 2:00-4:00, May 8-June 5. Fee \$2.00

Registration for the two field classes should be made in advance by mail or by phone. Applications should be addressed to Mrs. T. P. Walsh, Arnold Arboretum, Jamaica Plain 30, Mass.

OPEN HOUSE

Case Estates in Weston **Sunday, May 13th**

Staff members of the Arnold Arboretum will be about the grounds from 10 A.M. until 5 P.M. to explain the plantings and to answer questions pertaining to them. The Shrub and Perennial Garden, Ground Cover Plots, Small Ornamental Tree Plots, native wooded areas and experimental plantings are all worthy of a visit at this time of year.

OPEN HOUSE

Arnold Arboretum in Jamaica Plain **Sunday, May 20th**

Lilac Sunday is the best time of year to see the thousands of trees and shrubs in the Arboretum when many are at the peak of their bloom. Of special interest will be the new Dana Greenhouses, the new Bonsai house and the surrounding plantings. Staff members will be on the grounds from 10 A.M. until 5 P.M. to discuss questions concerning the plants with those interested. Parking will be permitted along the Meadow Road, but no driving will be permitted through the grounds.

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NUMBER 2

BARBERRIES

AS most nurserymen know, "Quarantine 38" and its numerous revisions govern the interstate shipment of barberries (as well as *Mahonia* and *Mahoberberis*). In the fifth revision of the list of rust-resistant species and varieties (made July 15, 1959) some 64 barberry species and varieties were listed as being rust-resistant, and not all these are worthy ornamentals. Only about two dozen of these were listed as being in the trade in the last issue of the Plant Buyer's Guide.

Because of quarantine restrictions, it is useless to grow *any* of the barberries susceptible to the black stem rust disease.

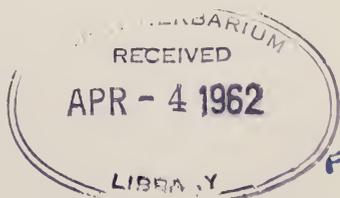
Rehder notes that there are 175 species in Europe, Central Asia, South America and a few in North America, so the Plant Quarantine #38 (and the susceptibility of certain barberries to the black stem rust of wheat) has done a lot to reduce the number of barberries it is possible to grow for sale and interstate shipment in the United States.

Barberries are either deciduous or evergreen shrubs grown for their flowers, fruits, foliage and habit.

Because most have thorns, they make excellent barrier plants and so are widely used in hedges. It should not be forgotten, however, that because of their other good characteristics they also make fine specimens. Certain types like *B. koreana* and *gilgiana* are excellent substitutes for the rust-carrying *B. vulgaris*.

There are nineteen states where eradication programs are being carried out, namely, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota, Virginia, Washington, West Virginia, Wisconsin and Wyoming. Each year more than 600 nurseries and dealers are inspected and issued certificates permitting interstate shipment of rust-free barberries. During the past few years very few susceptible plants have been found in these establishments. The principal problem is the hybrid or off-type bush resulting from impure seed. This is especially true in the eastern states where *Berberis vulgaris* is found in abundance.

[9]



The U.S. Department of Agriculture is doing an excellent job in trying to eradicate all the rust-carrying barberries from all commercial growing sources in the United States. Less than 55,000 square miles of an original 1,064,084 remain infested or potentially infested with rust-spreading barberries in the nineteen states engaged in eradication. In states outside this area, the approved nurseries (some 600) and their environs have been cleared of all rust-susceptible plants as a part of eligibility for certification.

Since all the rust-free barberries are not outstanding ornamentals, I will list only the 28 in the group which are. All others not mentioned should be considered for discarding. Actually, the barberries listed in Quarantine 38 include most of the best of the entire group. The Japanese barberry and its many excellent varieties are included, as well as some of the best of the evergreen types. It is a fortunate coincidence that this particular quarantine has worked out this way. The following, then, are the best of the rust-free barberries, and they are diversified enough to provide plenty of variation in height, hardiness, foliage, texture and color, as well as variations in fruit color and plant habit, to fill almost any landscape need.

Recommended Berberis

beanniana 8' Zone 6 W. China Bean's Barberry

Deciduous, producing 10-20 flowers together in a panicle, fruit $\frac{3}{8}$ inches long, egg-shaped, bright purple, apparently fruiting better when 3 to 4 plants are grown together.

buxifolia 9' Zones 5-6 Chile Magellan Barberry

An evergreen, native in the area about the Straits of Magellan, with orange yellow flowers and dark purple fruits.

buxifolia nana — a dwarf compact form under 2 feet tall.

Dwarf Magellan Barberry

calliantha 3' Zone 7 S. E. Tibet

A low evergreen shrub with fruits slightly egg-shaped, blue-black in color and covered with a gray bloom, and very conspicuously grayish white beneath.

candidula 2' Zone 5 China Paleleaf Barberry

A low evergreen shrub with arching branches, leaves produced in the angles of the spines. Purplish fruit.

× **chenaultii** 4' Zone 5 (*verruculosa* × *gagnepainii*) Chenault Barberry

An evergreen promising to be one of the best of the evergreen barberries in the Arnold Arboretum because of its vigorous growth and good condition of its foliage all winter long. Our older plants are still under four feet tall. The sparsely produced fruit is dark bluish.



PLATE III

Flowering branches of *Berberis koreana*.

concinna 3' Zone 6 Himalayas Dainty Barberry

Deciduous to half evergreen, not hardy in Boston. The leaves are white beneath and the red fruits are $\frac{1}{2}$ – $\frac{3}{4}$ inches long and solitary. This is recommended only because of its low habit; otherwise it is not especially outstanding.

darwinii 6–10' Zone 7 Chile Darwin Barberry

A lustrous dark-leaved evergreen with racemes of 15–25 golden yellow to reddish flowers in each raceme. The fruit is dark purple and the leaves are $\frac{3}{4}$ inches to 1 $\frac{1}{2}$ inches long. In England this is so popular it is considered one of the best of all the evergreen shrubs. Good as specimen or *en masse*.

gagnepainii 6' Zone 5 W. China Black Barberry

With evergreen leaves 1 $\frac{1}{2}$ –4 inches long, having spines on the margins. The fruit is black and covered with a grayish bloom. Not especially outstanding, but its foliage and habit provide variation in the winter.

gilgiana 10' Zone 5 N. China Wildfire Barberry

Deciduous shrub with pendulous clusters of yellow flowers and bright red fruits—an excellent substitute for *Berberis vulgaris*. In the fall the foliage turns a vivid scarlet. This is superior to *B. circumserrata* because of its longer clusters of flowers, and seems to be more dense than the Korean barberry.

juliana 6' Zone 5 C. China Wintergreen Barberry

Evergreen, with a dense upright habit, this is more hardy and, I think, a better ornamental than *B. sargentiana*. It grows vigorously, has bluish-black fruits and spiny leaves up to 3 inches long. It is a taller growing shrub than *B. chenaultii* and has been widely used.

koreana 8' Zone 5 Korea Korean Barberry

Another excellent deciduous substitute for the old *B. vulgaris* with arching branches. This species has pendulous clusters of rounded fruits that remain on the plant a long time as well as a very deep red autumn color. This species and *B. gilgiana* are excellent deciduous barberries, making it unnecessary to grow the more common *B. vulgaris* which is susceptible to the black stem rust of wheat.

linearifolia 1 $\frac{1}{2}$ ' Zone 7 Chile Jasperbells Barberry

A low evergreen with 3–7 orange to crimson flowers in a cluster. The fruit is dark blue to black. Recommended especially for its low size, but only for growing in the warmer parts of the country.

×**lologensis** 5' Zones 7–8 (*darwinii* × *linearifolia*) Lolog Barberry

A natural hybrid, intermediate between the parents but with flowers larger



PLATE IV

Foliage of three recommended *Berberis*: (left to right) *B. verruculosa*, *B. chenaultii* and *B. gagnepainii*.

than those of the Darwin Barberry. Comparatively new in America (it was found in 1927), it makes a splendid ornamental evergreen in the warmer parts of the country.

×**mentorensis** 7' Zone 5 (*julianae* × *thunbergii*) Mentor Barberry

Originated in 1924 by Mr. Horvath of Mentor, Ohio. It is semi-evergreen and shows many characteristics of both parents. This is an excellent substitute for the more tender evergreen barberries in the North, for it has withstood temperatures as low as -20° F. in Ohio without injury. Then, too, it has a deservedly good reputation in the Midwest for withstanding hot, dry summers better than any other barberry. Our plant is now 7 feet tall and 12 feet across.

replicata 4' Zone 7 S.E. China Curleaf Barberry

An evergreen with red to purple-black fruits; leaves 1–2 inches long borne in clusters of 3–5.

×**stenophylla** 9' Zone 6 (*darwinii* × *empetrifolia*) Rosemary Barberry

Originating before 1864, this narrow-leaved evergreen now has many forms. It produces a wealth of golden yellow flowers in the spring, each about $\frac{1}{3}$ inch in diameter. These are followed by black berries. It is especially valued south of Washington where it develops into a very graceful specimen. It is often used in England in hedges, and in the Pacific Northwest. Some of the varieties, like *gracilis*, are actually dwarf, growing only 3–4 feet tall, while one named 'Nana Compacta' is only about 1 foot tall.

thunbergii 7' Zone 5 Japan Japanese Barberry

The most serviceable of all the barberries and an excellent hedge plant and specimen, even though it is common. Its excellent yellow flowers, red fruits which usually last throughout the winter and scarlet autumn color are all well known assets. Not so well known, perhaps, are some excellent varieties:

atropurpurea – with reddish leaves throughout the season.

atropurpurea 'Erecta' – discovered in the summer of 1951 in a block of two-year seedlings in the Marshall Nurseries, Arlington, Nebraska. It is of upright habit, apparently a sport of *B. thunbergii atropurpurea*.

atropurpurea 'Red Bird' – this was selected as a single plant from a block of *B. thunbergii atropurpurea* in the Willis Nursery Co., Ottawa, Kansas, prior to 1959. A note by the introducer states that it is characterized by its brilliant color and dense habit of growth, being larger in size than 'Crimson Pygmy' and being typical of the standard *B. thunbergii atropurpurea* in general habit, but of a much better color. The leaves are larger than those of *atropurpurea*.



PLATE V

Berberis thunbergii. These 20-year-old plants growing in the Arnold Arboretum have never been pruned.

'**Crimson Pygmy**' - this plant originated in Holland prior to 1952 when we first obtained a specimen from Wayside Gardens of Mentor, Ohio. It is also being sold under the names of 'Little Gem,' 'Little Beauty,' and *B. thunbergii atropurpurea nana* as well as 'Crimson Pygmy,' the last name being supposedly "agreed upon" by several nurserymen growing it. However, once a plant is distributed under one name, it is most difficult to rename it and expect everyone to follow suit, especially if the proper rules of nomenclature in naming new cultivars have not been followed in the first place.

In any event, plants 8 years old are only 2 feet high and 3 feet broad. The foliage is red to reddish - if grown in the full sun. The young foliage has a brighter red color when it first appears than does the mature foliage. This makes an excellent spot of color in the sunny foundation planting, or it can be well used as a most colorful low hedge.

thunbergii 'Erecta' - Plant patent #110, 1936 - Introduced by the Cole Nursery Company, Painesville, Ohio, and now commonly grown in nurseries. Our 28-year-old plant is 5 feet tall, 10 feet across, yet all the branchlets are definitely upright.

'**Globe**' - this plant we received under the name of *Berberis thunbergii nana* from the Hill Top Nurseries, Casstown, Ohio. It was patented August 4, 1936 (#189) and called 'Globe' barberry. It is still offered by that nursery. Our plant is dense and globose in habit, 27 inches tall and 4 feet in diameter. It is green-leaved, definitely not the small-leaved variety *thunbergii minor*.

minor - a truly excellent plant with smaller leaves, flowers and fruits than the species. Dense and rounded in habit of growth, it is in every way a miniature *B. thunbergii* and should be used far more than it is.

'**Thornless**' - merely a novelty, without thorns. Our specimen is 4 feet tall, 6 feet across and globe-like - a fine specimen.

'**Variegata**' (Plant patent 867; August 30, 1949) - originating before 1947 as a chance seedling among 20,000 plants of *B. thunbergii* in the nurseries of Alex Toth, Madison, Ohio, this is unusual for its variegated foliage. The leaves are predominantly green with spots, splotches or dots of white, light gray and yellow. Otherwise the flowers and fruits are similar to those of the species.

verruculosa 4' Zone 5 W. China Warty Barberry

Evergreen with spiny leaves, justly valued for its low, compact habit and its lustrous dark green leaves which are white on the under side. The black fruit is covered with a grayish bloom.

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NUMBER 3

THE BIRCHES

THE birches have long been popular ornamental trees in America, chiefly in the northern United States and Canada. Several are native Americans, but many species have been introduced from Europe and Asia. In general, they are graceful trees, the most popular being those with white bark on trunks and larger branches. Some of the others are very serviceable, either because they will grow well in wet soil or because they will exist as well as any other trees, or better, in dry, poor soils.

Many of the exotic species and varieties, although they may be interesting botanically, have little in addition to offer as ornamentals when compared with those recommended.

In general, the birches are rather short-lived and are difficult to transplant, so that to insure success they should be balled and wrapped in burlap. They might best be moved in the spring. Arborists know that they are persistent "bleeders," and that pruning is best done at almost any time of year except in the spring when the sap is running. Large branches seem to break readily under heavy coats of ice and snow, yet some, like the Gray Birch, have trunks that are extremely pliable. I have seen plants of this species 20-30 feet tall, covered with ice and bending down to, or touching, the ground. Yet the additional weight had come so gradually that after the ice had melted, the trunks eventually returned to their normal upright position.

Most of the birches have bright yellow autumn color. The flowers are unisexual, with both male and female flowers on the same tree. The maturing of the catkins in the early spring and blown pollen in the air are two of the first signs of plant activity. Those familiar with the woods know that the birch is one of the few woods which will burn when it is "living" or "green," making this tree a welcome source of fuel when the woodsman is in a hurry to start his campfire.

Birches are susceptible to at least two serious insect pests which, if not properly controlled, can mar their effective use as ornamentals. The first is the bronze

[17]



birch borer, a small, flat-headed grub about a half inch to an inch long which eats just under the bark and, if present in numbers, can kill the tree. *Betula pendula* is especially susceptible to this insect. I have seen mature trees in the Cleveland area which had to be removed because this insect had killed the tops of the specimens and done the damage before control measures were taken.

Betula papyrifera is supposed to be much less susceptible to the inroads of this insect. The control, spraying with DDT or Dieldrin in late May and twice more at two-week intervals, is a chore which is sometimes overlooked. When this happens, and especially if the tree is *B. pendula* and growing in poor soil, attacks from the insect may soon follow.

The other insect which is most troublesome in New England, at least, is the birch leaf miner, a small insect which eats its way between the upper and lower epidermis of the leaf. If and when this happens, there is little that can be done. The leaf is marred for the rest of the season. Spraying with Lindane and Malathion is effective, if done about the first of May and when followed at 10-day intervals with two additional sprays. The second brood of insects appears about July 1, when another spraying (followed by still another on July 10) should be given.

With these hazards in mind, many a grower will not want to have a large number of birches. The list of fourteen here recommended is far too many for any one grower, but these are the better ones.

Of those recommended, *B. papyrifera*, *pendula* and *populifolia* and their varieties and *platyphylla* and its varieties have white bark. Those of us living in the northern United States and Canada have learned to appreciate the native Canoe Birch best of all. It does not have the graceful form or branching habits of *B. pendula* and its varieties, but when one has to consider the inroads of the bronze birch borer, it may well be that the Canoe Birch is the safer of the two species to plant.

The Gray Birch is a much smaller tree and is valued by landscape men because it grows in clumps, although it is not nearly as tall, nor does it have as clear a white bark as does the Canoe Birch. *Betula platyphylla* is the Asiatic counterpart of the Canoe Birch in America and the European Birch in Europe. Actually, it might be the first to eliminate from this short list of recommended white-trunked trees.

The native American River Birch (*B. nigra*), the Sweet Birch (*B. lenta*) and the Dahurian Birch of northeastern Asia are the other birch species recommended which do not have white bark, but nevertheless have ornamental values of their own. The River Birch is chiefly valued as a tree for wet soils—otherwise, it need not be used. The Sweet Birch is an excellent ornamental from the standpoint of foliage, general shape, and the vigor with which it grows. The Dahurian Birch has an interesting bark formation, but if not deemed desirable, this might be another of these recommended species to omit.



PLATE VI
Betula pendula tristis

Although usually associated with northern plantings, both *Betula nigra* and *B. pendula* have been noted as doing well in California. The Yellow Birch (*B. lutea*) is native down the eastern coast into Florida. So this graceful, colorful group of trees does have merit over a wide area, the main point being that they do have problems of growth which should be thoroughly studied and understood before any number are grown or planted on a large scale.

