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ARNOLD ARBORETUM  
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SERIES 4. VOLUME IV  
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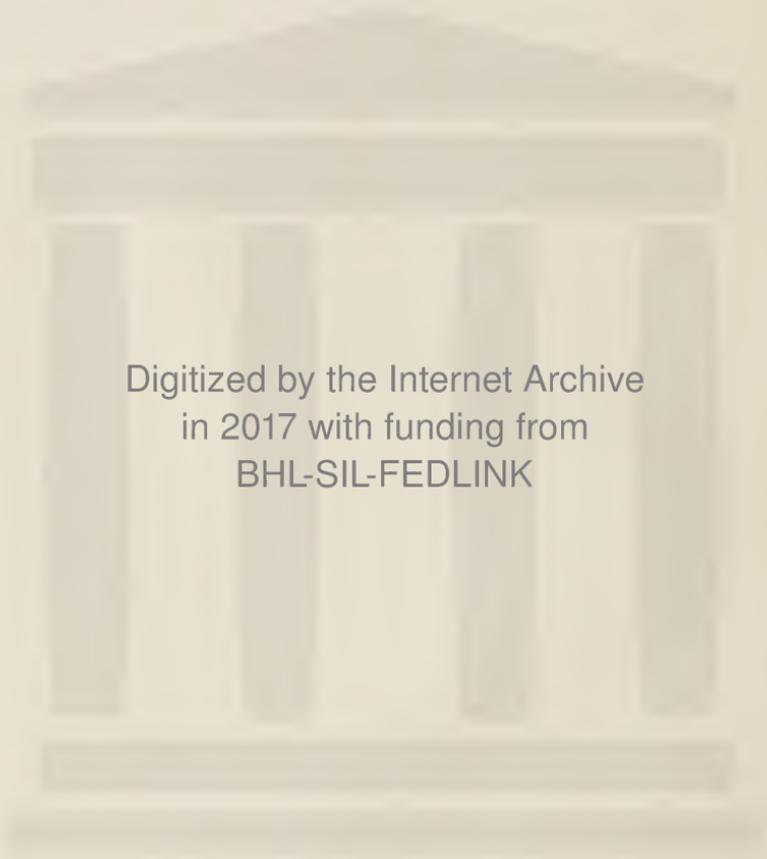
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ARNOLD ARBORETUM  
HARVARD UNIVERSITY



BULLETIN  
OF POPULAR INFORMATION

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SERIES 4. VOL. IV

MARCH 21, 1936

NUMBER 1

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TREE TROUBLES

NOT all trees keep in good healthy condition, and it is the purpose of this bulletin to mention some of the causes why we have "sick" trees, together with some recommendations for their "cure." The recommendations made are not primarily the results of any investigations at the Arboretum, but rather from various experiment stations throughout the eastern United States. Though suggestions are given on fertilizing it must be kept in mind that with wide variations in soils, in trees and in their root systems, any specific recommendation given to cover all conditions should be taken only at its face value. Efforts should be made by those interested to investigate thoroughly local conditions and try to suit any general recommendations to their particular needs.

**Illuminating Gas in the Soil.** Gas, leaking from mains, gets in the soil and may cause the death of trees. Even a very minute leak may, over a period of a few years, be sufficient to cause a nearby tree to die. An ingenious method has been devised at the Boyce Thompson Institute\* to determine the presence of illuminating gas in the soil. Of course, if gas is known to be present by its odor, then there is no need for the test, but often the damage is done by an amount of gas in the soil, so small that it cannot be detected by its odor. The test includes placing a young tomato plant in a hole in the ground, leaving it covered for twenty-four hours and observing its reaction when uncovered. If gas is present, the leaves will show a very definite type of wilting.

\*Toxic action in soil of illuminating gas containing hydrocyanic acid. By A.E.Hitchcock, William Cocker and P.W.Zimmerman. Boyce Thompson Inst. for Plant Research Contrib. 6: 1-30. 1934.

MAR 26 1936

If illuminating gas is present in the soil, no trees should be planted until the leak has been definitely and positively stopped. When this is done, the soil should either be removed entirely or be washed thoroughly so that all the soluble poisons are taken out of the soil. If the drainage is poor, tile drains should be put in since this washing process should be a complete one. When this has been done satisfactorily, new trees may be planted.

**Raising the Grade.** Raising or lowering the grade around a tree may cause serious damage. The feeding roots of most trees are usually within the upper 18 to 24 inches of soil. At this depth there is a certain amount of oxygen in the soil air spaces, while at lower depths there is usually less oxygen, more carbon dioxide and possibly less water. Since roots need a certain amount of oxygen, and large amounts of carbon dioxide are injurious, when soil is piled on top of the existing level under a tree, conditions for root injury are augmented. A fill of a few inches of soil on top of tree roots is not harmful, but a fill of 18 inches or more may prove decidedly harmful, depending on the type of tree, type of soil, amount of rainfall, drainage and the like.

If a considerable fill is to be made the procedure is as follows: The surface of the old grade is loosened; several lines (at least four) of 4-inch agricultural tile radiating out from the trunk of the tree like the spokes of a wheel, are laid as far as the spread of the branches; a layer of coarse stone or large screened gravel is used to cover the tile and to raise the grade to within 15 inches of the final lawn surface. On top of this is placed a 2-inch layer of smaller stone or pebbles, and on top of this a layer of straw, or better a layer of manure, or some similar material, in order to keep the dirt from sifting down through the rock layer. The top soil is then added to the finished grade. This treatment should be made over the entire area of ground covered by the tree branches.

At the same time a "well" is built around the trunk of the tree to the top of the proposed soil level. This "well" is from 3 to 4 feet in diameter, or larger, depending on the size of the tree, and is made to allow air and water to enter the tile and the layer of crushed rock after the filling has been done. In this way, air and moisture can reach the tree roots no matter how deep the fill is. This treatment also makes it possible to water the tree very effectively during dry weather.

**Gas in the Air.** City conditions are hard on plant life largely because of the injurious gases and soot in the air. The soot and dust

fall on the leaves and clog the stomates, thus preventing the normal intake of carbon dioxide. Also the gases contained in the air of the city, especially sulphur dioxide, are injurious to plant life. Some trees, such as *Ailanthus*, *Catalpa*, poplars and willows are more resistant than others to these variable conditions. The conifers, as a rule, are the most susceptible to this injury. If these conditions are present, one should observe the trees doing best in the vicinity and plant them, rather than trying a long series of untried and often disappointing types.

**Painting Wounds.** Experiments have shown that wounds heal most quickly when the pruning is done between February 1 and May 1. While many small wounds may heal over quickly enough to prevent infection, still it is best to paint all wounds 2 inches or more in diameter with some good durable wound dressing. At the present time the best paint for wounds, listed in order of their merit, are asphaltum, orange shellac, white and red lead paint and bordeaux paste. One of these should be applied immediately, as soon as the cut has been smoothed off, except on trees like the maples and birches, which "bleed" profusely in the spring. Such trees should be pruned only in the late spring or summer when the wood remains dry enough to paint.

Asphaltum is probably the best type of paint to use on wounds, providing a thin covering can be obtained. Several commercial asphaltum paints are on the market, some of which are thin enough so they can be used in cold weather without heating. This is the type to use. Thick asphaltum paints are not recommended, for they easily "blister" and are very hard to use properly in cold weather. The large "blisters" caused by moisture collecting under the surface eventually break the covering and provide a source of infection by the large opening they leave in the covering itself.

Orange shellac is about the least harmful to the cambium tissue of any of the paint wounds. It can be applied in cold weather but is often objectionable on account of its brilliant orange color. It also tends to crack, particularly on large wounds and may have to be retouched once or twice a year.

White or red lead paints are objectionable in color and are slightly injurious to the cambium; but they are effective and are usually available. Wounds should be repainted, when necessary, once a year.

Bordeaux Paste is made by mixing dry commercial bordeaux mixture with enough linseed oil to form a thick paste. As a wound paint it has the desirable property of being slightly porous to moisture and

air, and at the same time is a fungicide. Blistering does not occur underneath this dressing. Its outstanding drawback is its color, which passes through changes of blue to green after it has been applied. Apparently little is accomplished by painting over it, since the multi-colored copper salts eventually appear on the surface.

**Tree Repair.** Tree repair is a study in itself. It is usually unwise, and often impossible, for the inexperienced person to attempt to fill cavities. In fact, some question the value of filling tree cavities at all, believing that trees are better off if the cavities are cleaned out, painted properly and left alone. This subject is too broad for discussion here. At least a cavity should have all the diseased wood cut out, the remainder smoothed over and then painted, preferably with a good fungicidal paint like bordeaux paste. A coat of asphaltum may be added over the bordeaux for permanence.

One other thing the amateur can do is to brace some of the bad crotches in the older trees. This is never accomplished by completely encircling the limb with a wire, but by putting an eye bolt through each limb and connecting these two bolts with an iron rod or heavy cable. Each eye bolt should have the washer and nut completely countersunk on the outside so that the bark may heal over quickly.

**Fertilizers.** Lack of sufficient nutrients in the soil is only one of many causes for "sick" trees. The addition of fertilizer to the soil about a tree is not a cure-all, and should only be attempted when one is certain that malnutrition is the cause of the poor condition. Experiments on a wide range of soils, over a long period of time, have shown that in the United States at least it is nitrogen which is most frequently deficient in the soil, and possibly phosphorous. Well rotted manure is always good as a fertilizer, not only because it has a high nitrogen content, but also because it contains much organic matter which aids the soil in retaining moisture. However, many trees can be aided materially by simply broadcasting on the surface of the soil under the tree ammonium sulphate or sodium nitrate (both of which contain a high proportion of nitrogen with no phosphorous or potash); or ammophos, a trade name for a material very similar to ammonium sulphate except that it contains phosphorous in addition to nitrogen.

Shade trees may be fertilized either in the fall or in the spring. Spring fertilizing is often preferred because then, if a readily available fertilizer is used, increased growth will result the same year. If the tree is not in a valued lawn, such a fertilizer may be broadcast underneath the branches and washed in with water, but it must be remembered that large amounts of commercial fertilizer spread indis-

criminally on the grass may seriously injure it. Tests at Cornell University have shown that amounts of ammonium sulphate as high as 30 pounds per 1000 square feet can be applied to a grass plot without injury to the grass, providing application is made before the grass begins to grow in the spring.

On the other hand, there are many fertilizers on the market for shade trees with nutrients which are not so readily available to the plant as ammonium sulphate or ammophos. If such a fertilizer is applied, or if there is any danger from injuring a highly prized lawn with too much fertilizer, then the crow-bar method of applying the fertilizer should be used, as follows.

**Method of Applying Fertilizer.** A circle is drawn on the ground under the outside limits of the branches of the tree, and another circle is drawn two-thirds of the way towards the trunk. The area between these two circles is the area to be fertilized. Holes about 15 inches deep are then dug with a crow bar, soil augur or automatic drill, and the fertilizer so divided so that a small amount is placed in each hole, and the soil replaced. The amount of fertilizer in each hole depends largely on the kind of fertilizer, if it has a high amount of readily available material in it, as does ammonium sulphate, then only a few ounces should be put in a hole. The holes themselves should not be more than 3 feet apart, preferably less, for the more evenly they are distributed, the better the results. In fact, some commercial concerns are now actually blowing the fertilizer into the soil in order to get better distribution.

However, trees should not be fertilized, in general, until at least one year after transplanting, since the first year the tree is much more dependent upon its new water relations, that is, the amount of water which can be taken in by the roots as compared with the amount given off by the tops. The first year then, water the tree well, mulch it if necessary to give it additional moisture around the roots, but do not give it the highly concentrated commercial fertilizers. Some well rotted manure is satisfactory for this aids materially in conserving the moisture in the soil, but it must be well rotted.

**Amount of Fertilizer to Use.** Most fertilizer recommendations are based on the size of the tree trunk, implying that the size of the trunk is an accurate criterion to the general size of the tree. Fertilizers vary considerably with the amount of readily available material in them, and that is why some are to be used at the rate of only 1 pound per inch in diameter of tree trunk, and some at 3 pounds.

Ammonium sulphate and other similar materials can be used at the

rate of  $\frac{1}{2}$  to 1 pound per diameter inch of tree trunk on mature trees and even more on very large trees. Such materials should be used with caution on evergreens and deciduous trees under 4 inches in diameter.

A 10-20-10 fertilizer (that is, containing 10 parts nitrogen, 20 parts phosphorous and 10 parts potash) can be recommended at the same rate, the larger amounts for the larger trees. There are many such mixtures on the market, varying considerably in the amount of readily available nitrogen. The larger the amount of readily available plant food in the fertilizer, the smaller the application should be.

Well rotted manure, forked in under the trees is always good, and in a place like the Arboretum is one of the best and cheapest fertilizers which can be used.

**For Deciduous Shrubs and Evergreens.** The best general recommendation for deciduous shrubs and evergreens is to regularly mulch them in the winter with well rotted manure, rotted leaves or other quickly decomposing organic matter. Particularly is this true of evergreens, at least until more is known about their reactions to commercial fertilizers. No commercial fertilizer should ever be placed in the hole at transplanting time. At maturity, most shrubs maintain a fairly definite height, and it is foolish to fertilize such plants in the hope of making them grow taller. Also, when excessive amounts of nitrogenous fertilizers are given to certain shrubs valued for their flowers and fruits, they make a greater vegetative growth at the expense of flowers and fruits. With some shrubs (Wisteria and flowering dogwood) it has been found that a phosphatic fertilizer such a superphosphate, mixed with the soil in a trench dug around the plant, may aid in producing more flowers the following seasons.

If commercial fertilizers are to be used on the shrub border, then a 5-10-5 might be applied at the rate of  $1\frac{1}{2}$  to 2 pounds per 100 square feet. A 10-20-10 might be used at half this rate. In growing nursery stock, stronger applications than these have been used.

In fertilizing woody plants it should always be kept in mind that there is a time during the summer when no fertilizers whatever should be applied. For, if application were made at this time, increased growth might result in the early fall which would not have sufficient time to mature before the killing frosts came. Consequently, fall fertilizing might best be done at any time after the first of September.

DONALD WYMAN

## BOOKS

There are several books and many bulletins on the care of trees. A few of the outstanding ones might be:

Felt, E.P. and Rankin, W.H. Insects and diseases of ornamental trees and shrubs. New York. 1932. Macmillan Company.

Herrick, G.W. Insect enemies of shade-trees. Ithaca. 1935. Comstock Publishing Company, Inc.

Le Sueur, A.D.C. The care & repair of ornamental trees in garden park and street. London. 1934. Country Life, Limited.

Marshall, R.P. The relation of season of wounding and shellacking to callus formation in tree wounds. Washington. 1931. U. S. Department of Agriculture. Technical bulletin, 246.



ARNOLD ARBORETUM  
HARVARD UNIVERSITY



BULLETIN  
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SERIES 4. VOL. IV

MARCH 25, 1936

NUMBER 2

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INSECT CONTROL AT THE ARNOLD ARBORETUM

**I**T is the purpose of this article to give a practical summary of the problems in relation to insects effecting trees and shrubs, reporting methods of control that are used at the Arnold Arboretum. Though other materials and methods might give just as satisfactory results, only those will be reported which have been used over a period of years in the Arboretum and have proved satisfactory.

Considerable thought should be given as to the right kind of equipment used in the spraying of trees in parks or private estates. Here at the Arboretum we find that a 300 gallon sprayer, mounted on skids, with a 32 horse power motor that is capable of throwing a stream 80 feet with 350 pounds pressure, is very satisfactory. This sprayer, weighing 1620 pounds, can be loaded on a 1½ ton truck in a very few minutes from a platform. When not in use the truck is available for other work.

Our first problems are the **scale insects**. There are several kinds of these which do damage to shrubs, fruit and shade trees; namely, oyster-shell scale, San José scale, scurfy scale, evonymus scale, pine leaf scale that also affects spruces, and juniper scale. All of these scale insects obtain their food by sucking out the plant juices from the twigs and limbs, thus materially weakening the plant. Oyster shell, San José and scurfy scale may be found on apples, lilacs, plums, peaches, poplars and willows. They can be controlled by spraying with miscible oil, 1 gallon of oil to 15 gallons of water. Or lime sulphur may be used but, though it gives good control, it is being discontinued on ornamentals because of the bad color it leaves and because it is disagreeable to use. Spraying with oil for scale insects can

be done from February 15 to early April, as weather permits when the temperature is not below 35° F.

**Evonymus scale** is similar in shape to oyster shell scale and is the most serious pest of *Evonymus*, often killing entire branches. There are at least two generations of these insects a year. Spray with miscible oil (1 to 30) in the dormant season and again in summer when young scales have hatched (1 to 50). If the plants are badly infested a third spray may be necessary later. It is important to have the dormant spray weaker than for other scale insects, on account of ever-green foliage of *Evonymus radicans* and its varieties.

Considerable damage is done to pines and spruces by the **pine-leaf scale** which is easily recognized because it gives the trees a whitish appearance. Spray with miscible oil early in April, 1 part oil to 30 parts water.

**Spruce-gall aphids** can be easily recognized by pineapple-shaped galls on new growth of spruce trees, native and foreign. These gall growths are caused by small whitish plant lice feeding at the base of the leaves of young shoots. In August these galls become yellowish, dry and open, and the winged lice escape. Spraying in early spring before the new growth starts (about the middle of April) with miscible oil, 1 part miscible oil to 30 parts of water, will aid materially in controlling this pest.

The work of the **larch case-bearer** is easily recognized by the leaves of the larch turning yellow or brown in early spring. This injury is caused by the feeding of a brown, black-headed caterpillar about  $\frac{1}{4}$  inch long, first biting a hole (in the leaf) and then mining in the leaf. The caterpillar is enclosed in a small, grayish case. The young larvae at first mine in the larch leaf; later, this is cut off and serves as a case for the larvae. The winter is passed in the larval stage inside the case. We have found that early spring spraying with arsenate of lead, 2 pounds to 50 gallons of water when the young are feeding is an excellent method of control.

**Golden oak scale** is one of the most destructive scales occurring on oaks. It can be easily detected as the scale is a beautiful, greenish golden color, and often kills twigs and entire branches. The scales pass the winter as almost mature individuals, the young emerging in May. The pest may be controlled by spraying in very early spring with miscible oil, 1 gallon to 15 of water.

From the end of April to the middle of May, as new leaves appear, close watch should be given to **canker-worms**. As soon as they appear spray should be applied at once as they cause considerable dam-

age in only a few days. There are two common kinds of canker-worms, one appearing in the spring, the other in the fall. The spring canker-worm seems to be the most injurious. It attacks maples, elms, oaks, apples and many other fruit and shade trees. The worms themselves are yellowish brown, about 1 inch long when fully grown. When crawling they arch the middle of their body, being a typical "measuring worm." Spray should be applied when the worms are half grown, using arsenate of lead, 2 pounds to 50 gallons of water.

In the past few years the **willow leaf-beetle** has been giving us considerable trouble. The beetle is a metallic blue in color, oval and rounded, about  $\frac{1}{8}$  of an inch long. There are two broods a year. It passes the winter under the rough bark of willow trees. Spray early in June with arsenate of lead, 2 pounds to 50 gallons of water. Great importance should be placed on getting the spray on the **under surface** of leaves, as the beetle feeds *only* on that surface. It is frequently so prevalent that it destroys all the foliage on certain species of willows.

**Rhododendron lace-bug.** The lace-bug does considerable damage every year to Rhododendrons and mountain laurels, producing unsightly yellowish or brown spotting of the leaves, particularly on those in the full sun. It is a flat bug with light, lacy-like wings. The insect overwinters in the egg stage along the midrib on the under side of leaf. These eggs hatch in the early part of May. There is also a second brood in August. Spraying with miscible oil, 1 to 70, as soon as they hatch will control the early brood. The under surface of the foliage should be sprayed very thoroughly, using Sunoco oil at the rate of 1 to 60, for the August brood does the most damage. Select a partly cloudy day with temperature not above 80° F. to prevent the burning of foliage.

The **elm leaf-beetle** is one of the most destructive insects attacking elms. The beetles are about  $\frac{1}{4}$  of an inch long, yellowish green in color with a distinctly darker stripe along each side of the wing cases. The beetles pass the winter hidden under rough bark and various other types of shelters. In the spring they lay their eggs on the under surface of the leaves of elms. The larvae, hatching from these eggs, feed on the under surface of the leaf and practically skeletonize it. Spraying in early June, or as the larvae appear, with arsenate of lead, 3 pounds to 50 gallons of water will control the beetle. This spray should be directed especially to the underside of the leaves. As there are two generations a year, a second spray is necessary by the middle of July.

**Rusty colored evergreens** in summer often indicate **red spider** injury. These pests multiply very rapidly during hot, dry weather. They can be controlled by spraying with Sunoco oil, 1 gallon to 100 gallons of water, on a partly cloudy day with the temperature not over 80° F. We obtain best results in applying this as a very fine misty spray, using considerable force.

**White pine weevil** has caused considerable damage to young white pines in the Arboretum. It is easily determined by the central or terminal leader wilting and turning brown. As this damage is caused by grubs within the wood it is very hard to control. Cut out brown leaders and shoots at least several inches below the point where browning first occurs.

There are several **borers** that cause considerable damage to shade and fruit trees. Round-headed and flat-headed apple tree borers have long been a problem on fruit trees. The work of these borers is indicated by shallow burrows on the main trunk just under the bark. Some are noticeable in the spring by the fresh dust or burrow excavations on the trunk. The most effective way of controlling these grubs at the Arboretum has been to cut them out with a sharp pointed knife.

**Leopard moth** attacks a number of our valuable shade trees such as elms, maples, and lindens. These insects take 2 or 3 years to develop, so that two or three winters are passed in the larval stage. Young trees should be watched as borers get into the main stem. When a hole is located the grub can usually be hooked out with a wire. If this is not successful, put a few drops of carbon bisulphide into the hole and then putty up the opening.

Again we repeat that these control methods are the ones which are actually being used successfully at the Arboretum and have been for several years. However, there are other materials and possible other methods of control which would probably prove just as satisfactory.

L. V. SCHMITT

**N**OTE. In all cases where miscible oil is recommended in this bulletin, such recommendations have been based on Sunoco oil only, which has proved satisfactory at the Arboretum.

There are several books and bulletins available as references for problems dealing with insects or diseases. A few of the outstanding ones might be:

- Britton, W. E. Plant pest handbook for Connecticut. i. Insects. New Haven. 1933. Connecticut agricultural experiment station. Bulletin, 344.
- Chambers, E. L. and Thompson, N. F. Pests and diseases of trees and shrubs. Madison. 1933. Wisconsin department of agriculture and markets. Bulletin, 145.
- Clinton, G. P. Plant pest handbook for Connecticut. ii. Diseases and injuries. New Haven. 1934. Connecticut agricultural experiment station. Bulletin, 358.
- Felt, E. P. and Rankin, W. H. Insects and diseases of ornamental trees and shrubs. New York. 1932. Macmillan Company.
- Herrick, G. W. Insect enemies of shade trees. Ithaca. 1935. Comstock Publishing Company.
- Wilson, Andrew. Insects and their control. New Brunswick, N. J. 1929. Thatcher-Anderson Company.

## SPRAY PROGRAM AT THE ARNOLD ARBORETUM

	Spray Material	Amount to Apply	When to Apply
Scale insects	Miscible oil	1-15	Feb. 15 to early April
Evonymus scale	“ “	1-30 1-50	when plants are dormant in the summer
Pine-leaf scale	“ “	1-30	early April
Spruce-gall aphids	“ “	1-30	April 15
Larch case-bearer	Arsenate of lead	2 lbs.-50 gal.	when young are feeding
Golden oak scale	Miscible oil	1-15	early spring
Spring canker-worm	Arsenate of lead	2 lbs.-50 gal.	as soon as young appear
Willow leaf beetle	“ “ “	2 lbs.-50 gal.	early June, applied to un- der surface of the leaves
Lace-bug of Rhododendrons	Sunoco oil	1-70 1-60	as they hatch in the spring in August on a partly cloudy day when the tem- perature is not over 80° F.
Elm leaf-beetle	Arsenate of lead	3 lbs.-50 gal.	early June. A second spray may be necessary for a second brood
Red spider on evergreens	Sunoco oil	1-100	applied in summer as a fine mist on a cloudy day when temperature is not over 80° F.
White pine weevil			cut out borers and dead branches
Borers			dig out

L. V. SCHMITT

ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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APRIL 1, 1936

NUMBER 3

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THE VIEWPOINT OF THE ARNOLD ARBORETUM  
ON THE DUTCH ELM DISEASE

**A**MONG the various problems in the conservation of tree life in the United States the Dutch elm disease takes precedence. It is the most urgent because the Dutch elm disease is potentially capable of destroying practically all of our elms so long as it remains within our borders and because, failing intelligent, persistent, aggressive action, the time that remains to us during which we still retain the power to get rid of it is uncertainly and perilously short. The question before us is how best can we continue to meet the problem.