Birches Recommended

davurica 60' Zone 4 Northeastern Asia Dahurian Birch

Somewhat similar to the River Birch but, in the Arnold Arboretum at least, this is doing well on a dry, gravelly soil; hence it can be used as a substitute for the River Birch in dry situations where that species will not grow. The bark is reddish brown, curling and exfoliating in regular pieces an inch or so square.

lenta 75' Zone 3 Eastern United States Sweet Birch

A densely pyramidal tree, at least while young, but rather round-topped at maturity. The golden yellow autumn color, its habit and its ability to grow in rugged terrain are its outstanding characteristics. The cherry-like bark is dark and interesting, and the bark of young twigs has an aromatic flavor.

lenta laciniata — plants with cut leaves have been found, but the whereabouts now of living specimens is unknown.

nigra 90' Zone 4 Eastern United States River Birch

A pyramidal tree while young, with reddish brown exfoliating bark. Typically found along stream beds and in lowlands where the roots can easily penetrate to water. In fact, the trees in nature often have their roots in water standing for several weeks in the spring. It is not a long-lived tree, often has poor crotches and need be considered only for use in wet soil situations where other trees might not do well.

papyrifera 90' Zone 2 Central and northeastern N.A. Canoe Birch

This tree is familiar to everyone and is the most popular of all the birches for ornamental use. It is a larger-growing tree than the European White Birch, having a trunk which is larger and more clear of markings than most of its European relatives. It has proved itself less susceptible to disastrous attacks of the bronze birch borer; hence it has added merit as a valued ornamental. A number of botanical varieties have been named. Some are merely geographical varieties, but as far as I can tell, none is superior to the species as an ornamental tree.

pendula 60' Zone 2 Europe and Asia Minor European Birch

A pyramidal, short-lived tree, very popular in Europe and planted profusely



PLATE VII
Betula pendula fastigiata

for many years here in America, as well. It is pyramidal in habit, with a white-barked trunk and older branches and very graceful, slightly pendulous lateral branches. Formerly termed *B. verrucosa* or *B. alba*, it will be found in many American catalogues still listed under the latter name. The leaves are smaller and more triangular than those of *B. papyrifera* and the bark is not as clear as that of our native Canoe Birch. It also is short-lived, although many beautiful trees of the species or one of its varieties can be seen. There are even some in southern California. Unfortunately, the bronze birch borer seems to attack this more frequently than it does other birches and many a tree, just as it reaches a good size, has been known to be attacked high on the trunk so that the top is completely killed, thus spoiling it as an ornamental specimen.

pendula 'Fastigiata' – columnar, dense and beautiful while young.

pendula 'Gracilis' – similar to the variety 'Tristis,' but with leaves deeply cut. This is the popular Cutleaf European Birch, gracefully pendulous in habit.

pendula 'Purpurea' – the Purple Birch, supposedly with purple leaves, but I have never seen a good specimen.

pendula 'Tristis' – the Slender European Birch, with slender, pendulous branches and rounded, regular head.

pendula 'Youngii' – Young's Birch, a tree with an irregularly branched habit, the conspicuously pendulous branches being more marked than those of the variety 'Tristis.'

platyphylla japonica 60' Zone 4 Japan

This tree has an interesting pattern of ruffled white bark.

platyphylla szechuanica 60' Zone 5 Western China

The white bark peels off in paper-thin sheets. This is from the high mountains of extreme western China and is probably the best form of this species. It is like our native Canoe Birch but the twigs are a polished red-brown and the thick, blue-green leaves remain on longer in the fall than those of most other birches. The variety *kamtschatica* may be hardy as far north as Zone 2.

populifolia 30' Zone 4 Northeastern North America Gray Birch

Commonly known, grown and planted, this is another short-lived birch which grows in clumps, seldom appearing as a single-trunked tree. It is a plant for poor soils, with white bark spotted with blackish marks where branches have been and is popular for planting in small gardens where the taller-growing Canoe Birch would be out of place. Although it is short-lived, the trunk seems to have great

resilience, often bending to the ground under burdens of snow and ice and then springing upright once the weight has been removed. In burned-over areas it is one of the first trees to reappear, especially on poor, rocky soils, and forms an excellent nursing cover for seedlings of more valuable timber trees.

DONALD WYMAN

ERRATA

In the issue of March 30, 1962 (*Arnoldia* 22: 2) on barberries, pages 14 and 16, the following should have been listed thus:

thunbergii atropurpurea

thunbergii atropurpurea 'Erecta'

thunbergii atropurpurea 'Red Bird'

thunbergii 'Crimson Pygmy'

thunbergii 'Globe'

thunbergii minor

thunbergii 'Thornless'

thunbergii 'Variegata'

1962 Spring Program of the Arnold Arboretum



FIELD CLASSES

Spring Field Class in Ornamental Plants Instructor: Dr. Donald Wyman

Arnold Arboretum at Jamaica Plain. The class will meet in front of the Administration Building (inside the Jamaica Plain Gate) at 10 A.M. for a two-hour period. Dr. Donald Wyman will lead the class in a study of the trees and shrubs growing in the Arboretum, as they come into flower. In case of rain the meetings will be held indoors.

Five meetings. Friday mornings, 10:00-12:00, April 27-May 25. Fee \$2.00

Field Botany I

Instructor: Mr. Peter Green

Case Estates at Weston. The class will meet by the large barn at 135 Wellesley Street in Weston at 2 P.M. for a two-hour period. Mr. Peter Green of the Arnold Arboretum staff will conduct the classes in a study of the cultivated and native plant materials growing on this hundred-acre tract. The group will meet rain or shine.

Five meetings. Tuesday afternoons, 2:00-4:00, May 8-June 5. Fee \$2.00

Registration for the two field classes should be made in advance by mail or by phone. Applications should be addressed to Mrs. T. P. Walsh, Arnold Arboretum, Jamaica Plain 30, Mass.

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 22

APRIL 27, 1962

NUMBER 4

HAWTHORNS

IT is really difficult for anyone who knows the hawthorns and their many troublesome pests to recommend them. They are mostly small trees, with white flowers, a few varieties have pink to red flowers, and usually red fruits. A large number of them are natives of North America, and most of these of course are the ones that have conspicuously red autumn color. They are dense in habit, mostly with vicious thorns, and so no one looks forward to the prospect of having to prune them.

At one time, the Arnold Arboretum had over 500 species and varieties in its collection. They were a major interest of Professor Charles Sprague Sargent, and he has written much about them. However, as time went on, and newer plants became available for ornamental planting and possibly newer insects became more numerous it became clearly evident that the majority in this great collection would not prove to be prime ornamental plants to be sought after for garden planting. Many botanists have studied this group, making new species and re-grouping old ones, so that names have been changed during the past fifty years. Many species show strikingly similar characteristics and are hard to tell apart one from the other.

It is of interest to note that only 28 species and varieties of this great group of trees have been thought of sufficient ornamental value to be offered for sale currently by American nurserymen issuing catalogues. Of these 28, ten species and varieties have been listed by only one nursery so it is clear that there are not too many hawthorns popular today.

Of course there are many of the native species that are practically identical if their use in the landscape is considered. Unquestionably some of the local native species are just as good in their areas as those species and varieties in the following list. Here again, it is presumptuous for one individual to attempt to "cut down" the imposing list available in this country, but it is done rather relentlessly, to bring before American growers a few that might be designated outstanding.

[25]



Species and varieties doing well locally in the range of their habitat are naturally among the easiest to establish. Such plants, where they are used well and serve a purpose, should not be discarded.

Many of the species can be sheared and have been used in large clipped hedges. The Cocksbur Thorn is one example and has been widely used for this purpose in the past. Here again, however, hawthorns can not be recommended for this purpose in many areas because of serious pest problems.

Fireblight takes its toll on many an old plant, some years more heavily than others. Juniper rust and hawthorn blight are other diseases often troublesome. Lace bug, mites, leaf miners, woolly hawthorn aphid, cottony maple scale, *Lecanium* scale, scurfy scale, leaf skeletonizers, tent caterpillars, western tussock moth, Japanese beetle, various borers — these are only some of those listed as troublesome to hawthorns.

Then too, many are difficult to transplant, and certainly they are difficult to handle and propagate in the nursery. All these things considered, one should think several times before using hawthorns on a large scale.

On the credit side, they will thrive in poor soils, they will grow almost equally well in alkaline and acid soils, they are dense in habit and often picturesque because of their wide-spreading and horizontal branches. They have colorful interest in the spring and fall and some of them retain their fruit all winter. If the foliage goes unmarred in the summer, many species present a glossy foliage that has merit in its own right.

A close examination of the two dozen listed will show that there are some with unusually good red or pink flowers, others are outstanding for their habits of growth, still others have yellow to orange fruits. Even two dozen hawthorns seems too many of this questionable group but I felt that all unique forms should be included as well as some with red flowers and yellow fruits. Then too, some are listed because they are suitable for special areas about the country.

If these things were not considered, I would list only six, namely, *Crataegus crus-galli*, *lavallei*, *nitida*, *oxyacantha* 'Paulii,' *phaenopyrum* and *succulenta*. So, for those who care little for the group, these are the best six, and for those who see merit in them the list of twenty-six is one from which selections can be made.

Hawthorns of Merit

arnoldiana 39' Zone 4 (Eastern North America) Arnold Hawthorn

This is a handsome small tree with single white flowers about $\frac{3}{4}$ " in diameter and bright crimson fruit about $\frac{3}{4}$ " long. This ripens in the middle of August while the leaves are still green and drops in early September. It is one of the most conspicuous for its early fruits, also being one of the earliest of the American species to flower (early May). If late summer fruits are not desirable, then other species might be selected.



PLATE VIII

An excellent specimen of *Crataegus phaenopyrum* showing its dense habit.

coccinoides 21' Zone 5 (Central United States) Kansas Hawthorn

A densely branched, broad, round-topped small tree with good foliage as well as good fruits. The flowers are about $\frac{3}{4}$ " in diameter and the dark red fruit is about the same size, the foliage turns orange to scarlet in the fall. This plant is especially desirable in the area where it is native.

crus-galli 36' Zone 4 (Quebec to N. Carolina and Kansas) Cockspur Thorn

This is one of the most popular of the native American hawthorns, and justly so. It is native over a wide area of the northeastern United States. The flowers are $\frac{1}{2}$ " in diameter, the fruit is bright red and about $\frac{3}{8}$ " in diameter, remaining on the plant a greater part of the winter. The leaves are glossy, but the variety 'Splendens' has leaves that are even more glossy than the species. The foliage turns a good orange to scarlet in the fall. It withstands shearing well, and has been used in making hedges, especially because of its dense twiggy growth and sturdy thorns. Its horizontal branching habit and flat top are frequently conspicuous in the landscape.

×**lavallei** 21' Zone 4 (*C. crus-galli* × *pubescens*) Lavalley Hawthorn

With conspicuous flowers and showy fruits this is an excellent hawthorn, having been listed for some time under the synonym of *C. carrerei*. The leaves turn a bronzy red late in the fall. The fruits are a brick red, $\frac{5}{8}$ " in diameter and remain on the tree a greater part of the winter, the chief reason for its ornamental use.

mollis 30' Zone 4 (Eastern United States) Downy Hawthorn

With red fruits about 1" in diameter, this is one of the larger fruiting hawthorns, and so might even be considered coarse in some situations because of this. The flowers are 1" in diameter and the leaves are larger than those of many of the hawthorns. It is a handsome small tree in foliage, but because of the large size of leaves and fruits it may be a bit coarse, even though the fruit usually ripens to a good red in late August while the leaves are still green.

monogyna 30' Zone 4 (Europe to Western Asia) Single Seed Hawthorn

Because of the many native American species of hawthorns available in this country, this European species is mostly valued here for its many varieties. The flowers of the species are merely single white, about $\frac{5}{8}$ " in diameter and the fruit is red only about $\frac{3}{8}$ " in diameter. The leaves do not turn color in the fall. The tree is densely branched, round headed, and in England has been used in clipped hedges all over the island.



PLATE IX

Upper: The foliage and slightly pear-shaped fruits of *Crataegus pinnatifida major*.
Lower: The double-flowered variety of the popular English Hawthorn, *Crataegus oxyacantha* 'Plena.'

monogyna 'Biflora'

Zone 6

Glastonbury Thorn

In mild winters this frequently blooms in England at Christmas time thus living out an old legend. However, our winters are so cold in America that seldom does this have an opportunity to bloom then. Since it has no other particular ornamental merit, it might only be grown in America in those areas that are sufficiently mild so that it does stand a chance of blooming in mid-winter. However, this is only a secondary or token blooming, the main bloom being in the spring.

monogyna 'Inermis'

Zone 4

A thornless variety with dense upright branches and a globose round head like a large mushroom. This has possibilities for street tree work, not so much because it lacks thorns, but because of this unique form.

monogyna 'Stricta'

Zone 4

A columnar form, very dense and upright in habit, the tree at the Arnold Arboretum at one time was 30' tall and 8' wide. Fire blight reduced the height later. This is more narrow than *C. phaenopyrum fastigiata*, more dense also, but probably also more susceptible to fire blight.

nitida

30'

Zone 4

(Illinois to Arkansas)

Glossy Hawthorn

Performing extremely well in the Arnold Arboretum for many years, this is one of the three or four best native American hawthorns, especially because of the fact that the red to orange fruits remain on the plant a greater part of the winter. The lustrous leaves are 2-3" long and the flowers are profusely borne. The fruit about $\frac{1}{2}$ " in diameter, ripens about the end of October. The autumn color is an outstanding orange to red.

oxyacantha

15'

Zone 4

(Europe and N. Africa)

English Hawthorn

A very popular hawthorn in Great Britain and Europe where it has been grown and cherished for centuries, the several varieties may have white, pink or deep red flowers, either single or double. The flowers, $\frac{5}{8}$ " in diameter, are profusely borne in late May from whence it gets its name "May Tree" so popular in English literature and are followed by scarlet fruits $\frac{1}{4}$ "- $\frac{5}{8}$ " in diameter. Like other hawthorns, it is thorny, with a densely round habit, often with the branches touching the ground. The foliage does not turn color in the fall. Some of the more popular varieties:

aurea - fruits yellow.

'Paulii' – flowers double and bright scarlet, one of the most outstanding and conspicuous in flower of all these varieties.

'Plena' – double white flowers.

'Punicea' – sometimes found listed as 'Splendens,' with dark red single flowers.

phaenopyrum 30' Zone 4 (Virginia to Alabama) Washington Hawthorn

To my way of thinking, this is the best of all the hawthorns, and if only one were to be grown, this would be it. This plant has good flowers, excellent fruits, glossy foliage and a brilliant scarlet autumn color, as well as a habit of growth that is well suited to many purposes. This seems to have all the requisites of a good plant. The white flowers, appearing in mid-June are about $\frac{1}{2}$ " in diameter and appear in many-flowered clusters. The bright scarlet fruits are only about $\frac{1}{4}$ " in diameter, but appear in large clusters and remain on the tree a greater part of the winter. The orange to scarlet autumn color is always meritorious and the usually dense habit of this species makes it well suited for planting in the central strip of highways to reduce the headlight glare of automobiles. One of the last species to bloom, it is unquestionably one of the best.

phaenopyrum 'Fastigiata'

With all the good points of the species as well as a generally columnar habit.

pinnatifida major 18' Zone 5 (NE Asia) Large Chinese Hawthorn

This is one of the most handsome of the Asiatic species with the leaves often divided right down to the midrib of the blade. The fruit is somewhat pear-shaped, deep shining red in color and about one inch in diameter. It has been established in China for a long time because the fruits are edible. It blooms and fruits reliably well every year.

pruinosa 21' Zone 4 (Ontario to Va. to Ill.) Frosted Hawthorn

With large white flowers with rose colored anthers in late May, red to orange fruits $\frac{3}{8}$ " in diameter in the fall, and with bluish green foliage, this native hawthorn makes quite a display, especially when in fruit.

punctata 30' Zone 4 (Quebec to Ga. and Ill.) Dotted Hawthorn

The dotted fruits are among the largest of any of the native American hawthorns. Usually the tree is round or flat topped, sometimes it may grow to be twice as broad as it is high. It has a picturesque appearance because of the wide spreading horizontal branches. The fruit is red, about 1" long, and there is a particularly conspicuous yellow fruiting form — *aurea*.

succulenta 15' Zone 3 (Quebec to Mass. and Ill.) Fleshy Hawthorn

The hardiest of those to be mentioned in this selected list, this tree is also one of the smallest. The bright scarlet fruits are lustrous, ripening toward the end of October. Professor Sargent thought very kindly of this native American and claimed that it ought to be listed among the six best American hawthorns.

viridis 36' Zone 4 (Central and SE United States) Green Hawthorn

With white flowers in small 2'' clusters the end of May and bright red $\frac{1}{4}$ '' fruits in the fall and winter, this round headed, spreading branched tree should be chiefly valued for planting within that large area where it is native.

wattiana 21' Zone 5 (Central Asia) Watts Hawthorn

Perhaps one of the most beautiful of the yellow fruited hawthorns this has half inch wide fruits maturing in August that are a rich orange to translucent yellow. The flower clusters are 3'' in diameter.

'Toba' Zone 3

Actually a hybrid (*C. succulenta* × *oxyacantha* 'Paulii') introduced by the Dominion Experiment Station of Morden, Manitoba, about 1950. The flowers are double, fragrant, and deep rose, the fruits are red and about $\frac{1}{2}$ '' in diameter, the leaves are glossy. Its chief claim to fame is probably the fact that it is more hardy than forms of *C. oxyacantha* which it resembles in general habit.

'Autumn Glory' Zone 5

Another hybrid, 15-18' tall, with white flowers and brilliant red fruits first coloring late in the summer, then remaining on the tree well into the winter.

DONALD WYMAN

ARNOLDIA



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THE CHARLES STRATTON DANA GREENHOUSES OF THE ARNOLD ARBORETUM

IN March of 1962 the staff of the Arnold Arboretum accepted and occupied a new set of greenhouses. Modern in design, construction, and function these greenhouses provide excellent new facilities for the Arboretum staff for work in plant propagation and for the study of living plants.