From the outset the Arnold Arboretum has advocated complete eradication of the Dutch elm disease from the United States as the guiding principle, for, after due consideration of its nature and its means of spread, no other measure seemed to offer any hope if our elms were to be saved. Added knowledge and experience during the ensuing years have but served to strengthen our earlier convictions. So, in considering future action, we continue to unreservedly support the policy of eradication, with its complement of sanitation, which has been sponsored by the Federal Government and facilitated by State cooperation. Indeed, we are more strongly convinced than ever that it offers the only chance of preserving the priceless national heritages, the retention of which is at stake—our American elms of all species.

The federal machinery for combating the Dutch elm disease, as set up in 1933, consists of—(1) a laboratory at Morristown, N.J., for diagnosis and research; (2) offices at White Plains, N.Y., East Orange, N.J. and Stamford, Conn. which are responsible for (a) scouting, (b) eradication, (c) elm sanitation and (d) technical and educational projects. Organized cooperation, in addition, is afforded by the States

in which the disease is known to occur.

The actual working of the machinery has been as follows. The infected area and a surrounding 10-mile zone have been mapped and divided into administrative units; each unit is methodically scouted during the growing season in search of trees that exhibit suspicious symptoms; specimens from these trees are sent to the Morristown laboratory for diagnosis; if the diagnosis reveals the disease, the trees involved are condemned; the condemned trees are then promptly cut down and burned. Throughout the year a sanitation corps is occupied with a systematized removal of dead and decrepit elms within the affected area regardless of whether or not they carry the Dutch elm disease fungus; the purpose of this is to destroy the breeding places of the insect carriers and accessory breeding places of the fungus. Additional important service is rendered by the Morristown laboratory by researches that are designed to afford extended knowledge of the disease and its means of spread.

Speed in the detection and removal of diseased trees is of great importance, because such trees are not a menace in the spread of the disease until the "carrier" insects have had a few weeks in which to breed in the decrepit stems and branches. It should be added that continuity of the eradication service over a period of years is obviously of paramount importance because of the fact that several years may elapse before symptoms appear in an infected tree. But by dogged persistence the number of cases can surely be reduced to zero, just as has been true of an eradication campaign against citrus canker in Florida. Beginning there in 1915, at which time canker was present in 26 counties, the last diseased tree was found in 1927, and no instance of citrus canker in Florida has been found since that time.

Up to the summer of 1935 deductions as to the probable success of this policy were based solely on biological data derived, mainly, from European investigations; no practical tests of its efficacy had been previously made anywhere. Not until the fall of 1934 had a comprehensive survey of the range and the intensity of the occurrence of the Dutch elm disease in America been completed; and not until the spring of 1935 had those trees in which symptoms had become manifest been cut down and burned. With the compiled experiences of 1935 now available, however, we have, for the first time, statistical data against which to check our theoretical conclusions.

It will, I think, be generally agreed that in discussing these data we may dismiss without further reference the single, small infection spots respectively in Virginia, Maryland, Indiana, northern Connecti-



The Old Landeaster Elm

Courtesy of the Massachusetts Forest and Park Association

cut, and the two small spots in Ohio. All told they have involved fewer than 40 trees; the situation in each has been, and is being, closely watched and is well in hand. Moreover, except for Old Lyme, Connecticut, the origin of the infections in these locations is known with reasonable certainty and suitable restrictions on importations have been enforced by the Federal Quarantine Office to guard against the likelihood of further new outbreaks. Our main concern is with the infection area radiating out about 45 miles from the port of New York, an area embracing contiguous portions of the states of New York, New Jersey and Connecticut.

The results of the work of eradication and sanitation in this New York area, as revealed by the compilations of 1934 and 1935, afford great encouragement. Certainly a good beginning has been made towards the objective. Thus the number of trees showing symptoms of the disease appears to have been somewhat fewer in 1935 than in 1934—in round numbers for 1935, say 6,700 trees, that is, less than one-half of one percent of the elm population of the area involved. What a contrast with the doleful efforts to get rid of the chestnut blight! Then, too, the condemned trees were cut down and destroyed so promptly in 1935 that probably comparatively few of them were factors in a continuation of the epidemic. It is just in that feature, too, that the sanitation program helps enormously. Again it is highly significant that scarcely a dozen infected trees were found in the surrounding 10-mile scouted zone—a zone tentatively regarded in 1934 as infection-free. How many of these were really infected before the eradication project was begun, in other words, how many were really new cases, is purely a matter of surmise. The same question arises with all the other cases found in 1935. This uncertainty is obvious when we remember that the disease may be present in a tree for five years before external symptoms are manifest and that our acquaintance with it in the New York area covers a period of less than three years. As for the sanitation project, hundreds of thousands of dead and moribund elms have been eliminated—a very impressive step towards the goal of utterly removing the breeding places of beetle agents preponderantly responsible for spreading the disease-producing fungus.

Taking all these facts into consideration my own opinion of the results of the eradication work to date is that they indicate a substantial reduction of the disease in the New York area. At the very least we can confidently assert that combined Federal and State efforts have apparently held the disease in check and greatly lessened its potential spread. Surely there is good reason to conclude that we prob-

ably can save our elms if we will, and that the cost of the effort will be vastly less than that of removing dead trees if the disease be allowed to take its course.

Further evidence of the success of our eradication policy is afforded by comparing the status of the Dutch elm disease situation in America with that of western Europe—a region in which eradication has not been attempted. This will also help us to visualize the anticipated fate of our elms if we do not or cannot eradicate the Dutch elm disease. A few extracts from two recent reports (1935) which we owe to the British Forestry Commission will suffice to give us the picture. Quoting—“In Utrecht 64% of the elms have already been removed, in Rotterdam 55%.” “Between Louvain and Diest, a distance of 28 kilometres, there was originally a more or less continuous avenue of elms, about  $\frac{3}{4}$  of which have been felled as a result of the disease, and about  $\frac{1}{2}$  of those remaining are dead.” “This is comparable to the Newport Bishop’s Stortford area in England.” An estate in Worcester, England, “reports that 500 elms are to be felled in 1935 owing to the disease.” As for England the British Forestry Commission finds “it is still impossible to recommend the planting of elms.” As for Holland “it is assumed that all the present stand of elms in Holland, with the exception of a few specimens of resistant varieties, will eventually succumb to the disease.” In other words, the elm situation in western Europe appears to be hopeless. The conclusion is surely inescapable that, unless eradicated, the Dutch elm disease is not likely to be less disastrous in America than it is proving to be in Europe, knowing as we do from repeated tests that American species of elms rank among the most susceptible of all elms.

And now let us turn briefly to the question of costs. That matter must be faced regardless of what is done about our elms, whether we try to save them or leave them to their fate. It may readily be admitted that considerable cost will be incurred in carrying through the eradication project because it will take several years to bring it to completion. But costs are sure to be *many, many* times greater if we do not eradicate the Dutch elm disease. To my mind there is no alternative. So-called “control,” short of eradication, may defer the loss of our elms; but the conclusion in Holland, where essentially such a measure is being practiced, is that the elms will eventually go. Actually such “control” may be more costly in the aggregate than doing nothing at all. If our elms be allowed to die there will be unavoidable costs of removal and these will be huge because of the vast number of trees involved. Then there will be costs of replacements,

losses of property values, and the sad loss of the American elm for planting—a tree for which there is no equivalent.

In conclusion I should refer to criticisms that have been expressed with regard to certain practical features in connection with the carrying out of the eradication and sanitation programs. Fortunately, so far as I know, none have had reference to the scientific staff or the administrative officers in charge. We express complete confidence in them and admiration for what they have accomplished. There have been two serious criticisms: delays in making appropriations available, and insistence on employing a large proportion of field workers without due regard to their efficiency and training. Both procedures threaten the success of the undertaking, either through the chance that the area of infection may in consequence become so extended that eradication will be impossible of accomplishment, or through the danger that the process will be so long protracted that the people will tire and then withhold appropriations. Both can be corrected. It is plain that not only should appropriations be adequate but also that they should be available when best use can be made of them. They should be included in the regular budget, and the logical unit to handle this work would seem to be the Department of Agriculture. It is equally plain that the administrative officers should be made responsible for the efficiency of their field forces, which, of course, is irrational unless they are empowered to choose workers of the type needed.

Notwithstanding these criticisms the Arnold Arboretum holds fast to the adopted policy of eradication and its attendant sanitation project. The ship may leak somewhat at present, but the leaks can be mended. We have confidence that they will be and that the ship will, if there be no sabotage, reach its planned destination. Our confidence is strong because we believe the United States has begun its campaign in time. We know the locations and the extent of infected areas: and their size is not yet baffling. Of great importance is the circumstance that we are acquainted with the essential scientific aspects of the disease: from them we judge that it lends itself ideally to eradication. Moreover, from the practical results attained we believe the soundness of the policy has been demonstrated. It looks as though it offers the way out and at minimum costs. We are firmly convinced that the preservation of America's elms for our own and succeeding generations lies in our own hands. But there must be unflinching persistence and continuity of endeavor. Our purpose can be attained if we express an interest that will command the leadership and basic support of Congress.

J. H. FAULL

## THE LODER RHODODENDRON CUP

THE Arboretum is justly proud of the fact that the Loder Rhododendron Cup has recently been awarded to Professor Alfred Rehder for the year 1936. This makes the third time the cup has been awarded outside England, and each time it has come to men on the staff of the Arnold Arboretum. In 1924 it was awarded to Professor Charles S. Sargent, in 1927 to Dr. E. H. Wilson, and in 1936 to Professor Rehder.

The Loder Rhododendron Cup is awarded by a joint committee of the Royal Horticultural Society and the Rhododendron Society to men who have been outstanding in promoting knowledge concerning Rhododendrons. It was donated in 1921 by Mr. G. W. E. Loder in memory of his brother, Sir Edmund Loder.

Professor Rehder has for many years been making valuable contributions to our knowledge of Rhododendrons. Two notable examples are his contributions in "The Species of Rhododendrons," published by the Rhododendron Society of London, and "A Monograph of Azaleas" by E. H. Wilson and Alfred Rehder.



ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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EARLY BLOOMING SHRUBS AT THE ARBORETUM

**W**ITCH-HAZELS. These plants afford a "tie in" with fall and spring. The common witch-hazel (*Hamamelis virginiana*) is the last plant to bloom in the fall, usually late October or November. The vernal witch-hazel is the first woody plant to bloom in the spring at the Arboretum. This year some of the plants were in bloom by the middle of January. *Hamamelis japonica* and *H. mollis* bloom later in February or March. This year they both started about March 15.

The leaves of the Japanese witch-hazel (*H. japonica*) have a brilliant scarlet to orange autumn color, while the foliage of all the others are colored a good yellow in the fall. Though there are many plants with yellow colored foliage in the fall, these witch-hazels can always be counted on to be outstanding.

*Hamamelis virginiana* is a more or less scraggly growing plant, which is native all through the northeastern United States. In fact, it is much better used in naturalistic plantings and along the borders of woods than elsewhere because of this loose habit of growth. *Hamamelis vernalis*, native to southern Missouri and adjacent regions, was first brought to the attention of gardeners by Professor C. S. Sargent about 1908. It grows 5 to 8 feet tall, is dense and suckers very much at the base, making it an excellent species to use in mass plantings. It is the most floriferous of all the witch-hazels, though the individual flowers are the smallest. Therefore it is not as showy as the two Asiatic species, but it is valued for its fragrance, the flowers having a very distinctive and aromatic odor. There is a rather wide variation in the time individual plants bloom and in the color of the flowers. Typically, these have yellowish petals which are reddish towards the base. The flowers are closed when the temperature is low, and then

the petals gradually expand when it gets warmer, a very interesting process.