In the very early years of the Arnold Arboretum, the growth of seeds and the vegetative propagation of plants for the developing collection was implemented in the Harvard Botanic Gardens in Cambridge. The time required to commute and the difficulty of transportation led Mr. Jackson Dawson, the first superintendent and propagator, to build what he described as a "tiny unpretentious greenhouse" at the rear of his house at 1090 Centre Street, in Jamaica Plain. This modest unit, supplemented by a pit house and cold frames, contained for nearly a decade the plants propagated for the Arboretum collections and for distribution to other gardens. It was inevitable that this limited facility would be outgrown, and, in 1917, a modern greenhouse was built on a small corner lot between Prince Street and Orchard Street and separated from the Arboretum by the Arborway. It was again a limited area and proved to be even more restricted and isolated as the traffic increased on the Arborway and that street was widened. Dawson's successor, William Judd, for 33 years the propagator on the Arboretum staff, reported in his diary for June 13, 1927, that this property had been sold and that he must move his plants by May 1, 1928. Under the guidance of Oakes Ames, then supervisor of the Arnold Arboretum, a new location was chosen adjacent to the greenhouses of the Bussey Institution, on Bussey Institution land which did not belong to the Arboretum, overlooking the shrub collection of the Arboretum. The greenhouse area was occupied in the summer of 1928, and, in 1929, an additional greenhouse was added. This familiar pair of greenhouses with a small, white, frame headhouse served the Arboretum from 1928 through the



past winter. Finally another move seemed inevitable when successive bills were filed in the State Legislature during the past decade to acquire the Bussey land by eminent domain proceedings. The continuous threats to our greenhouse operations required the selection of an area offering greater stability, larger nursery areas, and a new and modern building. Fortunately, a timely bequest and some available land suitably located led to the present new development.

While the majority of the land occupied by the Arnold Arboretum is owned by the City of Boston and rented in perpetuity, the four and one-half acre site chosen for the Dana greenhouses is owned by Harvard College for the Arnold Arboretum. This property, at 1050 Centre Street, adjoins the main collections near the plantings of lilacs. Its accessibility for visitors, staff, and equipment, both from the Arboretum and from a major highway, makes it a most convenient location.

The construction of the new greenhouses at this time was made possible through the income of the Mercer Trust, established from the residuary estate of Mrs. William R. Mercer. Mrs. Mercer, née Martha Dana, was a native of Boston and the daughter of Charles Stratton Dana and Marie Grogan Dana. She died at Doylestown, Pennsylvania, February 21, 1960, and her will provided that the income of her estate be divided equally between the Arnold Arboretum, the Boston Symphony Orchestra, and the Boston Museum of Fine Arts.

It was Mrs. Mercer's wish that the use of her bequest honor her father and his lasting interest in the Arnold Arboretum. This has been done in naming the new greenhouses the Charles Stratton Dana Greenhouses of the Arnold Arboretum. A plaque inside the front hall indicates that construction was made possible through the generosity of his daughter, Martha Dana Mercer. The income from the Mercer Trust is also used to award Mercer Fellowships in horticulture and botany, thus honoring Mrs. Mercer, too. Research space in the Dana Greenhouses is available for holders of these fellowships.

With the approval of the President and Fellows of Harvard College, who are the trustees of the Arnold Arboretum, the firm of Griswold, Boyden, Wylde and Ames was engaged as architects. When final drawings were approved, the specifications were placed for competitive bids and the construction contract was awarded to Bond Brothers, Inc., of Everett, Massachusetts. Ground was broken on May 12, 1961, by President Nathan M. Pusey, of Harvard, in the presence of members of the Committee to Visit the Arnold Arboretum, the architects, the contractor, and members of the Arboretum staff. Work on the greenhouses continued through the fall, and the cold storage house was occupied in November 1961, and the greenhouses in March 1962.

The Charles Stratton Dana Greenhouses comprise a main building with three attached glasshouses, a cold storage house, a bonsai house, a permanent shade house, nursery and plant beds. The four and one-half acre plot of land has been fenced so that the gates can be locked and the buildings and nursery areas guarded in a manner not possible previously. Special plantings have been made

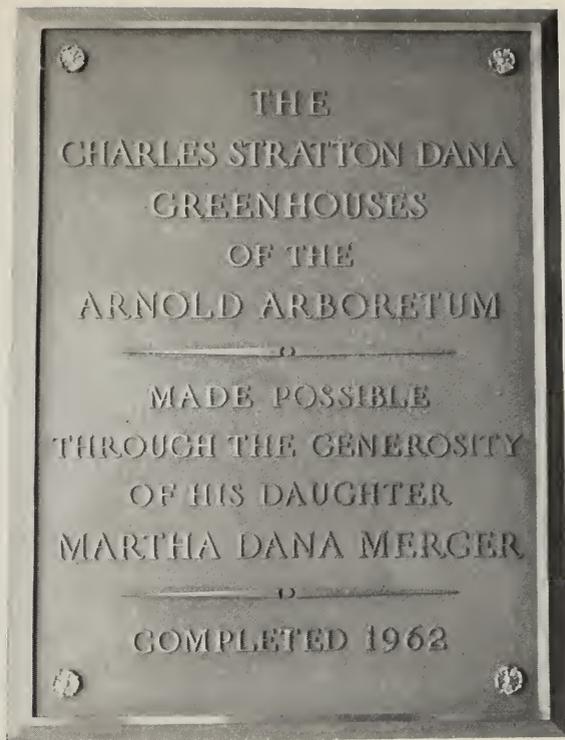


PLATE X

(Top): Plaque located in entrance to the main building. (Bottom): Mr. Nathan M. Pusey, President, Harvard University, breaks ground for the Dana Greenhouses on May 12, 1961 with members of the Overseers Committee to visit the Arnold Arboretum, architects, contractors, and members of the Arboretum staff present.

around the buildings in such a manner as to accentuate the nursery areas with displays showing how plant materials can be used.

The Main Building

By tradition the main building to which the glasshouses are attached bears the name of the "headhouse." This common name hardly does justice to the modern work area and research facilities now available to the Arboretum staff. The first floor and full basement are 36x111 feet and are topped by a centered second floor apartment 22x68 feet. Working space for the propagating staff occupies the central area of the first floor and the full length of the rear of the building. At the two ends are smaller rooms, one a modern laboratory for cytological or morphological research, the other a conference room with blackboard and screen which can be used as a small lecture room. Skylights in the roof supplement the fluorescent lighting in the research laboratory and the work areas. Storage space, such as walk-in rooms, cupboards, and open shelving, is abundant in all areas. An acid-resistant black "vulcathane" covers the 400 square feet of work surface and potting benches. The walls of the work area are of glazed tile for easy cleaning. Stainless steel sinks and drainboards are used in the laboratory. A small lunch-room area adjoins complete locker facilities for the staff. Soil for use in the work area is placed in hoppers located outside the building and so designed that the soil is available inside the building through openings under the work benches.

There are two walk-in cold-storage rooms on the first floor. One room 11x7 feet can be maintained at temperatures between 28° and 40° F. This will be used for temporary storage of cuttings, for seed storage, and for seed-dormancy research. The second room is 8x7 feet, with temperatures controlled between 35° and -20° F. This room will be used for experiments determining plant hardiness, inception of flowering, and foliage variation experiments. Either room can be readily converted to constant environment chambers if such physiological work is required. As with the first floor, the full basement is dominated by work or storage areas for plant propagation. A passageway the full length of the building is designed for plant beds which can be illuminated by fluorescent lighting, or portions of it can be used for storage. Two small rooms are designed for enclosed storage and open areas at either end of the basement for storage on exposed shelving. The basement can be reached by two stairwells inside the building as well as by a delivery well on the west end. An electric lift, a type of dumb waiter, allows the easy transport of a small wheelbarrow, bales of peat moss and similar supplies between the basement and the first floor work area.

The building is heated by two oil fueled furnaces and forced hot water. The furnaces can be run either interchangeably or together. Thirty-five thermostats control the supply of heat to the greenhouses and various parts of the building. An auxiliary electric generator capable of producing 15 kilowatts is operated on fuel oil from the main storage tanks and a storage battery. If the main line vol-



PLATE XI

(Top): North side of the main building and the greenhouses. (Bottom): View looking south of the main building, the glasshouses, the shade house and the cold storage house.

tage drops below 70% of its normal load the auxiliary generator operates automatically. This emergency electric supply will operate both the cold rooms and the furnaces in case of power failure, ensuring protection for the plants in the greenhouses as well as any low-temperature experiments in progress.

The second floor of the main building contains a modern two bedroom apartment. The back wall of the living room area consists of floor to ceiling glass panels which open onto a large deck area surrounding the apartment on three sides. The apartment will be occupied by a staff member generally responsible for the greenhouse area during non-working hours. The entire area is easily observed from this apartment, and a battery of eight searchlights can be used at night to illuminate the area. An electric system of alarms is located in the apartment, and will serve notice of heat, power, or refrigeration failure in any part of the building.

Stained redwood siding is used on the front of the main building. Aluminum casements are on all doors and windows and bronze screens add protection. Exterior maintenance costs should be moderate.

The Glasshouses

Three all-aluminum glasshouses, supplied by the Lord and Burnham Company, are attached to the main building. These are of the "Century" class and each is 17x51 feet, with eaves 6 feet high. House "A" is designed for research projects which may require different environmental conditions. Each section of this house may be maintained at different conditions of temperature, light, and humidity. Two of the sections have 155 square feet of bench space each, with a walk on either side of a central bench. The third section has a central area without benching to allow the growth of plants to a height of ten feet. House "B" is a single unit without divisions and with a central walk. An experimental bench plan utilizing peninsulas offers 582 square feet of bench space. The peninsulas and side walks off the central aisle are arranged so all areas can be reached by an average-sized person. House "B" has 15% more bench space than House "C" because of this bench arrangement. House "C" has one partition dividing it into two areas, each with 248 square feet of bench space. An area has been reserved for a fourth greenhouse designed to be comparable to house "A" when this additional space is required.

All sections of the greenhouse area have automatic heat controls and automatic ventilation. All benches are built of "Transite," a mixture of asbestos and cement. Suitable wiring and 88 electric outlets will allow the use of electric heating cables on the benches and accessory lights or additional types of electric research instruments. The walks in the greenhouses are at the same level as the floor of the main building and exterior sidewalks. Wheelbarrows, carts and similar vehicles can be moved easily in or out. Redwood slat shades will be used on the greenhouses.



PLATE XII

(Top): Propagation work area. (Bottom): Propagation work area at rear of main building. Shown on left wall is the electric lift to the basement, storage room, propagation work area, and two refrigeration rooms. Greenhouses are on the right.

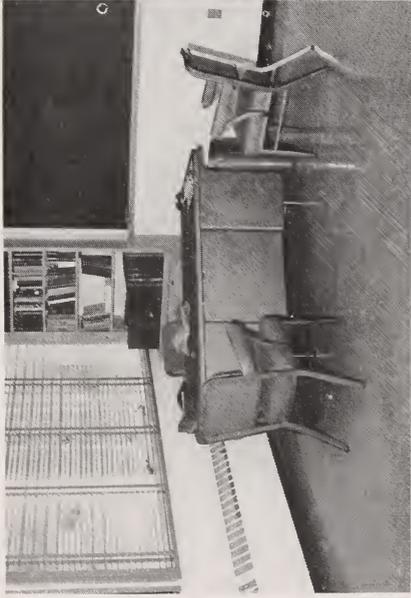


PLATE XIII

(Left, top): Office and conference room. (Left, bottom): Research laboratory. (Right, top and bottom): Two views of apartment for greenhouse guard.

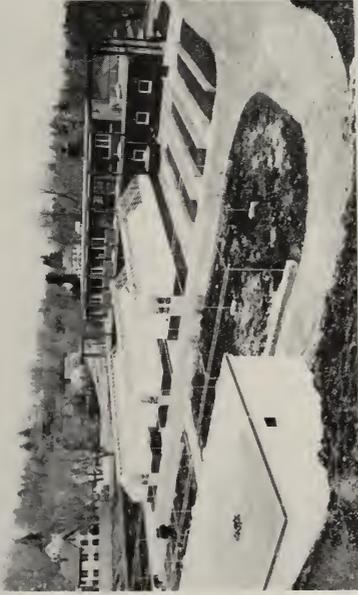


PLATE XIV
Four views of the Dana Greenhouses of the Arnold Arboretum.

Plant Beds and Nurseries

The plant beds and nursery areas are on the same level as the greenhouses and are easily accessible from bordering roads. They should be the most practical units of this kind that the Arboretum has ever had. A shade house 30x105 feet is located between the greenhouses and the cold storage house. Concrete frames mark the edges of this area. A permanent pipe frame supports not only the saran cloth but an overhead irrigation system as well. Saran cloth, woven of a plastic fiber, can be rolled over the pipe frame when required and removed for storage during the remainder of the year. Parallel to the greenhouses, occupying the place of the fourth greenhouse, are three concrete-framed nursery beds. Adjacent to the main building to the east and west are additional blocks of land totaling approximately an acre to be used as space for additional nursery plantings.

The Cold Storage House

A building of concrete blocks and reinforced concrete insulated with two-inch slabs of "Styrofoam" has been built into the north side of a hill and will serve as a cold pit storage area. The building, 15x100 feet, is divided into two compartments. The east end is for winter storage of the bonsai plants. The west end occupying three-fourths of the building is for the storage of dormant plants, cuttings, scions and stock plants in flats or pots. Twelve hundred and twenty-five square feet of shelving is provided for such storage. One side of this area is clear for heeling plants into the soil.

The cold storage house is built with electric heaters, as well as refrigeration units. The temperature in the area reserved for the bonsai collections will be maintained just above freezing. The temperature in the larger area can be fluctuated or maintained steady. The main objective of this experimental storage unit is to hold dormant woody plants from mid-October to mid-May and to prevent vegetative growth. When used in conjunction with the walk-in cold chambers of the main building, these refrigeration units will allow experimental work on hardiness and vegetative dormancy of the plants grown at the Arboretum.

The Bonsai House

In front of the main building, a hexagonal display house has been constructed for the collection of Japanese dwarfed trees given to the Arboretum by Mrs. Larz Anderson of Brookline, in memory of her husband. The attractive house is made of redwood slats, 2.25 inches wide and set 3.75 inches apart. The building is 9 feet long on each side and approximately 18 feet in diameter. The plants will be displayed on raised concrete benches and will be readily visible from inside or out. A walk with a railing completely surrounding the bonsai house serves for viewing the plants when the doors are locked and also gives a vista over the adjacent plantings. Overhead sprinklers facilitate the care of these interesting

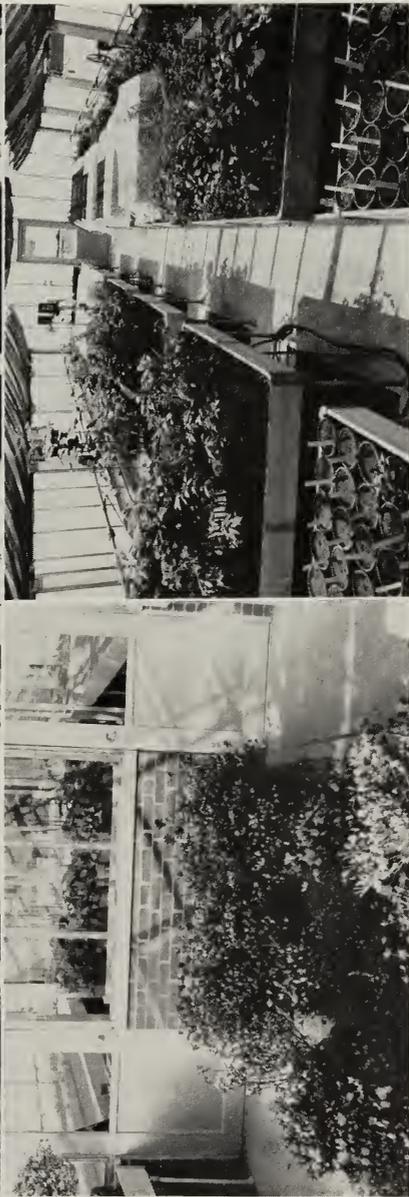
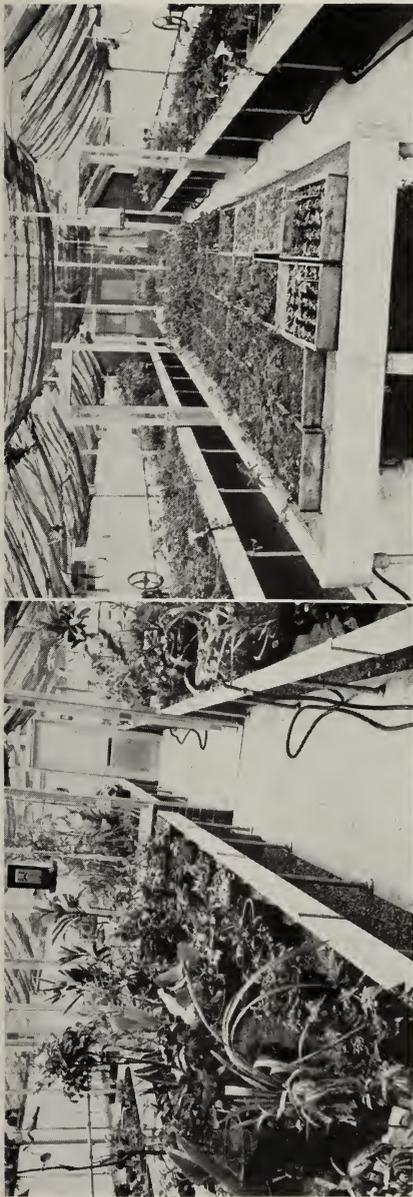


PLATE XV

(Left, top and bottom): Two views of greenhouse A. (Right, top): Greenhouse C. (Right, bottom): Greenhouse B, showing peninsula arrangement of benches.