*Hamamelis japonica*, the Japanese species, is similar in habit to *H. virginiana*, but the flowers are larger and more plentiful. The petals are pure yellow while the cupped sepals are more or less purple on the inside. The variety *arborea* is more tree-like in form with golden yellow petals, calyx deep purple on the inside, and the stamens with purple anthers. The other varieties, *H. japonica flavo-purpurascens* and *H. japonica Zuccariniana*, are apparently just as hardy, the former being of more ornamental value because of its larger red and yellow flowers. As a rule it is hardier than *H. mollis*. The Chinese witch-hazel (*H. mollis*) is the one that has the largest and the most conspicuous flowers of all and has been the most publicized. Unfortunately, it cannot always be depended upon at the Arboretum. The flowers, and even the flower buds themselves, are subject to injury from low temperatures, and none of the plants at the Arboretum have given a good performance during recent years. In warmer sections, or in places where this plant can be given ample winter protection, there is no doubt that it is an addition to the garden, particularly since it is the most outstanding of the small group of plants in bloom at this time of year.

**Daphne species.** The February daphne (*Daphne Mezereum*) is the most common of this group, since it has become naturalized at various places in the eastern United States. It is a native of Europe and has been in cultivation for about four hundred years. This is another plant whose early, fragrant, purplish spring flowers (there is a white flowered variety also) are not noticeably affected by freezing. When plants bloom at this early time in the year they are subjected often to violent changes in temperature, and the only flowers of value to us then are those which can stand such conditions. February daphne has red fruits in the summer, and these, combined with the green color of the leaves make a very effective combination at that time.

The lilac daphne (*D. genkwa*), though it has pretty violet colored blossoms, yellow fruits, and blooms in early May, has not proved very satisfactory here at the Arboretum. It has previously been grown here, but every now and then is either completely killed or is given a severe setback by a cold winter. This plant may do better further south, but cannot be recommended for climatic conditions similar to those at the Arboretum. *Daphne Cneorum* blooms in mid-May.

There are three other members of this genus, all of them white-flowered, which have been grown at one time or another at the Arbo-



*Hamamelis mollis*

*H. japonica*

*H. japonica Zuccariniana*

*H. vernalis*

return. They are *D. altaica*, *D. caucasica* and *D. alpina*, none of which are particularly outstanding.

**The Cornelian Cherry** (*Cornus mas*). A native of southern Europe and western Asia, this plant has been used in gardens for over three hundred years, and in this country for over a century. It is of value chiefly for its very early, bright yellow flowers, which apparently are not injured by late freezes. The flower buds themselves can usually be counted on even during the coldest winters in this section of the United States. It blooms at a time when there is little else of importance in flower except the early species of *Hamamelis* and *Daphne Mezereum*. Added to its effectiveness of flower is the beautiful, rich, dark green, shiny foliage, which is attractive all summer long. The fruits are something like elongated cherries, ripening during the summertime, red in color, and in Europe often used for making preserves. The plant itself is vigorous, dense, and is even used for clipped hedges, though it would be better perhaps to use it as an unclipped windbreak. There is a yellow-fruited form growing at the Arboretum.

The amount of fruit it bears apparently depends on weather conditions, for when the weather is particularly cold at blossomtime, there often results a very small amount of fruit later.

The Japanese cornelian cherry (*Cornus officinalis*) is very similar from a horticultural standpoint. It, however, is native of Japan and has only been in this country about sixty years. There is a striking difference in the bark of these two plants, in that the bark of *C. mas* is very close in texture, and a dark grey, while that of *C. officinalis* is loose, splitting and peeling off on the second and third year's growth, into short, papery strands. It is reddish brown in color. From a horticultural standpoint one of these plants is practically the same as the other. They are both valued for dependable early flowers, good foliage and fruit, and a good dense habit of growth.

**Blooming periods.** It is difficult to predict the weather conditions very far in advance, but it may be interesting to some if we list a number of the outstanding groups of plants, together with the approximate time that they normally would be expected to bloom.

Middle April—Forsythias

Late April—Single flowered forms of Japanese cherries

Early May—Shadbushes, Japanese quinces, early spiraeas

Middle May—Crabapples, double flowered Japanese cherries,  
red bud and flowering dogwood

Late May—Lilacs, wisterias, deutzias, diervillas, hawthorns

DONALD WYMAN

ARNOLD ARBORETUM  
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PLANTS BLOOMING IN APRIL AND SOME MAGNOLIAS

**P**IERIS FLORIBUNDA. The mountain andromeda has always been dependable at the Arboretum, much more so than the rhododendrons. Professor Sargent wrote of it that, "judging by an experience of over fifty years, it is the only broad-leaved evergreen to which nothing ever happens in this climate." It is not attacked by borers or the lace wing-fly, so troublesome on rhododendrons; its foliage stays a good bright green all winter long, and its nodding clusters of white flower buds are rarely injured by winter cold. They open the first thing in the spring and are in bloom now at the Arboretum. The mountain andromeda can not be recommended too highly, and, fortunately, is being used more frequently as its good properties are recognized.

**Pieris japonica**, the Japanese andromeda, is considerably less hardy, though its dark, shiny green leaves and the greater height to which it grows make it the more handsome of the two. However, there are some protected places in eastern Massachusetts (and at the Arboretum) where it is doing well; its clusters of flower buds hanging on the plant in graceful, drooping panicles, and its white flowers are certainly an asset in the garden at this time of year, if they can be brought through the winter uninjured.

**The Corylopsis**, now in bloom, are oriental shrubs, very similar to the witch-hazels in general habit. All species have yellow, drooping spikes of flowers before the leaves open. There are three Japanese forms, the oldest in cultivation being *Corylopsis spicata* and *C. pauciflora*. Unfortunately, these two plants can not be depended upon at the Arboretum, for they are frequently injured in the winter; either the flower buds themselves are killed or the branches and twigs are

killed back severely. The hardiest species is *C. glabrescens* (formerly *C. Gotoana*) which is, unfortunately, not very common in the trade. Seeds of this species were first sent to the Arboretum from Korea by Professor J. G. Jack in 1905, and the plant itself has proved the hardiest and handsomest of the lot. Though the buds have been occasionally injured in the winter, such injury has never been as severe as that of the other species. It grows as much as 10 feet in height. The two Chinese species, *C. Veitchiana* and *C. Willmottiae*, have been killed repeatedly at the Arboretum and are not recommended for this region.

**Rhododendron dauricum mucronulatum.** Though this "Azalea" was discovered in the mountains west of Peking in 1835 by Dr. P. V. Kirilow, it was not introduced to America until Dr. Emil Bretschneider sent seeds to the Arboretum in 1882. The flowers of this variety are large, rosy purple and not nearly magenta, as is the species. It is the first azalea or rhododendron to bloom and if weather conditions are right, it may make a good show for about two weeks at this time of year. Sometimes late freezes kill the flowers after they have opened, though it is seldom that the flower buds themselves are injured during the winter. If planted in the shade, particularly out of the morning sun, the chances are considerably increased for it remaining in bloom for some time. People interested in a long blossoming period from azaleas and rhododendrons, or wanting to get some color other than yellow in the garden this early in the year, are planting this very worth while Korean plant.

**Early Blooming Magnolias.** Those magnolias which bloom before the leaves open in the spring are naturally the most conspicuous and the ones in which the greatest amount of interest is shown. Most of them are Asiatic species, since the American species do not begin to bloom until mid-May. The first of the magnolias to bloom in the spring (usually late April) are *Magnolia stellata* or star magnolia and *M. kobus borealis*. The former is becoming common, fortunately, not only for its interesting, many petalled white flowers, but also for its excellent foliage. In fact, too much can not be said of its landscape value as a foliage plant. It is bushy in growth, dense, the leaves have a good, dark green color, and the whole appearance of the plant is one of a billowy mass of green foliage all summer long. Its texture is not coarse, like most of the other magnolias. With the exception of *M. kobus* and its variety *borealis*, *M. stellata* is about the hardiest of the magnolias, another excellent factor in its favor.

**Magnolia kobus borealis**, a variety much better than the species,

is native in Japan. It was introduced by the Arboretum in 1878 and has not been used in cultivation very much, possibly because in some places it is said to take a considerable number of years before the plant blooms sufficiently to make it of value. However, this is not always true since there are young plants which bloom profusely. The flowers are white and have fewer petals than those of *M. stellata*. It is the hardiest of the magnolias, a tree type often growing 60 to 70 feet tall. It is a valuable tree, a vigorous grower and because of this fact is used a great deal as an understock for grafting other magnolias.

**The white yulan** (*M. denudata* or *conspicua*) has been a favorite in Chinese gardens since the seventh century of the Christian era. It has a profusion of white flowers and blooms about the first of May, shortly after *M. stellata*. It is a fine type and should be planted more than it is. The lower growing *M. Soulangeana* and its several varieties are also in bloom the first of May. *Magnolia Soulangeana* is a hybrid between *M. denudata* and *M. liliflora*, and originated in France in 1820. There are several named varieties of this plant but only a very few are obtainable from nurseries in this country. The true *M. Soulangeana* has a purplish flower, but the color of the flowers in the varieties ranges from white (in *alba* and *spectabilis*) to reddish in *rustica*. Variety *Lennei*, the last of the *Soulangeana* types to bloom (late May) has petals colored rosy purple on the outside and white on the inside. Two other varieties have their flowers colored white on the inside and light purplish on the outside (*alexandrina* and *speciosa*). The magnolia collection in Highland Park, Rochester, N.Y., one of the best in the country, suffered a severe set-back in the cold winter of '33-34, when the branches of these *M. Soulangeana* varieties were killed back considerably.

**The lily magnolia** (*M. liliflora*) and *M. obovata* (*M. hypoleuca*) bloom the middle of May. *Magnolia liliflora* and its variety *nigra* are low, purple-flowered, shrubby plants, but have failed to do well at the Arboretum because they are tender. *M. salicifolia*, which the Arboretum introduced in 1892, is another of the white-flowered Asiatic species. A very interesting magnolia is *M. Watsoni*, first found in a Japanese nursery though its origin is unknown. It blooms in mid-June. The flower is about 4 to 5 inches across and saucer-shaped, while the sepals are pink on the outside and the petals creamy white. The anthers, in a ball-like mass in the center of the flower, are a reddish pink, which with the surrounding white of the petals makes a very effective color combination. For interest and beauty of individual flowers, this species might be termed one of the best of those men-

tioned.

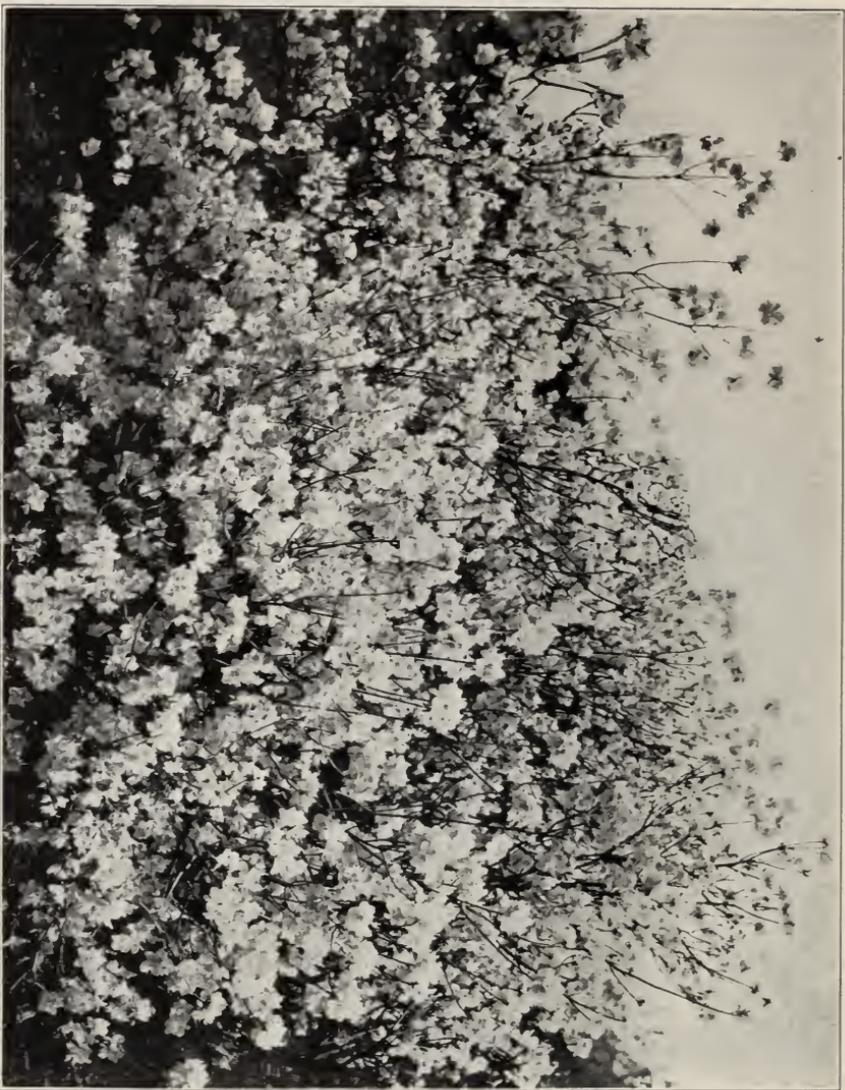
**Forsythias.** Much has been written in past numbers of this Bulletin about the Goldenbells, now in full bloom at the Arboretum. It is certain that no Forsythia can take the place of *F. intermedia spectabilis*, the showy border Forsythia, for a splurge of brilliant yellow color. Nor can *F. intermedia primulina*, the primrose forsythia, be replaced in the minds of those who have learned to appreciate its delicate, pale yellow flowers, a color which is not nearly as showy as that of *F. intermedia spectabilis*, but which is much more restful to the eyes.

However, the merits of *F. ovata* should be emphatically stressed again for those colder sections of the northeastern United States where the flower buds of the common forsythias have been repeatedly killed by cold winters. *Forsythia ovata* has the hardiest flower buds of any and though much might be desired in form and habit of growth it still blooms well (usually a few days before the rest) at times when the others fail. This plant was first introduced into this country by the Arboretum with seeds sent by E. H. Wilson from Korea in 1917. It should be grown more by nurserymen and used more by the gardening public.

DONALD WYMAN



*Magnolia stellata*, photographed by Alfred Rehder



Early-flowering Rhododendron (*dauricum* var. *microculatum*)

ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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EARLY JAPANESE CHERRIES,  
THE QUINCES AND SHADBUSHES

ACTUALLY, the first *Prunus* to bloom at the Arboretum is *Prunus Davidiana* (starting this year on April 1) and followed by *P. mandshurica* the middle of the month. In New York and New England Japanese cherries begin to bloom usually the latter part of April and by the time this Bulletin reaches its readers the early, single flowered group of these cherries will be in full bloom. Sargent's cherry, *P. Sargentii*, formerly *P. serrulata sachalinensis*, is the hardiest of these flowering cherries. It grows to be a standard tree, has light pink flowers, and the young foliage as it unfurls is a good bronze color, an excellent combination. Since the flowers are single, it, unfortunately, does not hold them very long, particularly during warm spells.

*Prunus subhirtella* is admittedly the most floriferous of any of this early flowering group, frequently having so many flowers that trunk and branches are actually hidden. The flowers are single, light pink. The tree itself is usually small and bushy, and among seedlings, there is considerable variation in the form of different plants. Its weeping form, *P. subhirtella pendula*, is now common everywhere, and was very likely one of the first "Japanese cherries" introduced into this country. In 1846 the old Ellwanger and Barry Nursery of Rochester, New York, listed a plant in their catalogue at that time, which was undoubtedly this variety.

The Yoshino cherry, *P. yedoensis*, is a beautiful tree with single white flowers, blooming just a few days later than the Sargent cherry, and which is slightly flower bud tender during the severest of New England winters. Where it succeeds, it makes an excellent combina-

tion with the deep pink-flowered *P. Sargentii*. It is interesting to note, that in the original gift of over two thousand cherry trees from the city of Tokyo to the city of Washington, in 1912, this tree constituted about half the lot. In fact, Professor C. S. Sargent in writing about the Yoshino in 1922 said that, prior to the great earthquake, there were at least two hundred and fifty thousand of these trees growing in Tokyo. This shows what the Japanese think of this beautiful tree.

These four trees then constitute the most outstanding of the single-flowered types, all of which bloom at about the same time. After this group has passed the stage of full flower, the double-flowered forms start to bloom, led by the Naden cherry, *P. Sieboldii*.

**Japanese Quinces.** There has been a great confusion about the nomenclature of this group of plants, but in common parlance they can still be termed Japanese quinces. *Chaenomeles lagenaria* is the scientific name now given to the old-fashioned Japanese quince formerly called *Chaenomeles japonica* or *Cydonia japonica*, which used to be planted so frequently for hedges before the advent of Japanese barberry. It was introduced from Japan, possibly before 1800, and is still a garden favorite. It will soon be in full bloom at the Arboretum. Since it has been in cultivation so long, there are naturally various varieties, with flowers of different hues, and some even with double flowers. Since many of these varieties are in the trade, but are only offered under the species name, it would only be confusion to mention them here. Suffice it to say that there are varieties in white, pink, a rich dark red, and various combinations of these.

The true *Chaenomeles japonica* (*Cydonia Maulei* now in the trade) is a lovely little plant which should be better known. It is not as tall growing as *Chaenomeles lagenaria*, seldom getting more than 2 or 3 feet tall, but is dense and compact with some varieties of very brilliantly colored flowers.

Since these flowering quinces, together with the common quince, *Cydonia oblonga*, which has little ornamental value but is used considerably for its fruits, are all members of the apple family, they are, of course, all subject to fire blight, borer and scale, and perhaps this is the chief reason why the Japanese barberry has replaced them in hedge plantings.

**The Shadbushes.** Now the shadbushes will soon be in bloom all over the northeastern United States. Often called shadblows, service berries or Juneberries, they are so named because they bloom at about the same time the shad run up the streams from the sea; their edible fruits ripen in June. There are tree types, *Amelanchier cana-*



Japanese Spring Cherry (*Prunus subhirtella*)

*densis*, *A. laevis* and *A. grandiflora*, and bushy types, *A. oblongifolia* and *A. spicata*. Their delicate white flowers, common to everyone familiar with the woods at this time of year, are all practically the same from a landscape point of view with the possible exception of *A. grandiflora* (*A. canadensis* × *A. laevis*) which has the largest flowers of any. Its variety, *rubescens*, has flowers which are more or less tinged with rose. Sometimes, unfortunately, weather conditions are such that the plants are only effective in flower for a very few days, particularly when a rather long cold spell has kept the buds from opening, followed by a sudden warm spell during which they open with a rush. It seems worthless, often, to use plants for only a few days effectiveness in the year, but the Amelanchiers have the added advantage of beautiful gray bark, and a fairly good autumn red color, together with fruits in June which are attractive to birds.

Amelanchiers are most effectively used in naturalistic plantings, especially on the borders of woodlands. Their dainty white blossoms, open now, seem to be a fulfilled promise that spring has come at last. Immediately after they are through blooming a great majority of plants burst out into leaf.

**Early Spireas.** Two of the first Spireas to bloom in the spring are Thunberg's *Spiraea Thunbergii*, and bridalwreath, *S. prunifolia plena*. Both these plants may be somewhat tender in New England, but in other sections they are both very common. Since Thunberg's Spirea is the first to bloom, it might be used effectively with the pink *Prunus triloba plena*, now in bloom. The double-flowered bridalwreath on the other hand can be used very effectively with the lower growing and later blooming pink-flowered *Prunus glandulosa sinensis*. In planning or replanting shrub groups enough emphasis cannot be placed on this very important factor of flower color and blooming dates, since effective combinations like these are decidedly worth while.

**Other Plants Now in Bloom.** With the early warm spell this spring and the more recent cold rainy spell the blooming dates of plants are again back to normal. Plants in bloom at the Arboretum now are the Corylopsis species, the forsythias, *Cornus mas* and *C. officinalis*, though these are about past, *Dirca palustris*, *Benzoin aestivale*, *Acer rubrum*, *Prunus mandshurica*, *Erica carnea*, *Pieris floribunda*, *Vinca minor* and *Magnolia stellata*, though *M. denudata*, *M. kobus* and even some of the *M. Soulangeana* varieties are fast nearing full bloom. Though it is hard to gauge blooming dates, particularly this year, we hazard a guess that the crabapples will be at their height of bloom May 10 to 16. Lilacs will probably be best at about May 15 to 20. DONALD WYMAN

ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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THE FLOWERING CRABAPPLES

AT THIS TIME of year in New England and New York, the flowering crabapples are in full bloom. Collected from widely segregated places in the northern hemisphere, nurserymen in this country are able to offer over fifty of them to the public. Generally, they can be grown wherever the common apple does well as far as hardiness is concerned, and, though subject to similar apple troubles such as borer and scale, they are an asset to any garden. The sizes and shapes of the twenty-six different crabapples listed in this bulletin differ greatly.

*Malus baccata mandshurica* is not only the first to bloom, starting this year while the Japanese cherries were still in flower, but is also the tallest, growing to fifty feet or more. On the other hand, *Malus Sargentii* is the smallest, often growing twice as broad as it does high and seldom becoming over 8 feet tall. This might be the best crabapple for the small home garden where space is the limiting factor. Unfortunately, nurserymen often grow it from seed which has not been collected from pure stands, resulting in trees that do not have the typical low-growing habit but are much more upright. Since there are few, if any, pure stands in this country, grafting might better be resorted to in order to insure the typical form. The rest of the flowering crabapples range in height from 15 to 30 feet, the majority of them being 15 to 25 feet tall. Some, like *M. Halliana Parkmani*, rarely exceed 15 feet, while others like *M. ioensis plena* and *M. floribunda* may attain 30 feet. Some of the varieties, like *M. prunifolia rinki*, are upright and spreading in habit of growth; others, like *M. floribunda* and *M. arnoldiana*, are generally mound-like in appearance. The most picturesque in habit is the tea crab, now called *M. hupehensis*, but

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listed in nursery catalogues as *M. theifera*. The main branches, originating from the trunk, are long with few side branches, appearing from a distance somewhat like a huge fan.

Like the common apples, the flowering crab has a strong tendency to be alternate bearing, that is, fruit production is poor one year but good the next. Though this may not be particularly noticeable in the flowering, it is very noticeable and often disappointing in the fruiting habits. For instance, the best fruiting tree in the group at the Arboretum (*M. toringoides*) was marvelous in fruit during the fall of 1934, but last year, even the largest plant was uninteresting because of few fruits.

**The Asiatic crabapples** (see table) are the first to bloom, followed shortly afterwards by the native species. The flower display lasts about a week, but, of course, depends entirely upon the weather, and this year is somewhat advanced because of the recent unusual warm spell. When this issue of the Bulletin reaches its readers the crabapples will be in full bloom at the Arboretum. Some years when the weather is particularly cool the beauty of these plants is prolonged, for some of them as, for instance, *M. hupehensis* (*M. theifera*) are often considered more beautiful when the flower buds are fully advanced but not open, than when they are in full bloom. In extremely hot weather plants may drop their petals two or three days after the flowers expand.

In new England and parts of New York, the past few winters have demonstrated that it is not worth while to count on the hardiness of the double-flowered Japanese cherries. Garden lovers in general should realize that the crabapples are considerably hardier and that there are also double-flowered forms (see table). Though these may not be considered as worthy substitutes for cherries, they can at least be counted on to bloom. The least hardy of all the crabapples is the Parkman crab, *M. Halliana Parkmani*, which was injured considerably during the winters of 1933 and 1934, both in New York and at the Arboretum.

The method of propagating these plants varies considerably. Many of the species can be easily grown from seeds, but in botanic garden collections, where a number of species are in close proximity, there is ample opportunity for cross pollination; and it has been definitely proved that *M. Sargentii* when grown from seed thus collected does not give plants with the desired low-growing habit but rather plants with a more upright form. It is much safer to bud or graft all forms, obtaining buds or scions from stock plants with known characteristics. There is a confusion in the nomenclature of the crabapples in many nurseries today, simply because large scale production from seed has

resulted in many variations from true types.

Asexual reproduction naturally brings up the problem of understocks, which is by no means definitely settled. The American species are best grafted on seedlings of *M. ioensis* or *M. coronaria*. Both French crab seedlings and those of the various Asiatic species have proved successful for the Asiatic forms, especially *M. robusta*.