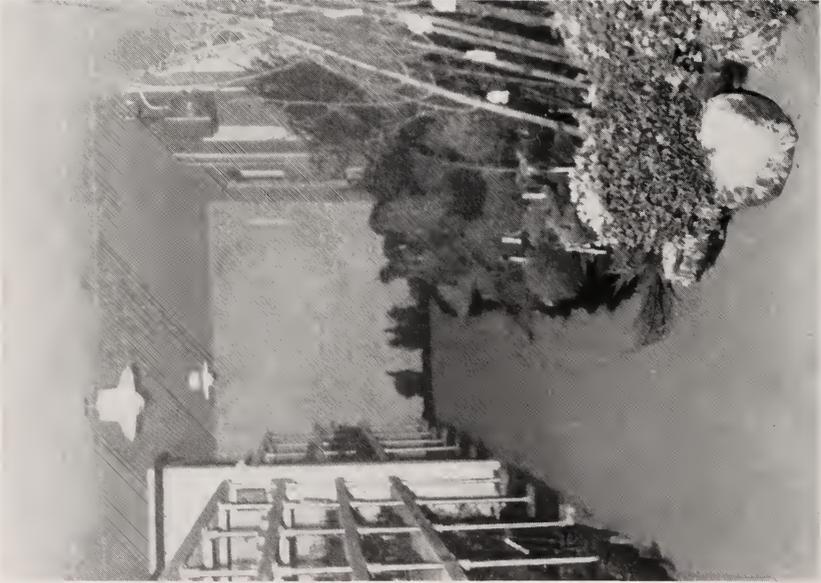


PLATE XVI
Two views inside the cold storage house.

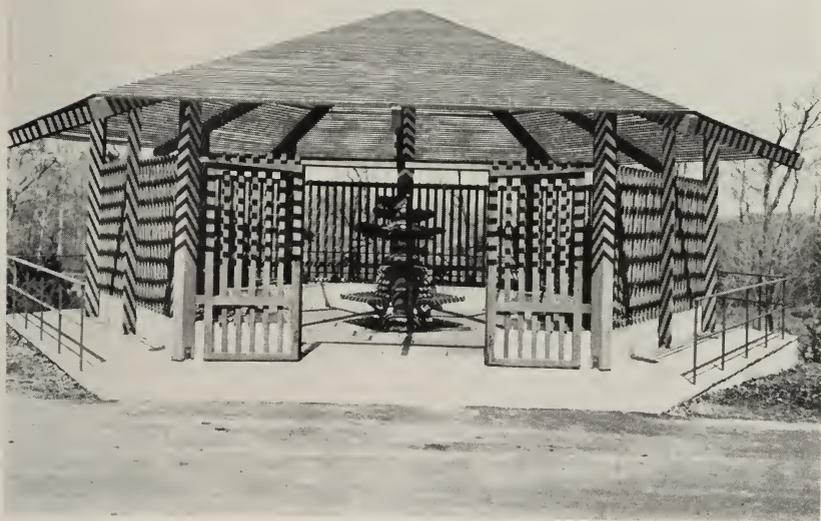


PLATE XVII

(Top): View inside the Bonsai house. (Bottom): The Bonsai house.

plants. Since the bonsai must be moved to the cold storage house for the winter, care was taken to assure that these heavy plants could be handled easily. The area between the two locations is level.

The Grounds

The construction of a new greenhouse on ample land of clear title not only will further the practical and scientific work in plant propagation and horticultural research but will also afford an opportunity for attractive landscaping of a building and the development of new collections of horticultural interest. Mr. Seth Kelsey of East Boxford, a member of the Committee to Visit the Arnold Arboretum has worked with the staff in designing these new plantings. Furthermore, he has on his own initiative invited various nurseries to contribute many of the plants needed for these plantings. As a result of his interest and effort, we gratefully acknowledge the contributions of over 1300 plants by eight Massachusetts nurseries: Adams Nursery, Westfield; Cherry Hill Nurseries, West Newbury; Corliss Brothers Nursery, Ipswich; Jackson Brothers Nursery, Norton; Kelsey-Highlands Nursery, Boxford; Littlefield-Wyman Nurseries, Abington; Weston Nurseries, Hopkinton, and Wyman's Garden Center, Inc., Framingham. The large plants these nurseries have donated will make many of the demonstration areas of practical value in the very near future. Many additional plants propagated by the Arboretum staff will be placed in their proper locations but will require a longer period to reach maturity and to be of demonstrative value.

One of the potentially attractive plantings is a collection of 28 cultivars of American holly. This selection was offered to the Arnold Arboretum by Wilfrid Wheeler in the fall of 1961. He personally selected the plants, which represent the last of a long series of generous gifts he has made to our plantings. Regrettably, Wilfrid Wheeler died on Christmas Day 1961, but his wishes were carried out by his sons, Wilfrid, Jr., Richard, and Charles. The Wheeler hollies are interplanted with flowering dogwood and white pine and are located on a slope immediately inside the Arboretum gate in the greenhouse area.

On the slopes flanking the cold storage house will be bank plantings of low or prostrate junipers. A demonstration area of various types of plants suitable for bank planting will be located along the Centre Street bank below the greenhouses. Plants suitable for espaliered growth are planted on the front wall of the cold storage house. Suitable ground-cover plants will be used in many flat areas. Genetically dwarf evergreens, mainly conifers, will form a bank planting below the bonsai house, accentuating the artificially dwarfed plants in the house. Finally, in the flat area north of the greenhouses the Arboretum collection of hedges will be planted. The present collection, of limited value for demonstration purposes because of its location on Bussey Institution property, will be moved when possible and new hedges added or used as replacements. The planting plan allows space for approximately 100 types of hedge planting.

The entire area is surrounded by a chain-link fence. It will be open to the public at regular hours, but the buildings, plantings, and nursery areas will be protected adequately for the first time in recent years.

The development of this new area of the Arboretum offering new plantings to the visitors and new facilities for horticultural research to the staff has been the work of many people. The generosity of Mrs. William Dana Mercer as one of the Friends of the Arnold Arboretum made the construction possible. The development of the area was aided by the use of the annual gifts and of the plants contributed by other Friends. These gifts from loyal supporters of the work of the staff of the Arnold Arboretum are acknowledged with gratitude.

RICHARD A. HOWARD

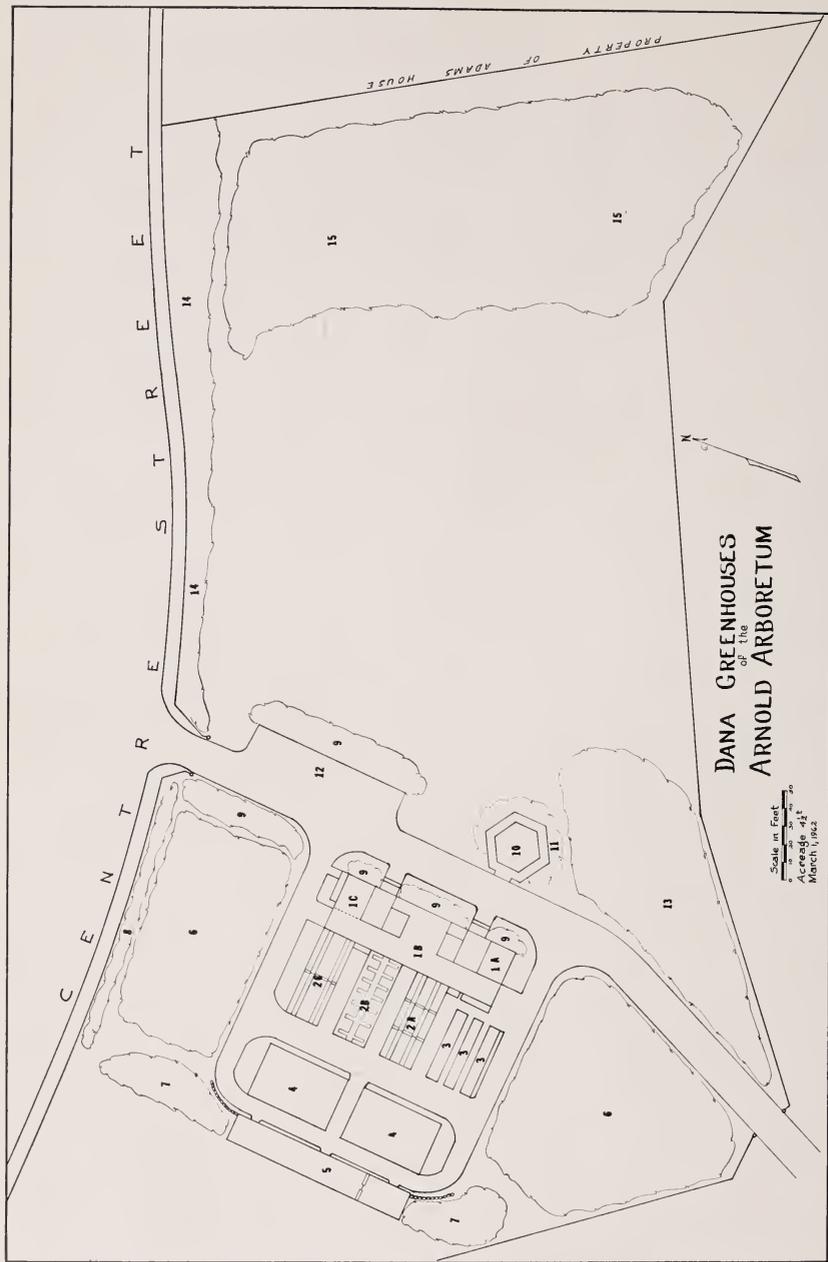


PLATE XVIII

1. Main Building. 1A. Research Laboratory. 1B. Propagation Work Area. 1C. Office and Conference Room. 2. Greenhouses. 3. Plant Beds. 4. Shade House. 5. Cold Storage House. 6. Nursery Areas. 7. Ground Covers. 8. Junipers. 9. Shrub Planting. 10. Bonsai House. 11. Dwarf Evergreens. 12. Parking Area. 13. Wheeler Holly Collection. 14. Bank Plants. 15. Hedge Plant Collection.

ARNOLDIA



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HERBACEOUS ALIENS IN THE ARBORETUM

MANY native New England plants are to be found growing wild in the Arboretum; trees and shrubs, of course, in the various areas of woodland, but also numerous herbaceous plants. In fact, over 300 native herbs were recorded in the lists of the spontaneous flora compiled by the late E. J. Palmer and published in the *Journal of the Arnold Arboretum* during 1930, 1936 and 1947. In addition, however, there are a surprising number of alien plants, many of which have entered into the natural vegetational communities and now survive and reproduce themselves alongside the native species. The aliens include numerous weeds, plants of disturbed soil and other man-made habitats, but it is not the intention in this particular article to discuss the weeds, but rather to comment upon some of the more attractive or noteworthy herbaceous plants that have come to New England and the Arboretum from abroad.

Perhaps the two most spectacular such herbs are to be seen in the Meadow, the low-lying marshy area near the Administration Building, where one may see the Yellow Iris (*Iris pseudacorus*) and the Purple Loosestrife or Spiked Salicaria (*Lythrum salicaria*, Plate XIX). The former comes into flower first, in June and July, and carries its handsome yellow flowers three or four feet above the wet marshy ground; the latter starts later, in July, but blooms throughout the height of summer, marking the Meadow with wonderful splashes of purple and looking so much at home. It is so familiar in many similar marshy spots in New England that there is every excuse for the common mistake of thinking it a North American native. When it first came from Europe is not known, but it must have been here for many generations for it was mentioned as an established alien in Floras over a century ago. Somewhat aggressive perhaps, like many colonists towards the endemic native population, it has settled in, made a home for itself and become quite naturalized. Close examination of the flowers reveals a point of interest: there are three different types, depending upon the lengths of the stamens and style, and any one plant displays only one kind. In each flower the stamens

[49]



are arranged in two groups of five which may be long, medium or short, as may also be the length of style. On any one plant there may be flowers with a long style, five stamens of medium and five of short length, flowers with a medium length style and long and short stamens, or flowers with a short style and stamens which are medium and long. The great Charles Darwin in particular investigated these flowers, making numerous, patient experiments which showed that the three types are bound up with their mechanism for pollination. Along with each type of style and stamen arrangement goes a different size of pollen grain and the papillate cells on the surface of the stigmata are also of different sizes according to the length of the style. The pollen grains from the longest stamens and the papillae of the longest styles are the largest whilst those from the shortest are the smallest. Seed is set only if pollen is received on the stigmatic surface from stamens of the same corresponding length as the style. In other words, cross pollination must take place and these three flower-types constitute, as the geneticists say, an out-breeding mechanism. One final curious point which does not appear to be concerned with the actual mechanism of pollination, but is nevertheless of interest, is the fact that the pollen borne by the long stamens is green in color whilst that from the medium and short is yellow. The only likely explanation for this that I have come across is that it is a protective device against pollen-eating insects.

Returning to the Yellow Iris which grows in the Meadow and about the margins of the ponds, along with the native wild Blue Flag, *Iris versicolor*. It is interesting to note that it is thought to be the original Fleur-de-lis, the emblem down the centuries of the French Royal family and still used, for example, in the flag of Quebec Province. It is not suggested that readers are in the habit of having their faces bruised but they may be glad to know of an ancient recipe for a cure given by John Gerard in his famous Herbal published in 1597: "The root of the common Floure-de-luce cleane washed, and stamped with a few drops of Rose-water, and laid plaisterwise upon the face of man or woman, doth in two daies at the most take away the blacknesse or blewnesse of any stroke or bruse." One never knows when such information might come in useful.

Passing from the marshy area known as the Meadow to the nearby grassy meadowland it is remarkable how alien is its composition. The principle constituents are the grasses: Sweet Vernal Grass (*Anthoxanthum odoratum*), Timothy (*Phleum pratense*), Meadow Foxtail (*Alopecurus pratensis*), Orchard or Cock's Foot Grass (*Dactylis glomerata*), Rye-Grass (*Lolium perenne*), Canada Blue Grass (*Poa compressa*), Kentucky Blue Grass (*Poa pratense*), and White Bent or Redtop (*Agrostis alba*), and the last two, whilst also natives of Europe, are the only species with any possible claim to nativity in New England. Nor is the similarity of the meadow to those of Britain and Western Europe confined to the pasture grasses, for along with them we find several clovers: Red, White and Alsike (*Trifolium pratense*, *T. repens* and *T. hybridum*) to mention the most important,



PLATE XIX

(Top) Purple Loosestrife, *Lythrum salicaria*. (Bottom) Lesser Celandine, *Ranunculus ficaria*. (Photographs by Heman Howard)

all components of the best pasture-land and now introduced from Europe the world over: to North and South America, Australia and New Zealand, the most famous areas for raising sheep and cattle. Without doubt these clovers were originally introduced by the early settlers and farmers in New England for exactly the same reasons as the grasses and, in the case of the Arboretum it is no coincidence either for much of it was established on the grounds of the old Bussey Farm.

The weeds of the typical English pasture are present too, the weedy Velvet Grass, or Yorkshire Fog as it is called in parts of Britain (*Holcus lanatus*), the Yarrow (*Achillea millefolium*), Stitchwort (*Stellaria graminea*) and Tufted Vetch (*Vicia cracca*), as well as the Buttercups (*Ranunculus acris* and *R. bulbosus*) and, where the soil is heavy or moist, the Creeping Buttercup (*Ranunculus repens*), an irrepressible weed when it gets into cultivated plots on heavy, damp soil. Along with buttercups one might expect daisies, and they are here, but not the common English daisy (*Bellis perennis*) which is not hardy enough to become naturalized in grassland and lawns in the Boston area. It occurs further south and is said to grow in a few milder spots in Rhode Island and Connecticut, or conversely it survives in Vermont where the snow covering is complete and deep enough to protect it throughout the winter from the severe sub-zero temperatures. The daisy found in the Arboretum meadows is the Ox-Eye or Wild Marguerite (*Chrysanthemum leucanthemum*), the wild European relative of the very different chrysanthemums of the horticulturalists. However, it does not flower in the spring with the first flush of buttercups as might the English daisy but appears as spring gives place to summer. Another summer flowering member of the daisy family which appears in the grassland of the Arboretum is Cat's Ear (*Hypochaeris radicata*) and, as the summer draws towards its end, the Fall Dandelion (*Leontodon autumnalis*). An unusual form of this latter can be found scattered throughout the grounds; it develops pale, greenish-yellow flower heads which are smaller than normal and do not bear proper, flat, ray florets. What exactly causes this form is not known as far as I am aware, but it has been named forma *ochroleuca*. However, one is left wondering whether it arises from insect attack or disease, or whether it is just an inherited teratology. A few careful observations might throw a lot of light on the phenomenon.

Possibly coming into the category of meadow weeds come the three alien sedges found in the Arboretum, *Carex caryophyllea*, *C. hirta* and *C. muricata*. It is difficult to visualize how these inconspicuous and often overlooked sedges could have been introduced into New England other than along with the other meadow plants. None of the three are weeds in the usual sense but to a greater or lesser extent each does occur in meadow land in Europe, where they are native.