Crabapples are hosts of Juniper rusts, and the Arnold Arboretum has found the Asiatic species to be the least susceptible. There are places around Boston where Bechtel's crab becomes so disfigured with this disease that it is not grown. Bordeaux has been used in efforts at control but apparently the disease thrives on it. After several years of careful investigation, the Arnold Arboretum recommends the following for its perfect control on ornamental flowering crabapples: Use 5 to 6 pounds of "Linco", a colloidal sulphur spray produced by the Mechling Chemical Company, Canton, New Jersey, with 100 gallons of water with 3 pounds of "S. S. S.", a commercial "spreader" available at any store selling spray materials. Spray at first when the young leaves become visible and follow with four or five sprays at six to ten days intervals. Spraying just before a rain gives optimum results. To control chewing insects, add 4 pounds of lead arsenate to one of the later applications.

**Plant Accessions.** During the past summer, Mr. W. H. Judd spent considerable time visiting European nurseries with the object of adding to the living collections at the Arboretum. Due to his efforts over four hundred different species and varieties of living plants have been added to our collections this spring. Then, too, nurserymen in this country have been generous in sending the Arboretum specimens of new things so that additional plants from this source number over one hundred. Cuttings, scions and seeds, received from various sources this spring, will add still another hundred species and varieties to our collections. A list of the nurseries sending material is as follows:

Berlin-Dahlem Botanic Gardens, Berlin	4
L. Spaeth, Berlin	24
H. A. Hesse, Weener-Ems, Germany	126
V. Lemoine & Cie, Nancy, France	53
Vilmorin, Verrières, France	10
Moser & Sons, Versailles, France	14
Léon Chenault, Orléans, France	33
Hillier & Sons, Winchester, England	30
Royal Botanic Gardens, Kew, England	86
W. J. Marchant, Wimborne, England	13

Joseph W. Gable, Stewartstown, Pa.	10
New York Botanic Garden, New York	25
Bobbink & Atkins, Rutherford, New Jersey	1
Hugh Barclay, Narberth, Pa.	4
Boyce Thompson Institute, Yonkers, N. Y.	13
Bristol Nurseries, Bristol, Conn.	2
Linn County Nurseries, Center Point, Iowa	2
United States Department of Agriculture, Washington, D.C.	15
Wayside Gardens, Mentor, Ohio	1
Mt. Desert Nurseries, Bar Harbor, Maine	2
Princeton Nurseries, Princeton, N. J.	23
Dr. Emmet Rixford, San Francisco, California	12

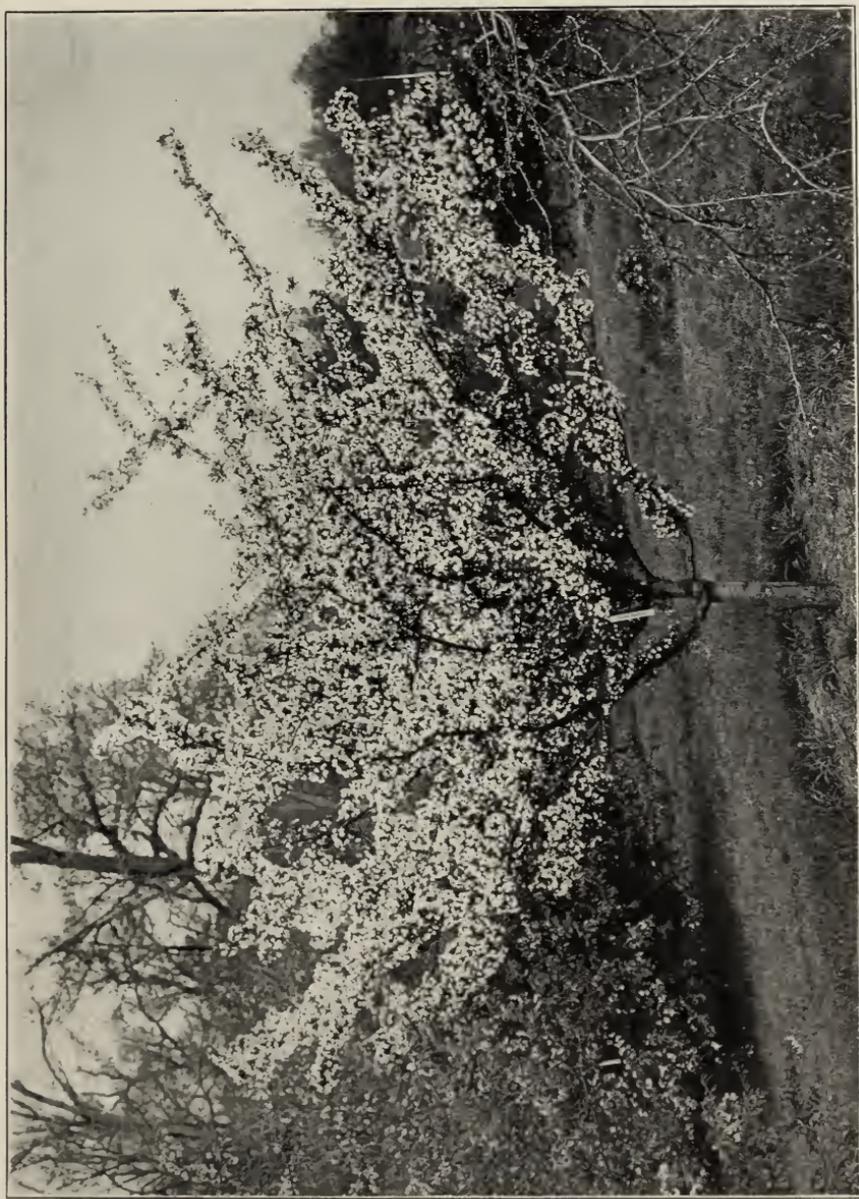
**Winter injury** at the Arboretum this past winter has been surprisingly small. Though certain plants have been affected they normally suffer such injury every winter. It cannot be said that any plant or groups of plants have suffered here this past winter, other than the little normally expected. This may be partly due to the fine blanket of snow on the ground in the early part of the year, and the length of time it was effective. Even California privet and similar plants were not touched on the Arboretum grounds.

**The Field Class** announced by the Arboretum some time ago, meeting Saturday mornings in May, has met enthusiastic response. Over fifty people were on hand for the first meeting.

**Plants now in full bloom at the Arboretum.** This week and next the Arboretum is the most interesting of any time during the entire year because the most number of plants are in bloom. Most of the crabapples are at the height of bloom. Some Amelanchiers can still be seen here and there. Other plants in full bloom include Viburnum Carlesi, the various Cytissus, some of the Syringa Henryi varieties, Syringa oblata and its varieties, Caragana, Cercis canadensis and C. chinensis, Halesia species, Fothergilla, Daphne encorum, some of the Spireas, the Pyrus group, Rhododendron schlippenbachi, Rhododendron yedoense poukhanense, Rhododendron obtusum Kaempferi and several others. Plants are looking in fine condition right now.

**Lilac Sunday** at the Arboretum will be May 17.

DONALD WYMAN



*Malus tchifera* = *hopehensis*

THE BEST FLOWERING CRABAPPLES (Malus)

	Characters of		FLOWER		and		FRUIT		Year discovered or introduced	Remarks
	Single or Double	Color	Landscape Value	Size in Centimeters	Color	Landscape Value	Color			
°°M. angustifolia . . . . .	S.	light pink	good	1.5-2.5	yellow green	poor	Native; thorny			
M. Arnoldiana . . . . .	S.	pink	excellent	1	yellow	good	1883; Hybrid (floribunda x baccata)			
M. atrosanguinea . . . . .	S.	deep carmine	excellent	1	dark red	good	1905; (Halliana x Sieboldi)			
°°M. baccata mandshurica . . . . .	S.	white	excellent	1.2	yellow or red	good	1825			
°°M. coronaria . . . . .	S.	pink	excellent	3	green	poor	Native; thorny			
M. coronaria Charlotte . . . . .	SD	pink	excellent	3	green	poor	1900			
°°M. floribunda . . . . .	S.	pink, fading	excellent	0.6-0.8	red and yellow	good	1862			
		white								
°°M. glaucescens . . . . .	S.	pink	fair	3-4	pale yellow	poor	Native; thorny			
°°M. Halliana Parkmanni . . . . .	D.	bright rose	excellent	0.6-0.8	red purple	poor	1862; least hardy of all			
M. "Hopa Crab" . . . . .	S.	rose red	good	1.5-2	red	good	1920 (baccata x pumila Niedzwetzkyana)			
°°M. hupchensis . . . . .	S.	pink, fading	excellent	1	greenish yellow,					
		(M. theifera)	white		red cheek	poor	1900			
°°M. hupchensis rosen . . . . .	S.	pink	excellent	1	greenish yellow,					
					red cheek	poor	1900			
°°M. ioensis plena . . . . .	D.	pink	excellent				1888; often thorny			
M. micromalus . . . . .	S.	pink	excellent	1-1.5	red or yellow	good	1856; Hybrid (baccata x spectabilis)			
°°M. pumila Niedzwetzkyana . . . . .	S.	red	fair	2	red	good	1891			
°°M. prunifolia rinki . . . . .	S.	pink	excellent	2	yellow to red	good	1850; upright growth			
M. purpurea . . . . .	S.	red purple	excellent	1	red	poor	1915; Hyb. (atrosanguinea x Niedzwetz.)			
M. purpurea eleyi . . . . .	S.	vinous red	excellent	1	red	poor	1920			
°°M. Sargentii . . . . .	S.	white	excellent	1	dark red	good	1892			
M. Scheideckeri . . . . .	SD	pale pink	excellent	1-1.5	yellow	poor	1882; Hyb. (spectabilis x micromalus)			
°°M. Sieboldi . . . . .	S.	pale pink, fading	good	0.6-0.8	red to yellowish	poor	1853			
°°M. spectabilis . . . . .	SD	pink	excellent	2	pale yellow	poor	1780			
M. spectabilis albi-plena . . . . .	D.	white	excellent							
M. spectabilis riversi . . . . .	D.	pink	excellent						1872	
°°M. torinoides . . . . .	S.	white	poor	1.1-2	yellow with red					
					cheek	excellent	1904			

°°Species native to the United States.

°°°°Asiatic Flowering Crabapples\* native to Asia.

SD=semi double

ARNOLD ARBORETUM  
HARVARD UNIVERSITY



BULLETIN  
OF POPULAR INFORMATION

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JUST ABOUT LILACS

**B**ROUGHT to this country by the earliest settlers, the lilac has endeared itself in the hearts of everyone. We cannot even think of a typical, old-fashioned New England garden without its lilac bush. Today gardeners have a list of twenty-eight different species and over three hundred different varieties from which to choose, truly a bewildering number for the gardener who only has a small space and wants possibly only one or two of these lovely plants. This bulletin is written chiefly for those persons who want to know more about lilacs, their propagation, care and culture, but at the same time are only interested in a few of those which are best for ornamental use. It will be necessary to discuss briefly some of the more undesirable species simply for the record, because many people think that if a plant is unknown to them it is better than the ones they already have.

It will be unnecessary to describe minutely all the species and varieties since there are other works in which this is well done. A selection will be made of what we think to be the best varieties, though it must be understood at the start that we fully realize this is a precarious thing to do. Every individual has his likes and dislikes, particularly regarding plants. Sometimes we connect personal events with certain definite plants and for this reason these naturally are more important to us. All we can do here then is to offer a good selection of varieties in the hope that it will assist others in becoming more observant in making their own selections accordingly.

HISTORY

Lilacs are not American plants. In fact, there is no member of this

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genus native in the United States, but they were brought to this country by the earliest settlers from the eastern hemisphere. All of the species come either from Europe or Asia, except two from the islands of Japan. Introduced into cultivation before 1560, the old-fashioned lavender colored lilac (*Syringa vulgaris*) and its white-flowered form have been grown so long in cultivation that many variations have arisen. From this early date, the hundreds of pink, red and deep purple-flowered forms have gradually arisen and been carefully selected and propagated. The Persian lilac (*S. persica*) is another plant that has been used almost as long as *S. vulgaris*. It is interesting to note that this lilac, crossed with *S. vulgaris*, gave the first hybrid lilac to horticulture, the Chinese lilac (*S. chinensis*). This originated in the Botanical Garden at Rouen, France, about 1777, and has been also called *S. rothomagensis*.

The term "**French hybrids**" has been loosely applied to the large group of varieties of the common lilac, probably because so many of them originated in France. Victor Lemoine and his associates have been more outstanding in introducing varieties of the common lilac than any others. However, a great many horticulturists have worked with the lilac, carefully selecting plants in France, Germany, Belgium and Holland. Comparatively recently some of them have originated in the United States and Canada, where lilac enthusiasts like the late John Dunbar of the Rochester Parks, have spent years in careful selection of good flowering varieties.