Not so conspicuous as many other herbaceous plants is the Ground Ivy, Gill-over-the-Ground, or Run-away-Robin (*Glechoma hederacea*) which is to be found in one or two places covering quite large areas in amongst the grass and other plants. As its common name suggests, it creeps along the ground, but it bears

no relationship to the Ivy, being a member of the Mint family, and like most members of this family (Thyme, Sage, Marjoram, Lavender and Rosemary, to mention a few) the leaves give off a characteristic odor when bruised; although in the case of Ground Ivy it is not a particularly attractive scent. In the majority of flowering plants both male and female organs, the stamens and pistils, are found together in the same flower, a condition known as hermaphrodite. In some plants, however, the sexes are separate, but occasionally the situation is slightly more complex and this is the condition in Ground Ivy. To use a technical term, it is gynodioecious; that is to say, some plants produce flowers which have both functional stamens and ovary (are hermaphrodite) whilst other plants are male sterile and only enclose a functional ovary. Stamens are usually present but they are small and abortive and contain no viable pollen. Close examination soon shows that the male sterile flowers are slightly smaller than the hermaphrodite but it is possible, although much less common, to get somewhat intermediate conditions as well where one, two or even three of the normal complement of four stamens are functional, and in these cases the corolla size is also intermediate. Furthermore, these intermediate flowers can occur on plants along with others which are fully developed or which are completely male sterile. It is particularly interesting therefore that in the two latest standard works for the identification of plants of New England and other northeastern areas, the 8th edition of Gray's Manual of Botany, revised by the late Professor Fernald, and the new Britton and Brown Illustrated Flora of Northeastern United States and Adjacent Canada by H. A. Gleason, a variety is described based upon the small size of the flowers (var. *micrantha* Moricand in Gray's Manual and var. *parviflora* (Benth.) Druce in Britton and Brown). This variety needs investigation in the case of the North American plants, for as there is no mention in either work of gynodioecism, one suspects that it has no claim to recognition as such and that they are really just names that have been given for the male sterile condition. In Britain, where Ground Ivy is a native component of hedgerows, light woods, etc., one investigation of plants over an area near Warwick I made with others showed that the two extreme types were found in approximately equal numbers, but according to the books mentioned above the variety *micrantha* is usually more common in northeastern United States than the larger flowered form. This too is worthy of investigation, for certainly the male sterile plant is present in the Arboretum.

A bright spring flower to be seen here and there is the Lesser Celandine (*Ranunculus ficaria*, Plate XIX), a kind of Buttercup, which bears its shiny yellow flowers only three or four inches above the ground and set off by a background of dark glossy leaves. It should not be confused with the Greater Celandine, *Chelidonium majus*, a taller, almost weedy perennial, also found in the Arboretum, but related to the Poppy and producing four-petalled yellow flowers and a bright orange or yellow juice when the stem or leaf is broken. *Ranunculus ficaria* is of interest in the Arboretum, or in northeastern North America for that matter, in

that it appears that it is only the sexually sterile, tetraploid plant which has been introduced. In Britain, where it is native and has been investigated, there are two main types, a fertile variety which has 16 chromosomes and a sterile one with 32, and the most obvious difference between them is that the former sets plenty of good seed whereas the latter hardly, if ever, produces any seed at all. Instead it reproduces by the production of bulbils, or little tubers about the size of a grain of wheat, in the axils of the foliage leaves and has in consequence been given the name var. *bulbifera*. The whole plant dies down early in the summer so that the bulbils are scattered onto the surface of the soil around the parent plant, or are accidentally dispersed in some other way, and eventually give rise to new plants. If one wishes to see the bulbils, look at the base of the leafstalks as the plants finish flowering, for it is then as the leaves die down that they develop quite rapidly to their full size. One suspects that this plant was first introduced for its bright cheerful spring flowers; the larger flowered var. *grandiflorus* which is similarly and intentionally grown as a garden plant in Britain, being a native of the Mediterranean area, is probably too tender to survive the winter in the Boston area.

Many of the more spectacular herbaceous aliens are escapes from cultivation. Not escapes from intentional cultivation by the Arboretum, but in at least one place there are remains of the foundations of a dwelling house. Snowdrops and Siberian Squill (*Scilla sibirica*) have obviously been garden flowers, the latter having spread from a garden on South Street so that behind the main planting of Forsythias there is now a large sward of it under the trees, vivid blue in April. Near-by, but flowering later in the year, there are a number of plants of Star-of-Bethlehem (*Ornithogalum officinale*), also an old fashioned garden plant and found in other parts of the Arboretum as well. Other escapes from cultivation found here and there are the Day-Lily (*Hemerocallis fulva*), whose exact country of origin is not really known but which almost certainly came from East Asia, the Sweet Violet (*Viola odorata*), the Lily-of-the-Valley (*Convallaria majalis*), the European Bellflower (*Campanula rapunculoides*), the related *C. persicifolia*, and Live-for-Ever (*Sedum purpureum*). Perhaps in this class belong the Hollyhock (*Althaea rosea*) and the Giant Mullein (*Verbascum thapsus*) which have almost become weeds and which soon seem to appear on almost any open area and waste ground. The latter especially is a striking plant at all stages of its growth, first with its large gray-green rosette of leaves, almost the texture of felt, and then in the second year it produces straight upright spikes 5 or 6 feet tall with scattered clear-yellow flowers. In this group comes the Deptford Pink (*Dianthus armeria*) which has found a home in open woods and dry banks and the extraordinary Birthwort or Dutchman's Pipe (*Aristolochia kaempferi*), native of Japan, growing near the Administration Building and possibly elsewhere.

Another group of plants escaped from cultivation were not originally grown in New England for their flowers but as food plants and one or two of these are to be found in the Arboretum. The carrot (*Daucus carota*) or Queen Anne's Lace,

as its flowers are called in New England, is almost certainly in this class, as is also the parsnip (*Pastinaca sativa*), although not as common in meadows and wasteland as the carrot. *Asparagus officinalis* grows near the remains of the foundations of the old Bussey House and elsewhere, and along with the Horseradish (*Amoracia rusticana*) probably comes into this category. Related to this last is the Watercress which has several times been recorded by streams and pond margins in the Arboretum but does not seem to be present today. Each one of the specimens of it that I have examined from the Arboretum has turned out to be the tetraploid species *Rorippa microphylla* and not the more widespread diploid *R. nasturtium-aquaticum*. Both were almost certainly introduced into the New World, but the former is almost confined to the northeast and is not the one usually grown in Europe as a commercial source of watercress for salads.

Earlier in this article it was said that there was no intention of discussing weeds, but where one draws the line in classifying a plant as a weed varies very much upon the circumstances and context. There are a few plants with weedy tendencies which are not always weeds in their immediate situation in the Arboretum. Mullein has been mentioned but another is the Bindweed (*Convolvulus* or *Calyptegia sepium*). The situation here though is extremely complex. Alien stock from Europe has undoubtedly been introduced but there are native varieties which differ only slightly; in addition, more than one species has perhaps been introduced. Furthermore, it seems probable that the different stocks hybridize and taxonomically the whole problem of the Bindweeds is very confused. Even within the Arboretum they are variable, but an examination throughout the whole of New England, or better still northeastern United States and adjacent Canada, employing modern experimental techniques, is called for to elucidate the problems. From East Asia came the Japanese Hop (*Humulus japonicus*) a rank herbaceous vine, almost a shrub, growing vigorously in the South Street area. Another plant on the border line between a herb and a shrub is the Woody Nightshade or Bittersweet (*Solanum dulcamara*), which can become a near-weed but prefers, if possible, to have its roots in damp soil. The name Nightshade indicates its relationship to the Deadly Nightshade (*Atropa belladonna*) but although it is poisonous, this relative of the tomato and potato is not as poisonous as the Deadly Nightshade which fortunately has not been recorded as an alien from New England. The other common name, Bittersweet, points a very good lesson in the advantages of using Latin names and the pitfalls that lie in wait for those who shun and despise them in preference for the common or folk names. In one State, I understand, when legislature to protect and conserve the attractive Climbing Bittersweet (*Celastrus scandens*), a totally unrelated plant, was being prepared, someone looked up the name Bittersweet and found in the reference book they used that its Latin name was listed as *Solanum dulcamara*; the result in that State has been that this rather undesirable poisonous alien is now protected by law.

Whilst most of the introduced herbs of the Arboretum have been discussed,

there are still a number which have not been mentioned ; sufficient has been said perhaps to draw attention to the fact that although only woody plants are intentionally cultivated there are still many that are herbaceous which are well worthy of attention.

PETER S. GREEN

ARNOLDIA



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THE HONEYSUCKLES

THESE constitute a sturdy group of shrubs and vines, some of which can be grown in every state of the union. As a group they are not susceptible to severe disease troubles, but some of the vines are very susceptible to infestations of plant lice. Aside from this, these plants, within their hardiness limits, are easily grown and will usually produce a wealth of foliage, flower and fruit with very little care.

As a group they thrive in full sunshine, although there are a few species which seem to do better in partial shade. Also, it may well be that some of the species may do better in limestone soils than in acid soils. For instance, we have always had a difficult time in transplanting small plants of *Lonicera korolkowii floribunda*. Some of the honeysuckle vines native to Europe may also be in this category.

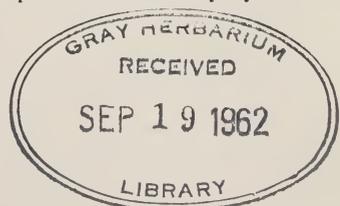
American nurseries list about 60 honeysuckles; the Arnold Arboretum is currently growing about 118. At least 240 species and varieties were considered in making up the following recommended list of 51 species and varieties. This is far too many, yet it must be considered that some seventeen of this recommended number are vines and are thus in a separate ornamental category from the shrubs.

However, a large number of the honeysuckle shrubs are either similar or have little to recommend them as ornamentals. Few have autumn color. Their chief ornamental value is their flowers, their colorful fruits, their ability to grow under various conditions, and sometimes their habit of growth.

The hardiest in the recommended list are *L. sempervirens*, *L. tatarica* and *L. chrysantha*, all hardy in Zone 3. In fact, the Tatarian honeysuckle is almost as common in the colder northern gardens as is the lilac. It was brought into cultivation about 1752 from southern Russia and shows a great variation in its offspring, both as to flowers and fruits. In fact, it has become naturalized in some parts of the eastern United States, for the birds readily distribute the seeds.

Nurserymen would do well to stop the practice of propagating honeysuckles from seed for anything other than plant breeding purposes because they hybridize

[57]



so readily. There are some excellent varieties of the Tatarian honeysuckle that have to be grown asexually in order to produce similar plants. Another case is that of the Morrow honeysuckle, which is a rounded bush with grayish-green leaves and an excellent ornamental. It has been propagated to such an extent by seed that most of the plants offered by commercial growers now are not true *L. morrowii*, but hybrids of this species and *L. tatarica*, with a corresponding decided upright habit in growth.

Fruits of the honeysuckles range in color from bright red and yellow to dark blue and black and some are whitish and translucent (*L. quinquelocularis*). They are most attractive to the birds. The early flowering species, like *fragrantissima* and *standishii*, of course bear early fruits in the late spring. These, together with the fruits of a few early flowering shrubs such as *Daphne mezereum*, come so early that they are avidly sought by birds, one of the reasons why they do not remain long enough to give color to the shrub.

On the other hand, the Tatarian honeysuckle, and others like it, bear their fruits in late June and some remain colorful for many weeks. There is a species, *L. maackii*, which is the last of all to bear colorful fruits. These are bright red and begin to color in late September. The leaves of this species remain on the plants well into November, so the bright, colorful, profusely borne berries, with a background of green leaves, do much to liven up the shrub border at a time when most other deciduous plants have already dropped their leaves. With these exceptions, most of the shrubby honeysuckles bear their fruits in the summer.

Flowering Shrub Honeysuckles

Pink and Red

A recent study I made of some of the pink- and red-flowering shrub honeysuckles finally settled the perennial question of just which is the darkest red-flowering bush honeysuckle. Without question the answer is 'Arnold Red.' Growing in close proximity to each other are all the contenders, *L. tatarica sibirica*, *L. korolkowii*, *zabelii*, 'Sheridan Red,' 'Hack's Red' and 'Arnold Red.' In our soils, 'Arnold Red' is the darkest.

Here is the way they might be listed, from the lightest pink to the darkest red, with color comparisons from the Nickerson Color Fan:

Very Pale Pink (almost white)

L. bella rosea, *L. notha*; **L. tatarica*, which varies considerably, *L. korolkowii* and its variety *floribunda*.

Pale Pink (2.5 R 9/8)

L. tatarica varieties **rosea*, **punicea* and **elegans*; *L. amoena* and its variety *'Arnoldiana.'

Petals striped Deep Pink and White

L. tatarica, varieties *angustifolia*, **lutea*, **sibirica* and *leroyana*.

* Best in the group.

Moderate Purplish Pink (2.5 RP 6/10)

* *L. korolkowii aurora*

Deep Purplish Pink (7.5 RP 6/12)

* *L. bella atrorosea*, 'Sheridan Red,' 'Hack's Red,' *L. amoena rosea* (5 RP 6/10).

Strong Purplish Red (7.5 RP 4/11)

* *L. korolkowii zabelii*; *L. maximowiczii* and its variety *sachalinensis*.

Deep Purplish Red (10 RP 3/10)

* 'Arnold Red'

Order of Bloom

(Recommended Honeysuckles)

Mid-April	fragrantissima
Early May	pileata
Mid-May	alpigena bella and vars. chrysantha and vars. claveyi or 'Clavey's Dwarf' syringantha thibetica 'Arnold Red' 'Dropmore'
Late May	amoena and vars. korolkowii aurora maackii and var. morrowii tatarica 'Morden Orange'
Early June	etrusca korolkowii
Mid-June	brownii japonica halliana
Late June	henryi
Mid-July	heckrottii sempervirens and vars.

Recommended Honeysuckles

alpigena nana 3' Zone 5 Central Europe Dwarf Alps Honeysuckle

One of the few dwarf honeysuckles and so of value for this reason. Flowers deep red, but very small.

× **amoena alba** 9' Zone 5 (*tatarica* × *korolkowii*)

Rounded, twiggy bush with white flowers.

×**amoena 'arnoldiana'** 9' Zone 5 (*tatarica* × *korolkowii*) Arnold Honeysuckle

The flowers are flushed pink, $\frac{1}{4}$ " in diameter and more narrow than those of the other members of this species. Also, the leaves are more narrow, giving the plant a more delicate appearance.

×**bella candida** 6' Zone 4 (*morrowii* × *tatarica*)

With pure white flowers — the variety in the trade termed *L. bella albida* is probably a synonym. Hybrid vigor is apparent in these varieties, for they are all fast growing and most floriferous.

×**bella rosea** — similar to the above, but with flowers a very light pink. Undoubtedly this is badly confused in the trade with var. *atrorosea*, which actually has deep pink flowers.

×**brownii** Vine Zone 5 (*sempervirens* × *hirsuta*) Brown's Honeysuckle

A vine, somewhat similar to *L. sempervirens*, but apparently popular in Europe, not in America. Several varieties (*fuchsioides*, *plantierensis*, *punica* and *youngii*) differ chiefly in flower color which varies from scarlet to orange-red.

caprifolium Twining shrub Zone 5 Europe Sweet Honeysuckle

A twining vine with beautiful fragrant yellowish-white flowers 2" long in whorls, produced from June onwards. The fruit is orange and the vine will twine up to 20'.

chrysantha 12' Zone 3 China, Japan Coralline Honeysuckle

Flowers are a pale yellow, in pairs in May and June. The fruits are a bright coral red. Retained in this recommended list for its hardiness and its height.

'**Clavey's Dwarf**' — This originated several years prior to 1955 at Clavey's Ravinia Nurseries, Deerfield, Ill. It has been widely distributed, as the plant is good as a low, thick, quick-growing hedge needing little shearing. Mature plants are said to be 6 feet tall, but most of the plants I have seen are only half this height. The flowers are white, smaller than those of *L. tatarica* and not at all showy.

deflexicalyx 9' Zone 5 China

Flowers, in pairs, yellow during early May and profusely borne. The fruit is a bright orange-red.

×'**Dropmore**' — a hybrid of *L. bella* raised by F. L. Skinner of Dropmore, Manitoba, Canada, with pure white flowers. It grows 6–8 feet tall with a pendulous, graceful habit, blooms and fruits freely and is thoroughly hardy at Dropmore, making it hardy in Zone 3. Our plant is 8 feet tall and 12 feet in diameter.

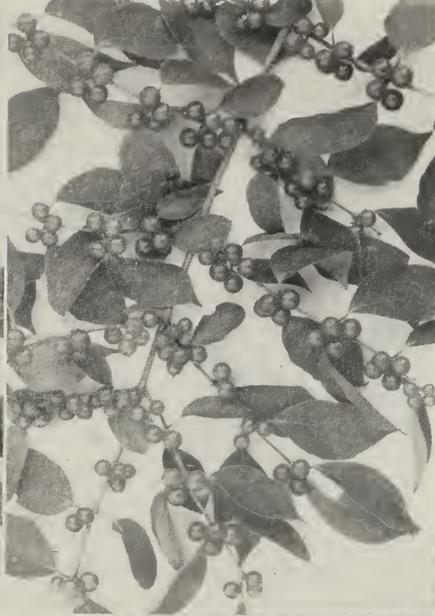


PLATE XX

Upper (left) Fruiting branches: *Lonicera tatarica* 'Arnold Red' and *L. tatarica*. (right) *Lonicera* 'Clavey's Dwarf'. Lower (left) *Lonicera bella rosea*. (right) *Lonicera maackii podocarpa*.

etrusca 'Superba' Vine Zone 7 Southern Europe Cream Honeysuckle

The flower clusters of this variety are larger than those of the species and also the plant is more vigorous. In some areas it is half evergreen, in others deciduous, a climber with reddish-purple shoots, yellowish, fragrant flowers 2 inches long and trumpet-shaped, suffused with red and produced in the middle of the summer.

flava Vine Zone 5 Southeastern United States Yellow Honeysuckle

The fragrant, orange-yellow trumpet-shaped flowers are produced in one to three whorls per stalk. It twines only slightly, but is considered to be the handsomest of our native honeysuckles.

fragrantissima 6' Zone 5 China Winter Honeysuckle

Blooming in mid-April with very fragrant flowers, this is a common favorite, half evergreen in the South. One of the few honeysuckles to bear flowers on the previous year's growth, it is one of the first of this genus to bear red fruits in late May. These are quickly eaten by the birds. It has a poor, open habit of growth, but this can be controlled with proper pruning.

×**heckrottii** Vine-like Zone 5 Origin unknown Everblooming Honeysuckle

This has often been considered one of the best of the climbing honeysuckles. It flowers in June with pink (outside) and yellow (inside) corolla, blooming throughout the summer. The buds are actually carmine and as they open the yellow inside the corolla lends a beautiful second color to the combination. The Willis Nursery of Ottawa, Kansas, has called this species 'Goldflame,' a name which has increased its sales markedly.

'Goldflame' — see *L. heckrottii*.

henryi Vine Zone 4 China Henry Honeysuckle

The flowers are yellowish to purplish red, the fruits black. This is a half-evergreen vine without the run-away vigor of Hall's Honeysuckle and thus makes an excellent, controllable ground cover.

hildebrandtiana Vine, climbs 60–80' Zone 9 Burma-China Giant Honeysuckle

The fragrant flowers are creamy white, changing to rich orange, in pairs $3\frac{1}{2}$ –6'' long. It has the largest flowers, fruits and leaves of all the climbing honeysuckles and is evergreen, but is hardy only in the deep South.

japonica aureo-reticulata Vine Zone 4 Eastern Asia Golden Honeysuckle

Not as vigorous as Hall's Honeysuckle, the leaves have a pleasing yellow netted marking, giving rise to the common name. It colors best in the full sun.



PLATE XXI

Upper: *Lonicera amoena* 'Arnoldiana.' Lower: *Lonicera* 'Dropmore.'

japonica halliana Twining vine Zone 4 Eastern Asia Hall's Honeysuckle

Actually a weed and a nuisance in many areas where it has escaped cultivation — commonly known to all growers.

japonica repens — not so vigorous as Hall's Honeysuckle, the lower leaves are sometimes lobed — a neater plant, otherwise similar to it.

korolkowii 12' Zone 5 Turkestan Blue-leaf Honeysuckle

As far as I can tell, this species and its variety *floribunda* are inseparably mixed in the trade. The variety is supposed to be the better of the two in flower, but our specimens of them are definitely similar. They do have a gray-green foliage which makes them desirable in the landscape.

korolkowii aurora — much the better variety, with moderately purplish-pink flowers (2.5 RP 6/10 Nickerson Color Fan) up to 3" in diameter. This blooms profusely.

korolkowii zabelii — has flowers a darker red than all honeysuckles except 'Arnold Red' which is the darkest.

maackii 15' Zone 2 Manchuria, Korea Amur Honeysuckle

The chances are that this species and its variety *podocarpa* are badly mixed in nurseries. The species is much hardier and has larger flowers, while the variety is more widespread. The Amur Honeysuckle is one of the tallest and hardiest of all the honeysuckles. The flowers appear in early June and the red fruits remain on the plant until November, as do the leaves.

morrowii 6' Zone 3 Japan Morrow Honeysuckle

A wide, rounded, dense bush with gray-green leaves, white flowers maturing to yellow and dark red fruits. The true species is desirable, but it has been grown from seed so much that the real plant is extremely difficult to find anywhere. Most plants being offered under this name now are upright hybrids (*morrowii* × *tatarica*) and are decidedly mediocre as ornamentals.

nitida 6' Zone 7 Central and Western China Box Honeysuckle

With creamy white, fragrant flowers which are none too profuse, and blue fruits, this twiggy shrub is a small-leaved evergreen (leaves about $\frac{1}{2}$ " long) and is excellent for clipped hedges. It withstands salt water spray well.

pileata 4' Zone 5 China Privet Honeysuckle

Deciduous or evergreen low shrub, flowers have little beauty and though the fruit is translucent, it is usually sparsely borne. Does well at the seashore. Ap-



PLATE XXII

Upper: *Lonicera* 'Clavey's Dwarf.' Lower: *Lonicera alpigena nana*.

parently young plants tend to be more evergreen than older ones, withstanding some shade.

prostrata Prostrate shrub Zone 5 W. China Creeping Honeysuckle

E. H. Wilson said this was especially useful in bank planting or ground cover. The flowers are pale yellow, have no fragrance and the reddish fruits are egg-shaped. Nothing to commend it except its habit, with branches flat on the ground and the plant making a low, hemispherical mass of foliage.

pyrenaica 2-3' Zone 5 S. E. Europe Pyrenees Honeysuckle

This plant is an interesting dwarf not thoroughly hardy in the Arnold Arboretum. Of value only because of its size. The flowers are pinkish to white and the fruits, united at the base, are red.

'Redgold' — see *L. tellmanniana*.

sempervirens Vine Zone 3 Eastern United States Trumpet Honeysuckle

The orange, scarlet or yellow flowers of this straggly vine make it most conspicuous. The trumpet-shaped flowers are 2'' long, but are not fragrant. Occasionally it becomes infested with plant lice, but it is the hardiest of all the honeysuckle vines and as such, has merit.

sempervirens sulphurea — with yellow flowers.

sempervirens 'Superba' — with bright scarlet flowers. It is highly probable that this variety is being offered under several names. 'Magnifica,' 'Dreer's Everblooming,' 'Red Coral,' 'Red Trumpet' and 'Rubra' are offered in various parts of the country, probably all traceable to a selection made by Dreer's of Philadelphia, Pa., 30 or 40 years ago, a variety that blooms almost continuously in the summer when grown in full sunshine.

syringantha 6' Zone 4 N. W. China Lilac Honeysuckle

With lilac-colored, very fragrant flowers which are not always abundantly borne. It has a mound-like, sprawling habit of growth and red fruit. Mr. H.G. Hillier (England) has selected a seedling which he states has slightly larger flowers than the species and he has given it the varietal name 'Grandiflora.'

syringa wolfii 4'

Of more prostrate habit than the species and producing especially fragrant carmine flowers.

tatarica 9' Zone 3 Southern Russia Tatarian Dogwood

An upright, vigorous shrub with pink to white, very fragrant flowers and red or yellow fruits. One of the most dependable and hardy of ornamental shrubs.

Many selections have been made, but unfortunately most show a leggy condition at the base as the plants mature. A few of the worthy varieties are:

alba — flowers pure white.

'Arnold Red' — darkest red flowers of any shrub honeysuckle, large red fruits.

grandiflora — with large white flowers, sometimes called 'Bride.'

leroyana — a dwarf variety 3' tall, flowers few, pink and white stripes, 1¼" in diameter, valued for its low height.

lutea — fruits yellow, flowers with pink stripes in center of petals, edges white.

The flowers of varieties *punicea* and *elegans* are similar, but because of the bright yellow fruits, *lutea* is selected as the best of this group.

'Morden Orange' — very pale pink flowers; fruits orange. Originated at the Canada Experiment Farm, Morden, Manitoba, Canada, but not deemed worthy of introduction by them. Introduced by a United States nursery.

nana — plants 3' high, pink flowers.

parviflora — one of the best varieties for white flowers.

rosea — flowers rosy pink outside, light pink inside.

sibirica — flowers with deep pink stripes in center of petals and white margins, leaves larger than those of species.

virginalis — rosy pink flower buds and flowers; the largest flowers of any *L. tatarica* variety.

× **tellmanniana** Vine Zone 5 (*tragophylla* × *sempervirens*) Tellman Honeysuckle

A deciduous climbing vine, with flowers in terminal heads of 6-12 flowers in each cluster. They are 2 inches long and 1 inch across, a beautiful yellow, the buds having a touch of red. (Commonly called 'Redgold' by Willis Nursery Co., Ottawa, Kansas, this was a mere replacing of the species common name.)

thibetica 4' Zone 4 W. China Tibet Honeysuckle

The flowers are lilac-colored and especially fragrant, the fruits are red. It is a deciduous, low-spreading shrub, sometimes with a width of 6-10 feet. Under side of leaves is covered with a felt of pale gray hairs.

tragophylla Zone 5 China Chinese Woodbine

A climbing shrub with bright yellow flowers in large terminal heads of 10-20 flowers in each head. They are not fragrant and the plant does best in semi-shade. This apparently does best in limestone soils, like many another *Lonicera*.

yunnanensis Twining shrub Zone 7 China Yunnan Honeysuckle

Low creeper with yellow flowers.

DONALD WYMAN

Classes at the Arnold Arboretum

Fall, 1962

Fall Field Class in Ornamental Plants

Instructor: Dr. Donald Wyman

Dr. Donald Wyman will lead five trips around the collections of the Arnold Arboretum on successive Fridays beginning September 28 at 10 a.m. All trips will start at the Administration Building, where the meetings will be held in case of rain. These trips will consider trees and shrubs in their fall condition. Berried plants, trees and shrubs for fall color, broadleaved evergreens, and cone-bearing plants will receive special attention.

Five meetings. Friday mornings, 10:00-12:00
Sept. 28-Oct. 26.

Fee \$2.00

Field Botany

Instructor: Dr. R. A. Howard

Dr. Howard will lead a series of walks around the grounds of the Case Estates in Weston with an informal discussion of the botanical points of interest. Special attention may be given to the recognition of fruit types and families of flowering plants in Fall and Winter condition. One class will be devoted to recognition of woody plants in leafless winter condition with the aid of botanical keys. Footwear suitable for walking in woodlands is recommended. Cars may be parked near the barn at 135 Wellesley Street. All classes will begin at that location and in case of bad weather may be held at the "summer house."

Five meetings. Wednesday afternoons, 2-4, Oct. 3-31.

Fee \$2.00

Plant Propagation

Instructor: Mr. A. J. Fordham

The methods of increasing plants by seeds, cuttings and grafting and the proper handling of such propagants comprise this course. The class will meet at the Dana Greenhouses, 1050 Centre Street, Jamaica Plain. Ten meetings are scheduled on Saturday mornings and Thursday evenings in September, October, February, April, June and July, with the first at 9:30 a.m. on Saturday, September 22. A full schedule will be distributed at that time. This irregular schedule allows a meeting at the proper time for a particular type of horticultural work. An apron and a very sharp pocket knife will be needed. The plants propagated will become the property of the student. The class will be limited to 15 people with priority going to those who have not taken this course before.

First meeting, Saturday, Sept. 22, 9:30 a.m.

Fee \$15.00

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 22

OCTOBER 5, 1962

NUMBER 10

THE LINDENS

THIS is an important group of shade trees, chiefly of value for their foliage, although their flowers are most fragrant, but none too conspicuous. Only about 14 are being offered by American nurseries, 35 are being grown in the collections of the Arnold Arboretum.

Lindens are important trees, both as specimens and as street and avenue trees. They are used in formal gardens in Europe where they are sheared, but little of this is seen in America, where life moves at such a pace that there is little time in anybody's book for shearing them.

Plantsmen should know that the American species, and most of the Asiatic as well are not nearly as good tree specimens as are some of the European species. The American trees, like *Tilia americana* are too large leaved and hence are coarse in texture when compared with the smaller leaved European types. Also, the American types (especially *T. americana*) and to some extent the Asiatic types, do not look well in the late summer. Their leaves turn brownish very early.

The European lindens on the other hand, retain their leaves in good green condition late in the autumn and sometimes turn yellow before they drop.

A word should be said about the common linden *T. europaea* or *T. vulgaris*. Years ago this was widely planted in Europe and Britain, but it is not as good an ornamental as some of the other species. It should not be recommended. Mature trees are continually throwing up suckers at the base which must be cut off, and it seems to be the species most susceptible to severe infestations of plant lice.

Two of the smaller Asiatic lindens (*chinensis* and *mongolica*) might be tried experimentally because of their smaller heights (45 and 30 feet respectively). These are rare in America, are not even needed if larger trees will suffice, or if the slow growing *T. cordata* would be adaptable for a particular situation.

As for the rest of the recommended types, they vary in habit, some being fastigate, some narrowly pyramidal but more are densely pyramidal in habit — a form by which a member of this genus can usually be told at great distances.



The flowers, as all know, are extremely fragrant and are borne in the greatest profusion at the end of June. They are most attractive to bees — honey made from them is excellent.

Wood of the linden is used for drawing boards, sounding boards on pianos. In early times many centuries ago, the inner bark fiber was used for making paper, and even today in parts of Europe the "bast" fibers are used in making mats, coarse cloth and occasionally shoes.

The leaves have been collected (in Europe) and fed (dry or fresh) to cattle. Linden oil distilled from the flower is used in perfumes. In the past, Americans have planted the native species (*T. americana heterophylla*, *caroliniana-floridana*, *neglecta*, *monticola*), but with the excellent performance of the European species and their hybrids, and the long lasting qualities of their foliage, the native American species have been relegated to the background, and justifiably so.

Sixteen lindens might be considered sufficiently important ornamentals to plant and grow commercially. Forty have been relegated to the list of "not recommended" types. It must be admitted that the American and Asiatic types have been downgraded largely on their performance in the Arnold Arboretum in Boston. If, in other parts of the country, they do better than the European species or their hybrids, the author would certainly like to know it.

Tilias Recommended

americana 'Fastigiata' 90' Z 2 — a narrow pyramidal form with larger leaves than some of the European forms, but nevertheless with some ornamental value because of its habit.

cordata 90' Z 3 Europe Littleleaf European Linden

Leaves $1\frac{1}{2}$ "-3" long, slow growing, but one of the best and hardiest of lindens, especially well adapted for planting in urban areas. It is usually seen only half as high in cultivation as it is in its natural habitat. Hardy even at F. L. Skinner's in Dropmore, Manitoba, Canada.

cordata 'Pyramidalis' — with a widely pyramidal habit.

× **euchlora** 60' Z 5 (*cordata* × *dasystyla*) Crimean Linden

The leaves of this hybrid are a bright glossy green, being about 2"-4" long. The branches are only slightly pendulous but it makes an excellent specimen or street tree.

× **europaea 'Pendula'** — with branches slightly pendulous. I have not seen a specimen of this tree, nor do I know where there is one in the United States. From the description, however, it might be worthy of a trial.



PLATE XXIII

Three tree types at "Planting Fields" Arboretum, Glen Cove, Long Island. Left to right: *Tilia petiolaris*, *Robinia pseudo-acacia*, *Ulmus americana*.

mongolica 30' Z 4 China Mongolian Linden

With leaves $1\frac{1}{2}''-3''$ long, this small leaved, small tree is very graceful with reddish young branchlets, and merits further trial as an important small shade tree.

petiolaris 75' Z 5 S.E. Europe and western Asia Pendant Silver Linden

This is another linden that should be planted far more than it is, with pendulous branches and leaves $2''-4\frac{1}{2}''$ long on petioles that make it possible for the leaves to flutter in the slightest breeze. Closely resembling *T. tomentosa* but more graceful, and under surface of the leaves not so downy.

platyphyllos 120' Z 3 Europe Big-leaf Linden

This has the largest leaves of any of the European lindens ($2''-5''$) and so might be considered slightly coarse in texture, but it is a better ornamental than *T. europaea* (*vulgaris*).

platyphyllos aurea — with young twigs and branches yellow.

platyphyllos 'Fastigiata' — narrowly pyramidal in habit of growth.

platyphyllos 'Laciniata' — with irregularly lobed leaves and a considerably smaller tree than the species.

platyphyllos 'Rubra' — with young twigs red. There is a variety in European nurseries listed as *T. platyphyllos corallina*, but this is a synonym of '**Rubra**.'

tomentosa 90' Z 5 S.E. Europe and W. Asia Silver Linden

So named because of the dense white pubescence on the under surface of the leaves that give the whole tree a whitish appearance especially when there is even a slight breeze. Possibly not a tree for planting in areas where there is much smoke or dust in the air since minute particles will adhere to the under surface of the leaves. In the open, however, it makes an excellent specimen.

tomentosa erecta — supposedly an erect form. However, the species itself is stiff when young and since our plants are only two feet tall we have not observed this variety long enough to know whether it will retain this erect habit at maturity.

'**Handsworth**' — a clone of *T. cordata*, obtained as scions from the Royal Botanical Gardens at Kew, England in 1952. The one year twigs are a beautiful light yellow green. Small trees with vigorous growth are most outstanding in the winter. Originated in the Handsworth Nursery near Sheffield, England, according to Mr. Campbell of Kew.