Besides the "French hybrids," there are other species and varieties that have merit in ornamental plantings, some of which will be mentioned later.

## PROPAGATION

The Arnold Arboretum is firm in its belief that lilacs are best on their "**own roots**". This is a controversial point; it has been for some years and probably will be for some time to come. Lilacs do not root readily from cuttings. When grafted on privet or some other such stock they "take" quickly and get an early and vigorous start, but, as investigations in the Pathological Laboratory at the Arboretum have shown, they are subject to a severe disease known as the "**graft blight**" of lilacs. When this occurs the plant eventually dies. This disease most frequently occurs not in the nursery but after the plants have been in the garden for several years. There is little that can be done to cure the disease once it has become established in a plant.

There are several ways of having "own root" plants. One is to



Congo, with flowers a good dark reddish purple,  
one of the best varieties of the common lilac.

graft low down, and place such plants lower in the soil than ordinarily so that eventually the graft union is about 4 inches below the soil level and then the scion will throw out roots itself in from two to four years. Eventually then, the privet portion could be cut off. This sounds easy but varieties differ greatly in the rapidity with which they make their own roots, this being a constant difficulty to nurserymen.

Lilacs may also be grown from softwood cuttings and occasionally from hardwood cuttings, from layers or from suckers of "own rooted" plants. It might be said that lilac seedlings should make good understock for grafting ornamental varieties but this is not advised. Such understock always suckers badly and it is then difficult to tell which is understock and which is scion, since leaves and twigs of both would look apparently the same. On the other hand, privet foliage and twigs are easily distinguishable from those of lilac.

Various people have pointed out that for quick results, that is, for forcing in pots or some similar use, grafting on privet is best and quickest, but for the best plants over a long period of time, "own rooted" stock is necessary. Experience has shown that the privet ordinarily used in grafting (California) is much less hardy than the common lilac, and at the Ottawa Experiment Station in Canada, during severe winters, the root killed plants have always been the grafted ones rather than those on their own roots.

Consequently then, "own rooted" lilacs are always best for the home owner who wants long-lived plants, and though they may be more expensive because harder to grow, as has been pointed out, they will always give more pleasure and satisfaction in the end.

## CULTURE

Lilacs are among our hardiest ornamental shrubs, when grown on their own roots, and even in the most severe winters suffer little if any winter injury. They grow in almost any good soil. Contrary to popular belief, they do not need lime, except in rare cases where the soil is very acid. Care should be taken in controlling the borer as much as possible, keeping down disease and scale pests and practicing intelligent pruning. It might be wise to use a good mulch of well rotted manure every fall. If plants get too tall or too old to bloom properly, prune out the older wood and force younger growth from the base. Be certain that "own rooted" plants are obtained at the start, since this goes a long way in making a permanent, long-lived collection.

## PRUNING

Pruning may be done at any time, as far as the plants are concerned, but is usually advisable to wait until after flowering to do it, simply because pruning before would needlessly cut out a lot of flowers that might otherwise bloom. Lilacs only need pruning to cut out dead or diseased wood, or to "renew" old plants. Young plants are best let alone. Sometimes older plants grow very tall and out of proportion, so that it is difficult for an observer, standing on the ground, to view the flowers. When this is the case, drastic pruning is in order, for they should be made to bloom so that their flowers can be observed and enjoyed by all. However, such pruning is not advisable when the plants serve as a screen or windbreak.

Lilacs "break" easily from the base, that is, even if cut to a foot from the ground, new buds easily form on the old stems. However, it may not be advisable to cut an old plant down all at once, but to prune out gradually a few of the large old branches every year, so that younger growth will be forced out from the base slowly.

Borers are troublesome sometimes on the older lilac branches, and the only way to control them is to cut out infested branches and burn them. This does not materially hurt the plants since they naturally are many stemmed, and if one or two branches are girdled by borers, their removal makes little difference.

Cutting off the flowers immediately after they have bloomed is another good practice, for this prevents seed formation and hence aids in flower production for the next year.

## DISEASE AND INSECTS

One of the things that make lilacs so popular is the fact that they are so little troubled with disease and insects. True, in grafted plants, there is always the possibility of "**graft blight**," but "own rooted" plants would eliminate this possibility. Lilacs are among the hardiest of our ornamental plants, another reason why they can be used to so great an extent. Other than the "graft blight" and the **lilac borer** already mentioned, for which there is no remedy but cutting out and burning, there may be considerable trouble with scale.

Various types of **scale insects** infest lilacs, particularly oyster shell scale. These can be readily controlled by spraying with a dormant oil spray between February 15 and early April. Mr. L. V. Schmitt of the Arboretum has effectively controlled them for years by using Sunoco oil spray, 1 part of oil to 15 parts of water, sprayed on the plants

before the buds begin to swell. Other oil sprays may be just as satisfactory.

Although **mildew** is very common on the leaves of lilacs in the late summer, evident by whitish blotches or spots, it is not particularly destructive, and usually there is no reason for attempting to control it. Dusting the foliage with finely divided sulphur every two weeks has proved effective in its control where necessary.

If large old branches are cut out, the remaining stubs should be smoothed off carefully and painted, either with a lead paint or some thin asphaltum paint. Other than these already mentioned there are no serious diseases or insect pests on lilacs.

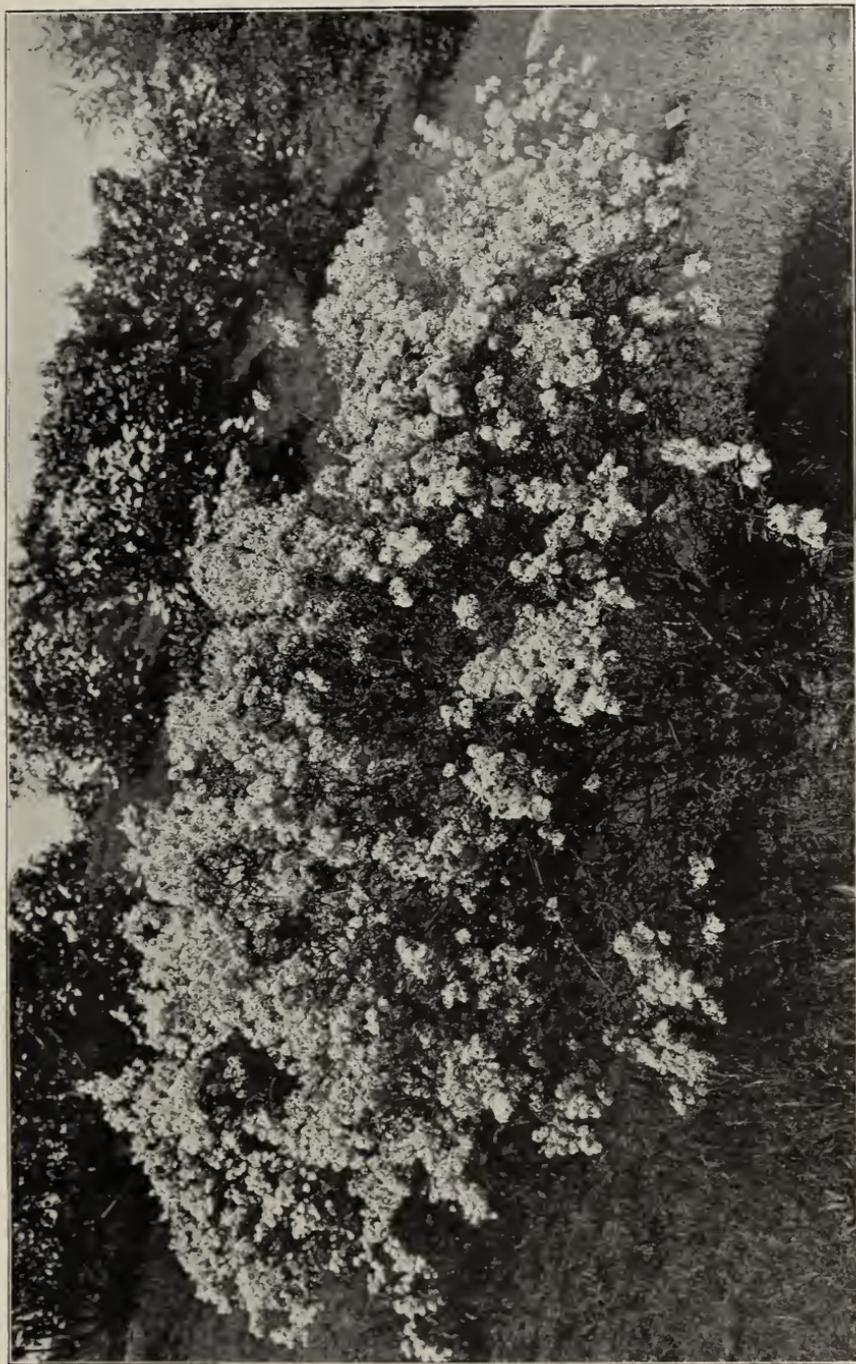
### LILACS THAT DO NOT BLOOM

Sometimes certain lilac bushes, due to various causes, simply will not bloom. This is disconcerting particularly to the person who has staked everything on the flowers of one or two plants. All lilacs bloom eventually, provided, of course, the growth conditions are right. If the plants are in a shaded corner, this shade aids materially in preventing good bloom. If the soil is too poor or too rich, this also prevents blooming, the latter because all the nourishment may be going into vegetative growth. In such a case, a good root pruning might be effective.

Then, too, when a plant grows old, blossoms may become noticeably smaller and less numerous. Such conditions may be helped by renewed pruning, thus forcing out young shoots from the base of the plant. A good rich soil always promotes blooming, provided it does not create too vigorous growth.

Superphosphate, or in fact any fertilizer with a goodly proportion of phosphorous is known to promote flowering and fruiting in many plants, and has been used on lilacs and even on the flowering dogwoods to increase flower production. The way this can be applied is as follows: dig a ditch around the plant, several feet from the base, about a foot and a half deep and mix the superphosphate or other phosphatic fertilizer into the soil as it is thrown back into the ditch. The amount of fertilizer depends on the kind used and the size of the plant, but on a ten year old lilac one could use several pounds of superphosphate. This type of fertilizer is only advised in case the plants are making normal growth but are not flowering. If they are making very poor growth, then the better method would be to give them some good well rotted manure or general fertilizer mixture early in the spring.

These are only suggestions, but there are numerous instances where



The Chinese lilac (*Syringa chinensis*). The first hybrid lilac and still one of the most floriferous of all.

they have been known to assist lilacs to bloom.

## TIME OF FLOWERING

With a selection of different lilac species, one can have lilacs in bloom for at least four weeks. They start, in Boston, about the second week in May with *S. Henryi* and *S. oblata* and their varieties, followed a week later by many species and the hundreds of varieties of *S. vulgaris*. After these are through there follows the white-flowered late lilac, *S. villosa*, and two of the tree lilacs, followed by the last, the Japanese tree lilac, *S. amurensis japonica*. Though these later blooming lilacs are not fragrant, and all have creamy white flowers, they are of use to us because of their late flowers, and also their very vigorous habit of growth.

## SPECIES AND VARIETIES COMMON IN AMERICAN GARDENS

*Syringa chinensis*. This was the first hybrid lilac, a cross between *S. persica* and *S. vulgaris*, appearing in the Botanic Garden at Rouen, France in 1794. Formerly called *S. rothomagensis*, it is one of the most floriferous of all the lilacs, having immense clusters of reddish flowers intermediate in size between those of both parents. It is perfectly hardy, a rapid grower and a good bloomer, the branches often being so covered with flowers that two foot lengths often appear as a single inflorescence, so heavy that the branches bend under their weight. There are white (var. *alba*) and deep pink (var. *Saugeana*) flowered varieties.

*Syringa persica*. The Persian lilac can be termed our daintiest because of the very small leaves and finely divided flower clusters. There is a cutleaf form, var. *laciniata*, and a white form, var. *alba*. It has supposedly been cultivated in Persia and India from time immemorial and has been in Europe at least 300 years. The flowers are typically pale lilac.