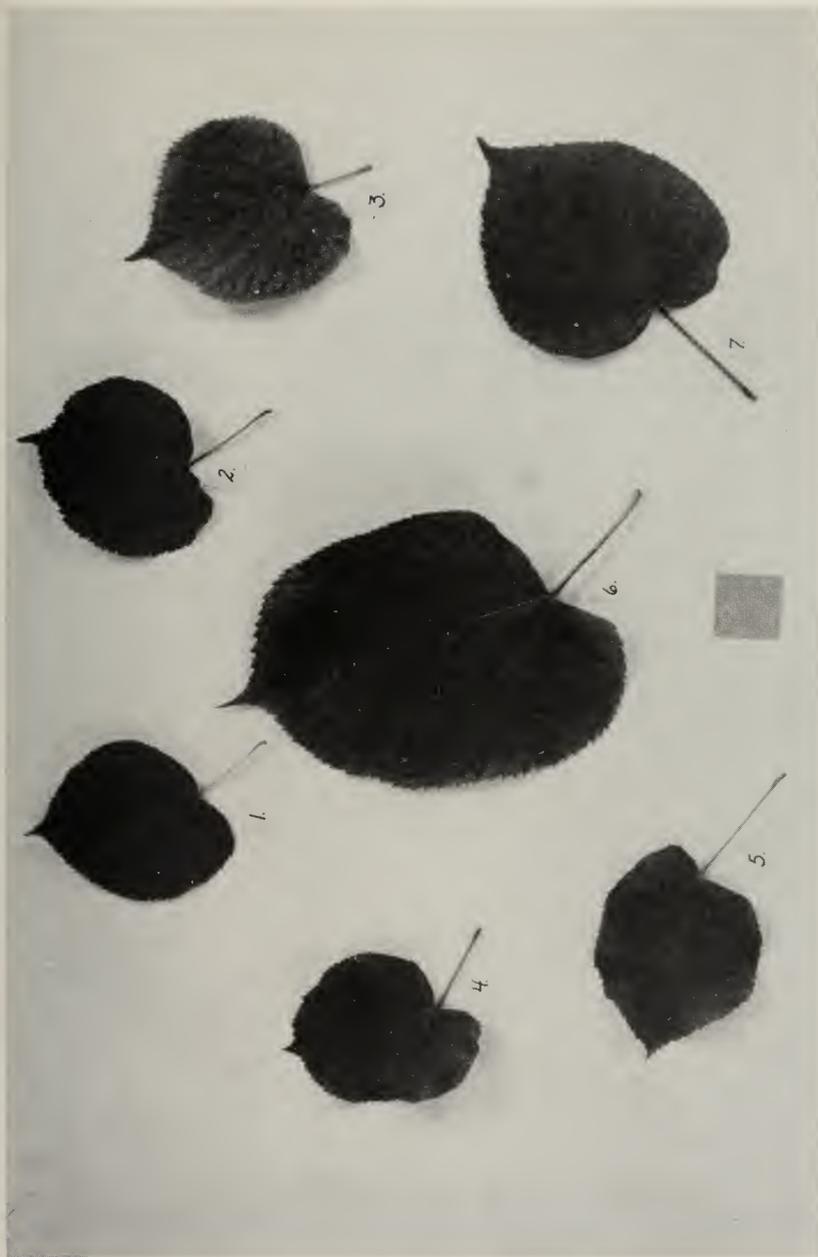


PLATE XXIV

Closeup of leaves: 1. *Titia euchlora*, 2. *T. cordata*, 3. *T. europaea*, 4. *T. tomentosa*, 5. *T. petiolaris*, 6. *T. americana*, 7. *T. platyphyllos*.

'Redmond' — this variety of *T. euchlora* from the midwest was introduced by the Plumfield Nurseries of Fremont, Nebraska, in 1927. It was named in honor of C. M. Redmond who discovered the original tree growing in his garden in Fremont, Nebraska, in the early 1920's. The parent tree is now nearly 50 feet tall, densely pyramidal in habit, adapted to growing well in many situations.

Tilias Not Recommended

B = inferior or no better than recommended types

americana — leaves too large (3" × 6"), color poor in late August.

ampelophylla — leaves lobed, too large, color poor in late August.

dentata — leaves dentate, too large, color poor in late August.

macrophylla — leaves too large, color poor in late August.

amurensis — B

caroliniana — B — a native American — poor foliage.

chinensis — more information needed concerning the ornamental possibilities.

cordata ascidiata — B

“ **cordifolia** — differs very little from the species.

dasystyla — B

× **europaea** — the common linden widely planted and recommended by E. H. Wilson probably before he noted the good points of some of the other lindens. This suckers badly at the base, always requiring some attention. Also it has, in my experience at least, been the linden most susceptible to serious infestations of plant lice. It also drops its leaves earlier than some of the others. It might be well to consider *T. cordata*, *euchlora* and even *platyphyllos* before selecting this one.

× **europaea pallida** — leaves poor pale green and larger than those of species.

× **flaccida** — B — hybrid (*platyphyllos* × *americana*) retains some of *T. americana*'s objectionable characteristics.

× **flavescens** — B — this is a hybrid *cordata* × *americana* and retains some of *T. americana*'s objectionable characteristics.

floridana — B — a native American — poor foliage.

henryana — B — leaves up to 5" long.

henryana subglabra — B — leaves up to 5" long.

heterophylla — B — a native American — poor foliage.

“ **michauxii** — B — native American — poor foliage.

insularis — B — a native American.



PLATE XXV

Tilia tomentosa in the Arnold Arboretum when all the leaves have dropped showing the branching habit.

intonsa - B - leaves $3\frac{1}{2}$ "-6" long - hence leaves too large.

japonica - B - resembling *T. cordata* but leaves slightly larger and color in August is poor.

×**juranyana** (*tomentosa*×*cordata*) - this tree should have good foliage, but apparently it is not in cultivation.

kiusiana - Zone 7

mandshurica - B - leaves 4"-8" long - too large.

maximowicziana - B - leaves 4"-7" long - too large.

miqueliana - B - foliage not as good as European species.

×**moltkei** - B - (*americana*×*petiolaris*) leaves too large and coarse (4"-7").

monticola - B - leaves 4"-8" long, too coarse texture, poor color in August.

neglecta - B - " " " " " " " " " " "

oliveri - B

×**orbicularis** (*petiolaris*×*euchlora*) - more information is needed about this before it is recommended or rejected.

paucicostata - native of northern China - more information is needed about this before it is recommended or rejected.

platyphyllos corallina (syn. for *platyphyllos rubra*).

" **vitifolia** - B

" **begonaefolia** - from Kew - probably identical with var. *laciniata* or possibly *T. dasystyla*.

platyphyllos tortuosa - B - the twigs are slightly irregularly borne, giving rise to the name, but it is not sufficiently different from the species to warrant it being grown commercially.

tomentosa pendala=*petiolaris*

tuan - leaves 3"-5" long - more information needed concerning its ornamental possibilities.

tuan chinensis - differs little from species.

DONALD WYMAN

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ARNOLDIA



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NUMBERS 11-12

THE OAKS

THE oaks constitute one of the most important groups of trees in the world, both as timber trees and as ornamentals. They are native throughout the northern temperate regions of the world and in tropical Asia, being just as important in Europe and in certain parts of Asia as they are in North America. Thirty-five oaks are recommended here for growing in the United States as ornamentals. Seventy species and varieties are in cultivation in the Arnold Arboretum and American nurserymen offer about forty. In selecting the following thirty-five recommended oaks, nearly 150 were omitted as being insufficiently ornamental.

The oaks in general are large trees, the alternate-leaved foliage of many being rather large and coarse. The best examples of small leaves (and of the finest foliage texture, as well), might be *Quercus phellos*, *Q. palustris*, *Q. ilex* and *Q. libani*. Of the thirty-five listed here, six are native to Asia, ten to Europe and the remaining nineteen are native to North America.

There are only five in the following list which have mature heights under sixty feet. These are *Quercus acutissima*, *Q. glandulifera*, *Q. engleriana*, *Q. liaotungensis* and *Q. libani*. Of these, the first two mature at about forty-five feet and the others at about thirty feet. This is one of the reasons these smaller trees, not grown widely in America at the present time, are recommended for trial.

It is interesting to note that of those recommended in the following list, ten are hardy only in Hardiness Zone 7 (the southern United States) or in warmer parts of the country.

There are seven of the recommended oaks with evergreen leaves and of course these are for growing only in the South. They are *Quercus agrifolia*, *Q. chrysolepis*, *R. engleriana*, *Q. ilex*, *Q. suber*, *Q. virginiana* and *Q. wislizenii*.

Those species native to America are especially noted for their excellent red autumn color, although all do not necessarily turn red. For instance, *Quercus imbricaria* turns a rich yellow-bronze. Those native to Europe, like many other European plants, usually have no special autumn color, the leaves sometimes dropping before turning brown.

[77]



The oaks are noted as being long-lived and growing to a great size. The following measurements are from records kept by the American Forestry Association which has listed "400 Big Tree Champions" growing in the United States.

	Trunk circumference at 4½ feet	Crown spread	Total height
<i>Quercus alba</i>	27'8"	165'	95'
<i>agrifolia</i>	38'	123'	88'
<i>bicolor</i>	16'11"	112'	90'
<i>borealis maxima</i>	23'3"	100'	80'
<i>chrysolepis</i>	36'3"	130'	60'
<i>imbricaria</i>	9'7"	72'	61'
<i>laurifolia</i>	24'	—	—
<i>palustris</i>	18'2"	—	—
<i>macrocarpa</i>	21'4"	114'	143'
<i>montana</i>	19'1"	111'	82'
<i>phellos</i>	20'	106'	118'
<i>prinus</i>	30'3"	—	110'
<i>velutina</i>	19'6"	136'	90'
<i>virginiana</i>	35'	168'	78'

All in all, there are many excellent ornamental trees among the oaks and plantsmen would do well to choose from the following list those trees which will grow well under local conditions.

Oaks Recommended

Q. acutissima 45' Zone 6 China, Korea, Japan Sawtooth Oak

The Sawtooth Oak is an excellent, wide-spreading tree with glossy foliage resembling that of the chestnut. The tree usually grows as broad as it does high; hence plenty of space should be allowed for its full development.

Q. agrifolia 90' Zone 9 California California Live Oak

This roundheaded, evergreen tree with holly-like foliage is chiefly of value as an ornamental in the hills and valleys of the California coast where it is native.

Q. alba 90' Zone 4 Eastern United States White Oak

The broad, round head, spreading branches and purplish-red autumn color of this tree make it an excellent specimen in the open. Slow in growth, its open branching system usually makes the passage of electric wires through the tree a simple matter.

Q. bicolor 60' Zone 3 Eastern and Central North America
Swamp White Oak



PLATE XXVI

Quercus robur 'fastigiata.' This splendid specimen is growing on the campus of the Pennsylvania State University.

This species is similar to *Quercus alba*, but has coarser leaves. It does well in moist to wet soils.

Q. borealis 75' Zone 4 Northeastern and Central North America
Red Oak

This tree, often incorrectly listed as *Quercus rubra*, is commonly grown throughout much of the United States where it is hardy. It can be transplanted easily and is one of the fastest growing of the oaks. In shape it is pyramidal when young, generally becoming rounded with age, and has excellent red autumn color. The variety *maxima* is practically identical for ornamental purposes at least, differing slightly from the species in that it has larger fruit and a slightly more southern range.

Q. canariensis 90' Zone 7 Spain and North Africa Canary Oak

A handsome deciduous tree with leaves which frequently remain on the tree until Christmas, this has not been widely used in America, but its good performance in Europe would seem to recommend its trial here.

Q. cerris 90' Zone 6 Southern Europe and Western Asia Turkey Oak

This broadly pyramidal tree has fine texture, the leaves ranging in length from 2 to 4 inches. It is one of the faster growing oaks, but in this country does not do well north of southern New England.

Q. chrysolepis 60' Zone 7 Pacific Coast Canyon Live Oak

An evergreen oak, among the most beautiful of those native to California, this has a wide-spreading head and branches which are often pendulous.

Q. coccinea 75' Zone 4 Eastern and Central United States Scarlet Oak

This lustrous-leaved tree, more open in habit than either the Pin or the Red Oaks, has been planted profusely. The autumn color is a brilliant scarlet. Unfortunately, it is difficult to transplant and in the midwest the Shumard Oak is taking its place.

Q. engleriana 30' Zone 7 Central and West China Engler's Oak

Because of its small size and evergreen foliage, this might be worthy of trial wherever larger evergreen oaks thrive. The leathery leaves are 3 to 7 inches long.

Q. falcata 75' Zone 5 New Jersey to Florida and Missouri
Spanish Oak or Southern Red Oak

The branches of this tree form an open, round-topped head with dark green, deeply cut leaves. The autumn color is dull orange to brown. Because it is a native, it has been used to some extent in landscape work.



PLATE XXVII

Above: *Quercus ilex* at Kew Gardens, London, England. Below: *Quercus alba*, the native White Oak.

Q. glandulifera 45' Zone 5 Japan, Korea and China Glandbearing Oak

A small, shapely tree with open branching habit and lustrous green leaves which retain their color until late fall.

Q. ilex 60' Zone 9 Southern Europe Holly or Holm Oak

Roundheaded, with broad, spreading branches, this evergreen oak has been popular for centuries in southern Europe. The small, often holly-like leaves, although varying somewhat in size, are generally $1\frac{1}{2}$ to 3 inches long and the tree takes shearing well. It does best in areas near the seashore where there is a high degree of atmospheric moisture.

Q. imbricaria 75' Zone 5 Central United States Shingle Oak

A round-topped, rather open tree when mature, but nicely pyramidal while young, this excellent deciduous native tree is not grown much at present. It is one of the very best of the oaks. Its lustrous leaves are similar in shape to those of mountain laurel, though somewhat longer, and have a russet fall color. The Shingle Oak makes an excellent windbreak and can be sheared to grow as a clipped hedge. There are many excellent reasons why it should be used much more in landscape work than it is at present.

Q. kelloggii 90' Zone 7 Oregon to California California Black Oak

This is a dense roundheaded tree with stoutly spreading branches and with leaves similar to those of the Red Oak. This long-lived tree is used only on the Pacific Coast, where it does well in dry, sandy or gravelly soils.

Q. laurifolia 60' Zone 7 Virginia to Florida and Louisiana Laurel Oak

The semi-evergreen, lustrous leaves of this species are mostly entire, 2 to $5\frac{1}{2}$ inches long, with some slightly lobed. It is often used as a street tree in the southeastern United States. The variety 'Darlington' is sometimes listed as being more dense and compact and as retaining its leaves longer than the species.

Q. liaotungensis 30' Zone 5 Northeastern Asia

Closely related to *Quercus mongolica*, this tree has foliage somewhat similar to that of *Q. robur*. A fifty-year-old specimen in the Arnold Arboretum is only about 30 feet tall, but has a nicely arched habit, with branches facing the ground on all sides.

Q. libani 30' Zone 5 Syria and Asia Minor Lebanon Oak

The leaves of this handsome, deciduous or half evergreen small tree are long, narrow, regularly toothed, about 2 to 4 inches in length and look from a distance like those of a willow. This, and *Quercus phellos* have the smallest leaves of any of the oaks growing in the Arnold Arboretum. *Quercus libani* is used extensively in England and does well there.



PLATE XXVIII

Left: Trunk of *Quercus suber*, the Cork Oak. Right: Trunk of *Quercus variabilis*, the Oriental Oak.



PLATE XXIX

Leaves and fruits of some oaks. Top row: *Quercus velutina*, *Q. robur*, *Q. variabilis*, *Q. borealis* and *Q. marilandica*. Middle row: *Quercus glandulifera*, *Q. imbricaria*, *Q. macrocarpa*, *Q. palustris* and *Q. bicolor*. Bottom row: *Quercus alba*, *Q. montana*, *Q. arkansana*, *Q. coccinea* and *Q. dentata*.

Arboretum has faintly purplish green leaves, the color differing only slightly from that of the species.

Q. robur 'Concordia' - This is the Golden English Oak, a weak grower, sometimes scorching badly in very hot sun. The leaves are a bright yellow, especially in the early spring. An excellent specimen of this formerly grew near Highland Park in Rochester, New York, but small plants tried on several occasions in the Arnold Arboretum have invariably succumbed to winter killing and heavy sun scorch.

Q. robur 'Pendula' - This is a form reported to have pendulous branches. It appears to be rare in the United States. Since plants of this variety apparently vary considerably, it is likely that the poorer clones would have little value as ornamentals.

Q. shumardii 120' Zone 5 Central and Southern United States
Shumard Oak

Throughout its native habitat this tree makes a good substitute for the Scarlet Oak.

Q. suber 60' Zone 7 Southern Europe, Northern Africa Cork Oak

Usually an evergreen, roundheaded tree with massive branches, this plant requires full sun and semi-arid soil conditions in areas where the winter temperatures never drop below zero Fahrenheit. This tree is the source of cork for commerce and many are being planted experimentally in the southern United States.

Q. variabilis 75' Zone 5 China, Korea and Japan Oriental Oak

The foliage of this tree is dull green in color and of a size and shape resembling that of *Castanea crenata*. The interesting bark, only about $\frac{1}{2}$ inch thick, is corky and very ornamental, showing off especially well in winter.

Q. velutina 100'-150' Zone 5 Eastern and Central United States Black Oak

One of the largest of the northern American oaks, this tree has lustrous green leaves which turn red in the fall. There is usually a deep tap root, making larger trees difficult to transplant. It is not a good tree for the small place.

Q. virginiana 60' Zone 7 Southeastern United States Live Oak

A tree with massive trunk and branches, the spread of which is twice that of the height, this is evergreen in the far South and deciduous in the northern limits of its habitat.

Q. wislizenii 70' Zone 7 California to New Mexico Interior Live Oak

The Interior Live Oak is another evergreen oak with glossy leaves and slow growth. It is of use ornamentally only near the valleys of the southern California coastal region where it is native.

DONALD WYMAN



PLATE XXX

Leaves of twenty-three oaks. The small square at the base of the picture is one inch on each side. 1. *Q. imbricaria*. 2. *Q. chrysolepis*. 3. *Q. suber*. 4. *Q. laurifolia*. 5. *Q. cerris*. 6. *Q. acutissima*. 7. *Q. ilex*. 8. *Q. variabilis*. 9. *Q. phellos*. 10. *Q. agrifolia*. 11. *Q. palustris*. 12. *Q. coccinea*. 13. *Q. borealis*. 14. *Q. falcata*. 15. *Q. velutina*. 16. *Q. nigra*. 17. *Q. alba*. 18. *Q. bicolor*. 19. *Q. virginiana*. 20. *Q. robur*. 21. *Q. garryana*. 22. *Q. marilandica*. 23. *Q. montana*.



INDEX TO VOLUME XXII

Illustrations are in **bold face** type.

- Achillea millefolium*, 52
Agrostis alba, 50
 Alsike Clover, 50
Althaea rosea, 54
Amoracia rusticana, 55
Anthoxanthum odoratum, 50
Aristolochia kaempferi, 54
Asparagus officinalis, 54
Atropa belladonna, 55
 Barberry, Bean's, 10
 —, Black, 12
 —, Chenault, 10
 —, Curleaf, 14
 —, Dainty, 12
 —, Darwin, 12
 —, Dwarf Magellan, 10
 —, Japanese, 14
 —, Jasperbells, 12
 —, Korean, 12
 —, Lolog, 12
 —, Magellan, 10
 —, Mentor, 14
 —, Paleleaf, 10
 —, Rosemary, 14
 —, Warty, 16
 —, Wildfire, 12
 —, Wintergreen, 12
 Barberries, 9-16
 Beech, American, 2
 —, Copper, 2
 —, Cutleaf European, 4
 —, Dawyck, 4
 —, European, 2
 —, Oak-leaved, 4
 —, Purple, 2
 —, Roundleaf, 4
 —, Weeping, 4
 Beeches, The Majestic, 1-7
 Bellflower, European, 54
Berberis thunbergii atropurpurea, 14
 — — — 'Erecta', 14
 — — — 'Red Bird', 14
 — *beaniana*, 10
 — *buxifolia*, 10
 — — *nana*, 10
 — *calliantha*, 10
 — *candidula*, 10
 — × **chenaultii**, 10; Plate IV, 13
 — *concinna*, 12
 — *darwinii*, 12
 — **gagnepainii**, 12; Plate IV, 13
 — *gilgiana*, 12
 — *julianae*, 12
 — **koreana**, Plate III, 11; 12
 — *linearifolia*, 12
 — × *lologensis*, 12
 — × *mentorensis*, 14
 —, Recommended, 10
 — *replicata*, 14
 — × *stenophylla*, 14
 — **thunbergii**, 14; Plate V, 15
 — — 'Crimson Pygmy', 16
 — — 'Erecta', 16
 — — 'Globe', 16
 — — *minor*, 16
 — — 'Thornless', 16
 — — 'Variegata', 16
 — *verruculosa*, 16
 —, Plate IV, 13
Bellis perennis, 52
Betula davurica, 20
 — *lenta*, 20

- Betula lenta laciniata*, 20
 — *nigra*, 20
 — *papyrifera*, 18, 20
 — *pendula*, 20
 — — ‘*Fastigiata*’, Plate VII, 21; 22
 — — ‘*Gracilis*’, 22
 — — ‘*Purpurea*’, 22
 — — ‘*Tristis*’, Plate VI, 19, 22
 — — ‘*Youngii*’, 22
 — *platyphylla japonica*, 22
 — — *szechuanica*, 22
 — *populifolia*, 22, 23
 Bindweed, 55
 Birch, Canoe, 20
 —, Dahurian, 20
 —, European, 20
 —, Gray, 22, 23
 —, River, 20
 —, Sweet, 20
 Birches Recommended, 20
 —, The, 17-23
 Birthwort, 54
 Bittersweet, 55
Bonsai House, The, 42; Plate XVII,
 45; 46
 Buttercup, 53
 —, Creeping, 52
 Buttercups, 52
Calystegia sepium, 55
Campanula persicifolia, 54
 — *rapunculoides*, 54
 Canada Blue Grass, 50
Carex caryophylla, 52
 — *hirta*, 52
 — *muricata*, 52
 Carrot, 54
 Cat’s Ear, 52
 Celandine, Greater, 53
 —, Lesser, 53
Celastrus scandens, 55
 Charles Stratton Dana Greenhouses,
 The, 33-48
Chelidonium majus, 53
Chrysanthemum leucanthemum, 52
 Climbing Bittersweet, 55
 clover, red, 50
 —, white, 50
 Cock’s Foot Grass, 50
Cold Storage House, The, 42; Plate
 XVI, 44
Convallaria majalis, 54
Convolvulus, 55
Crataegus arnoldiana, 26
 — *coccinoides*, 28
 — *crus-galli*, 28
 — ‘*Autumn Glory*’, 32
 — *×lavallei*, 28
 — *mollis*, 28
 — *monogyna*, 28
 — — ‘*Biflora*’, 30
 — — ‘*Inermis*’, 30
 — — ‘*Stricta*’, 30
 — *nitida*, 30
 — *oxyacantha*, 30
 — — ‘*Paulii*’, 31
 — — ‘*Plena*’, Plate IX, 29; 31
 — — ‘*Punicea*’, 31
 — **phaenopyrum**, Plate VIII, 27, 31
 — — ‘*Fastigiata*’, 31
 — **pinnatifida major**, Plate IX, 29;
 31
 — *pruinosa*, 31
 — *punctata*, 31
 — *succulenta*, 32
 — ‘*Toba*’, 32
 — *viridis*, 32
 — *wattiana*, 32
Dactylis glomerata, 50
 Daisy, English, 52
 —, Ox-Eye, 52
 Dandelion, Fall, 52
Dana Greenhouses, Plate XIV, 41
Daucus carota, 54
 Day-lily, 54

Deadly Nightshade, 55
 Deptford Pink, 54
 Dianthus armeria, 54
 Dogwood, Tatarian, 66, 67
 Dutchman's Pipe, 54
 Fagus crenata, 6
 — engleriana, 6
 — grandifolia, 2
 — — caroliniana, 6
 — — pubescens, 6
 — japonica, 6
 — longipetiolata, 6
 — lucida, 6
 —, Not Recommended, 6, 7
 — orientalis, 6
 —, Recommended, 2-6
 — sieboldii, 6
 — *sylvatica*, 2; Plate I, 3
 — — albo variegata, 6
 — — 'Asplenifolia', 2
 — — atropurpurea, 6
 — — atropunicea, 2
 — — crispa, 6
 — — 'Cristata', 6
 — — 'Cuprea', 2
 — — dentata, 6
 — — 'Fastigiata', 4
 — — grandidentata, 6
 — — heterophylla, 7
 — — incisa, 7
 — — 'Laciniata', 4
 — — 'Latifolia', 7
 — — 'Luteo-variegata', 7
 — — macrophylla, 7
 — — nigra, 7
 — — 'Pendula', 4; Plate II, 5
 — — purpurea, 7
 — — purpureo-pendula, 4
 — — 'Quercifolia', 4
 — — 'Quercoides', 7
 — — 'Rivers', 4
 — — 'Rohani', 4

 — — 'Roseo-marginata', 4
 — — 'Rotundifolia', 4
 — — sanguinea, 7
 — — 'Spaethiana', 6
 — — 'Tortuosa', 6
 — — 'Tricolor', 7
 Field Classes, Fall, 68
 — —, Spring, 8, 24
 Flag, Blue, 50
 Gill-over-the-Ground, 52
 Glasshouses, The, 38
 Glechoma hederacea, 52
 Grass, Sweet Vernal, 50
 —, Timothy, 50
 —, Velvet, 52
 —, White Bent, 50
Greenhouses, new, 33-48; Plate X,
 35, Plate XI, 37; Plate XII, 39;
 Plate XIII, 40; 42; Plate XV, 43
 Ground Ivy, 52
Ground-breaking Ceremony, Plate
 X, 35
 Hawthorn, 26
 —, Dotted, 31
 —, Downy, 28
 —, English, 30
 —, Fleshy, 32
 —, Frosted, 31
 —, Glossy, 30
 —, Green, 32
 —, Kansas, 28
 —, Large Chinese, 31
 —, Lavalley, 28
 —, Single Seed, 28
 —, Washington, 31
 —, Watts, 32
 Hawthorns, 25
 — of Merit, 26-32
 Hemerocallis fulva, 54
 Herbaceous Aliens in the Arboretum,
 49-56
 Holcus lanatus, 52

Hollies, Wheeler, 46
 Hollyhock, 54
 Honeysuckle, Amur, 64
 —, Arnold, 60
 —, Blue-leaf, 64
 —, Box, 64
 —, Brown's, 60
 —, Coralline, 60
 —, Cream, 64
 —, Creeping, 66
 —, Dwarf Alps, 59
 —, Everblooming, 62
 —, Giant, 62
 —, Golden, 62
 —, Hall's, 64
 —, Henry, 62
 —, Lilac, 66
 —, Morrow, 64
 —, Privet, 64
 —, Pyrenees, 66
 —, Sweet, 60
 —, Tellman, 67
 —, Tibet, 67
 —, Trumpet, 66
 —, Winter, 62
 —, Yellow, 62
 —, Yunnan, 67
 Honeysuckles, Flowering Shrub, 58,
 59
 —, Order of Bloom, 59
 —, Recommended, 59
 —, The, 57-67
 Horseradish, 55
 Humulus japonicus, 55
 Hypochoeris radicata, 52
 Iris pseudacorus, 49
 — versicolor, 50
 —, Yellow, 49
 Japanese Hop, 55
 Kentucky Blue Grass, 50
 Lavender, 53
 Leontodon autumnalis, 52

Lily-of-the-Valley, 54
 Linden, Big-leaf, 72
 —, Crimean, 70
 —, Littleleaf European, 70
 —, Mongolian, 72
 —, Pendant Silver, 72
 —, Silver, 72
 Lindens, The, 69-76
 Live-for-Ever, 54
 Lolium perenne, 50
Lonicera alpigena nana, 59; Plate
 XXII, 65
 — × amoena alba, 59
 — × amoena 'Arnoldiana', 60;
 Plate XXI, 63
 — × bella candida, 60
 — × bella rosea, 60; Plate XX, 61
 — × brownii, 60
 — caprifolium, 60
 — chrysantha, 60
 — 'Clavey's Dwarf', 60; Plate XX,
 61; Plate XXII, 65
 — deflexicalyx, 60
 — 'Dropmore', 60; Plate XXI, 63
 — etrusca 'Superba', 62
 — flava, 62
 — fragrantissima, 62
 — 'Goldflame', 62
 — × heckrottii, 62
 — henryi, 62
 — hildebrandtiana, 62
 — japonica aureo-reticulata, 62
 — — halliana, 64
 — — repens, 64
 — korolkowii, 64
 — — aurora, 64
 — — zabelii, 64
 — maackii, 64
 — — podocarpa, Plate XX, 61
 — morrowii, 64
 — nitida, 64
 — pileata, 64

Lonicera prostrata, 66
 — *pyrenaica*, 66
 — 'Redgold', 66
 — *sempervirens*, 66
 — — *sulphurea*, 66
 — — 'Superba', 66
 — *syringa wolfii*, 66
 — *syringantha*, 66
 — **tatarica**, Plate XX, 61; 66, 67
 — — *alba*, 67
 — — 'Arnold Red', Plate XX, 61;
 67
 — — *grandiflora*, 67
 — — *leroyana*, 67
 — — *lutea*, 67
 — — 'Morden Orange', 67
 — — *nana*, 67
 — — *parviflora*, 67
 — — *rosea*, 67
 — — *sibirica*, 67
 — — × *tellmanniana*, 67
 — — *virginalis*, 67
 — *thibetica*, 67
 — *tragophylla*, 67
 — *yunnanensis*, 67
Loosestrife, Purple, 49
Lythrum salicaria, 49; Plate XIX,
 51
Majoram, 53
Marguerite, Wild, 52
Meadow Foxtail, 50
Mercer, Martha Dana, 34
 —, Mrs. William R., 34
Mullein, Giant, 54
Oak, Black, 86
 —, California Black, 82
 —, — Live, 78
 —, Canary, 80
 —, Canyon Live, 80
 —, Chestnut, 84
 —, **Cork**, Plate XXVIII, 83, 86
 —, Engler's, 80

—, English, 84
 —, Glandbearing, 82
 —, Golden English, 86
 —, Holly, 82
 —, Holm, 82
 —, Interior Live, 86
 —, Laurel, 82
 —, Lebanon, 82
 —, Live, 86
 —, **Oriental**, Plate XXVIII, 83, 86
 —, Pin, 84
 —, Red, 80
 —, Sawtooth, 78
 —, Scarlet, 80
 —, Shingle, 82
 —, Shumard, 86
 —, Southern Red, 80
 —, Spanish, 80
 —, Swamp White, 78
 —, Turkey, 80
 —, Water, 84
 —, **White**, 78; Plate XXVII, 81
 —, Willow, 84
Oaks Recommended, 78-87
 —, The, 77-87,
Open House, 8
Orchard Grass, 50
Ornithogalum officinale, 54
Parsnip, 55
Pastinaca sativa, 55
Poa compressa, 50
 — *pratense*, 50
Queen Anne's Lace, 54, 55
Quercus acutissima, 78; Plate XXX,
 87
 — **agrifolia**, 78; Plate XXX, 87
 — **alba**, 78; Plates XXVII, 81;
 XXIX, 85; XXX, 87
 — **arkansana**, Plate XXIX, 85
 — **bicolor**, 78; Plates XXIX, 85;
 XXX, 87
 — **borealis**, 80; Plates XXIX, 85;

XXX, 87
Quercus canariensis, 80
 — *cerris*, 80; Plate XXX, 87
 — *chrysolepis*, 80; Plate XXX, 87
 — *coccinea*, 80; Plates XXIX, 85;
 XXX, 87
 — *dentata*, Plate XXIX, 85
 — *engleriana*, 80
 — *falcata*, 80; Plate XXX, 87
 — *garryana*, Plate XXX, 87
 — *glandulifera*, 82; Plate XXIX, 85
 — *imbricaria*, 82; Plates XXIX, 85;
 XXX, 87
 — *ilex*, 81; Plates XXVII, 82;
 XXX, 87
 — *kelloggii*, 82
 — *laurifolia*, 82; Plate XXX, 87
 — *liaotungensis*, 82
 — *libani*, 82
 — *macrocarpa*, Plate XXIX, 85
 — *marilandica*, Plates XXIX, 85;
 XXX, 87
 — *montana*, Plates XXIX, 85;
 XXX, 87
 — *nigra*, 84; Plate XXX, 87
 — *palustris*, 84; Plates XXIX, 85;
 XXX, 87
 — *phellos*, 84
 — *prinus*, 84
 — *robur*, 84; Plates XXIX, 85;
 XXX, 87
 — — ‘*Asplenifolia*’, 84
 — — ‘*Atropurpurea*’, 84
 — — ‘*Concordia*’, 86
 — — ‘*Fastigiata*’, Plate XXVI, 79;
 84
 — — ‘*Pendula*’, 86
 — *shumardii*, 86
 — *suber*, Plate XXVIII, 83; 86;
 Plate XXX, 87
 — *variabilis*, Plates XXVIII; 83;
 XXIX, 85; 86; XXX, 87

— *velutina*, Plate XXIX, 85; 86;
 XXX, 87
 — *virginiana*, 86; Plate XXX, 87
 — *wislizenii*, 86
Ranunculus acris, 52
 — *bulbosus*, 52
 — *ficaria*, Plate XIX, 51; 53
 — *repens*, 52
 Redtop, 50
Robinia pseudoacacia, Plate XXIII,
 71
Rorippa microphylla, 55
 — *nasturtium-aquaticum*, 55
 Rosemary, 53
 Run-away-Robin, 52
 Rye-Grass, 50
 Sage, 53
Salicaria, Spiked, 49
Scilla sibirica, 54
Sedum purpureum, 54
 Siberian Squill, 54
 Snowdrops, 53
Solanum dulcamara, 55
 Star-of-Bethlehem, 54
Stellaria graminea, 52
 Stitchwort, 52
 Thorn, Cockspur, 28
 —, Glastonbury, 30
 Thyme, 53
Tilia americana, Plate XXIV, 73; 74
 — — *ampelophylla*, 74
 — — *dentata*, 74
 — — ‘*Fastigiata*’, 70
 — — *macrophylla*, 74
 — *amurensis*, 74
 — *caroliniana*, 74
 — *chinensis*, 74
 — *cordata*, 70; Plate XXIV, 73
 — — *ascidiata*, 74
 — — *cordifolia*, 74
 — — ‘*Pyramidalis*’, 70
 — *dasystyla*, 74
 — × *euchlora*, 70; Plate XXIV, 73

Tilia × **europaea**, Plate XXIV, 73; 74
 — × — **pallida**, 74
 — × — ‘**Pendula**’, 70
 — × **flaccida**, 74
 — × **flavescens**, 74
 — **floridana**, 74
 — ‘**Handsworth**’, 72
 — **henryana**, 74
 — — **subglabra**, 74
 — **heterophylla**, 74
 — — **michauxii**, 74
 — **insularis**, 74
 — **intonsa**, 76
 — **japonica**, 76
 — × **juranyana**, 76
 — **kiusiana**, 76
 — **mandshurica**, 76
 — **maximowicziana**, 76
 — **miqueliana**, 76
 — × **moltkei**, 76
 — **mongolica**, 72
 — **monticola**, 76
 — **neglecta**, 76
 — **oliveri**, 76
 — × **orbicularis**, 76
 — **paucicostata**, 76
 — **petiolaris**, 72: Plates XXIII, 71;
 XXIV, 73
 — **platyphyllos**, 72; Plate XXIV, 73
 — — **auraea**, 72

— — **begonaefolia**, 76
 — — **corallina**, 76
 — — ‘**Fastigiata**’, 72
 — — ‘**Laciniata**’, 72
 — — ‘**Rubra**’, 72
 — — **tortuosa**, 76
 — — **vitifolia**, 76
 — ‘**Redmond**’, 74
 — **tomentosa**, 72; Plates XXIV, 75;
 XXV, 75
 — — **erecta**, 72
 — — **pendula**, 76
 — **tuan**, 76
 — — **chinensis**, 76
Tilias Not Recommended, 74
 — **Recommended**, 70
Trifolium hybridum, 50
 — **pratense**, 50
 — **repens**, 50
Ulmus americana, Plate XXIII, 71
Verbascum thapsus, 54
Vetch, Tufted, 52
Vicia cracca, 52
Viola odorata, 54
Violet, Sweet, 54
Watercress, 55
Wheeler, Wilfrid, 46
Woodbine, Chinese, 67
Yarrow, 52
Yorkshire Fog, 52