*Syringa amurensis* var. *japonica*. This Japanese tree lilac is the last of all the lilacs to bloom, usually about the middle of June or later. It has large creamy white flower spikes with a disagreeable odor, and grows to a height of thirty feet or more. In the forests of northern Japan, where it is native, it is a valued timber tree. It is the last of the two "tree lilacs" to bloom, and probably the best for ornamental use. The other is *S. pekinensis*. The Japanese tree lilac was first raised in this country in the Harvard Botanic Garden prior

to 1870, and was introduced to cultivation by the Arnold Arboretum.

**Syringa villosa.** The late lilac has creamy white flower clusters with a slightly disagreeable odor, but it blooms after the *S. vulgaris* varieties and before *S. amurensis* var. *japonica*. A dense growing tall shrub, it is valued for its late flower and good dense growth. The flower spikes are always numerous and very prominent.

**Syringa vulgaris.** The common lilac, and its white flowered form, are the oldest in cultivation. Now there are over 300 varieties. The famous French nurseryman, Victor Lemoine, and his associates have probably introduced more of these than anyone. In this country, the late John Dunbar of the Rochester Parks has been outstanding for his many introductions. Today, there are too many varieties of the common lilac in the trade. A collection of two or three dozen or less, should include the best of the group. An examination of the collections in Highland Park, Rochester, N. Y., and at the Arnold Arboretum, two of the best in the country, indicates that the following certainly are among the best for their respective colors:- (all single flowered unless otherwise mentioned.)

White	Originator and date	
Edith Cavell, double flowers	Lemoine	1916
Madame Lemoine, double flowers	“	1890
Reine Elisabeth, strong bloomer	Stepman (Brussels)	1908
Siebold, creamy white, double flowers	Lemoine	1906
Pink to rosy lilac		
Clara Cochet, blush, distinct and dainty	In France	1855
Lilarosa, probably the finest of this group	Spaeth (Germany)	1887
Lucie Baltet, delicate pink, salmon in bud	In France about	1888
Macrostachya, resembles Lilarosa	“ “ “	1874
Lavender to purple		
Charles X, reddish	“ “ “	1831?
Cavour, rich purple	Lemoine	1910
Philemon, dark purple, reddish in bud	In France about	1855?
President Lincoln, wedge wood blue; this is the finest of all the blue lilacs	Dunbar	1917
Deep purple-red to reddish		
Aline Mocqueris, dark reddish purple	Dauvesse (France)	1872
Congo, deep purple-red, the finest dark lilac	Lemoine	1896
Ludwig Spaeth, one of the best	Spaeth (Germany)	1888
Diderot, claret-purple	Lemoine	1915

## SPECIES AND VARIETIES THAT COULD BE USED MORE

**Syringa Henryi.** (*S. villosa* × *S. Josikaea*). Probably the best known and most outstanding of the varieties of *S. Henryi* is **Lutece**, which is similar to *S. villosa* but has a larger and looser panicle of pale violet-purple flowers which are not fragrant. A good plant, and one about which Professor Sargent wrote highly in the Bulletin of Popular Information.

**Syringa Julianae.** The Juliana lilac is a native of western China and is in the group of late blooming lilacs. The outer surfaces of the corolla of the flower and also of the flower stalk itself, are a deep pink, while the inside is considerably lighter in color. This makes a very interesting color combination particularly when the flowers are opening. It has relatively slender ascending and spreading branches, forming a broad rounded mass. *Syringa velutina* is similar to it.

**Syringa Komarowii.** The Komarof lilac is very similar to *S. reflexa* except that its flower cluster is more cylindrical and compact. The flower buds are bright red and very conspicuous. The open flowers are a deep rose. Though it often blooms profusely while still a small bush, it is not as handsome a plant as *S. reflexa*.

**Syringa microphylla.** The littleleaf lilac is very free blooming. The flowers are in small clusters, lavender to pink and fragrant, somewhat resembling those of *S. pubescens*. This plant is valued because it blooms both in the spring and again in the fall. *Syringa Meyeri* also does this but not to so great an extent.

**Syringa oblata.** This broadleaf lilac comes from north China and is valued because it is the first lilac to bloom, usually starting a week before the common lilac. Unfortunately, there are times when the flower buds are injured by severe winters. It is also the only lilac with a good orange to red autumn color in the fall. The leaves are large and usually not disfigured by the mildew in summer. The three varieties are:

**affinis** - white flowers, commonly cultivated in Chinese gardens.

**Giraldii** - lilac colored flowers, loose open clusters.

**dilatata** - lilac-pink flowers, perhaps the best of the three.

**Syringa pubescens.** Commonly called the hairy lilac, this plant is valued because its flowers are the most fragrant of all the lilacs. A tall-growing shrub, very floriferous, it should have a place in every lilac collection if for nothing more than to give more fragrance to the group. It has small, pale lilac flowers in loose clusters and is said to be hard to root from cuttings.

**Syringa reflexa.** The nodding lilac is one of the most graceful and distinct of the species. It has long, nodding panicles of red buds which later open into pink flowers. Native in the margins of woods in central China, it was discovered by E. H. Wilson in 1901, and certainly would add interest and beauty to any lilac collection.

**Syringa tomentella.** The felty lilac has foot-high panicles of pink to rosy-lilac colored flowers which sometimes are almost white. The plants are compact in habit of growth, often growing to fifteen feet in height. One of its interesting characteristics is its smooth pale gray bark with dark lenticels. The flowers are not very fragrant but it is valued because it blooms at about the same time as the late lilac, *S. villosa*. *Syringa Sweginowii* is very similar.

#### OTHER SPECIES OF LITTLE ORNAMENTAL VALUE

1. **Syringa emodi** - Himalayan lilac.
2.    “    **hyacinthiflora** - Hyacinth lilac.
- <sup>1</sup>3.   “    **Josikaea** - Hungarian lilac.
4.    “    **pinnatifolia** - Pinnate lilac.
5.    “    **yunnanensis** - Yunnan lilac.

<sup>1</sup> Very similar to *Syringa villosa* in habit of growth and makes a good hedge plant because of its shiny, deep green leaves, but not outstanding for its flower.

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DONALD WYMAN



ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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RHODODENDRONS

**T**HIS is the time of year when the rhododendrons are at the height of their bloom. Though most of the commonly called "azaleas" are classed as rhododendrons, still most of the gardening public think of rhododendrons merely as those large leaved plants which keep their leaves all winter. Botanically this is not correct, but the idea has come to be accepted by many through long usage. Now, most of the azaleas are about past bloom, except the flame azalea, *Rhododendron calendulaceum*. This will be followed a little later by the sweet azalea, *R. arborescens*, and in July by the swamp azalea, *R. viscosum*. The last two have very fragrant white flowers and are of particular value because of their late bloom.

During the past, many hybrid rhododendrons have been tried out under New England conditions. Several studies have been made of varieties which have successfully withstood the rigorous New England winters, but it can be said that only a comparatively few have proved satisfactory, and even these suffer during the most severe winters.

Bulletin readers who have raised hybrid rhododendrons for a period of years will probably be able to add certain plants to the list given below, but for those who have not, it would be best to adhere to the fifteen given here as having proved the most hardy over a long period of time. Undoubtedly, new ones will be added and there are peculiar situations where certain half-hardy types will grow well, but in general the following list includes the hardiest:

**White**

- Boule de Neige
- Album elegans
- Album grandiflorum

### Purple

*Purpureum elegans*

*Purpureum grandiflorum*

*Everestianum* (a pale purple, much lighter than either of the others)

### Pink

Abraham Lincoln

Lady Armstrong

Henrietta Sargent

Mrs. C. S. Sargent

*Roseum elegans*

### Red

Kettledrum

*Atrosanguineum*

H. W. Sargent

*Caractacus*

Added to this list of hybrid types are certain species which have been commonly planted for years.

*R. carolinianum*

*R. catawbiense*

*R. catawbiense album*

*R. maximum*

*R. minus*

*R. Smirnowii* (not much planted yet, but a very good type)

There might be mentioned a long list of rhododendrons which have been tried but been found slightly tender under New England conditions. For instance, the lovely *R. Fortunei* and its hybrids, though apparently doing well on Cape Cod, they have not proved satisfactory at the Arboretum. However, there is one plant, the "Duke of York," growing in the rhododendron collection at the Arboretum which is about 8 feet high and literally covered with blooms this year. It is apparently an exception to the rule, but is growing in a shaded, sheltered place at the base of Hemlock Hill. If moved to a more open situation, it undoubtedly would suffer some injury.

At the Arboretum, the length of bloom of the rhododendrons is rather long. This year, for instance, it started with *R. venustum* (one of the less hardy types) about May 5, followed closely by "Mont Blanc" and a few days later by "Boule de Neige" and "Charles Dickens," the last two being in full bloom by the end of May together with *R. carolinianum*. Then the majority of them burst into



A good hybrid, *Rhododendron* "Album elegans"

bloom around the first to the middle of June to be followed at the end by the giant rosebay, *R. maximum*, which will bloom by the end of June. This is the tallest of all, but unfortunately blooms after the new leaves and shoots have started growth, so that its effect in flower is greatly decreased.

**Notes.** Volume iv of "Icones Plantarum Sinicarum," an important, beautifully illustrated folio work with descriptive text in English and Chinese, appeared this spring and was dedicated to Dr. E. D. Merrill, Acting Supervisor of the Arnold Arboretum, as an authority on the flora of Malaysia and "in recognition of his signal contributions to the knowledge of the flora of Hainan and Kwangtung." It is the work of Dr. H. H. Hu and Professor W. Y. Chun, both of whom received a part of their training at the Arnold Arboretum, and is published by the Fan Memorial Institute of Biology, Peiping, China.

Other volumes have been dedicated to Charles Sprague Sargent (vol. i, 1927), Augustine Henry (vol. ii, 1929), and Ludwig Diels, Director of the Berlin Botanical Garden and Museum (vol. iii, 1933).

Dr. Merrill has recently been honored by election as an honorary member to the Botanical Society of Japan, the oldest botanical society in Asia, organized in 1887 as the Tokyo Botanical Society.

The degree of Doctor of Laws was conferred on Dr. E. D. Merrill on May 27, by the University of California at its 73rd Commencement. In introducing Dr. Merrill for the degree, President Sproul of the University of California, characterized him as "Dean of the College of Agriculture in the University of California for five years; one of America's most eminent botanists; distinguished authority on tropical flora; interpreter of plant geography in relation to man's food; able coordinator of agricultural and botanical research."

**Color Photography.** Friends of the Arboretum will be glad to know that a recent voluntary gift made by one of the supporters of the Arboretum has made possible a serious attempt to increase the collection of natural color slides owned by the Arboretum. It is possible, through the intelligent use of one of the color processes now available, to portray flower colors accurately on slides. The Arboretum should have the best collection in this country of natural colored slides of trees and shrubs, and this gift will aid materially in attaining this objective.

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ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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THE BEST PHILADELPHUS

**D**URING recent years, there have crept into the trade a bewildering number of *Philadelphus* species and varieties. The plants themselves, though of value when in flower, are not particularly outstanding at other seasons of the year, though there are notable exceptions. It is interesting to note that "Standardized Plant Names" (published in 1923) lists 58 species and varieties; Rehder's "Manual of Cultivated Trees and Shrubs" (1927) lists 40 species and about as many varieties, while the "Plant Buyers' Index" (1931) lists no less than 68 different types in the trade. This is truly a bewildering number, particularly to the lay gardener who has the opinion that there are at the most only a dozen different *Philadelphus* from which to choose. In fact, one nurseryman feels the genus to be so important that he lists as many as 29 different kinds.

A careful study of the group, particularly with the ornamental qualities of these plants in mind, will show that there is a surprising similarity among varieties and even among species. Ordinarily, gardens are planted to be enjoyed longer than a week or two, the length of time these plants are in bloom, and plants so selected should have as many good qualities as possible so that they may be enjoyed at various seasons.

To illustrate this point, take as an example the flowering dogwood, *Cornus florida*. This is a plant which is of interest in the winter because of its excellent horizontal branching habit. In the spring it is outstanding with its lovely flowers opening before the leaves appear; in the summer it is of interest for its good, dark green foliage all summer long; in the early fall the excellent fruits turn a brilliant red while the leaves are still green, a very good color combination; and

in the late fall the leaves turn a brilliant red color. Because this plant has ornamental interest at all seasons of the year it is one of the best woody plants to use in landscape work.

On the other hand, take the widely planted *Philadelphus virginialis* varieties: True, they have very large, double, fragrant, white flowers, which may last at the most two weeks, but before and after that time, there is nothing ornamental about these plants. In fact they are always of poor shape, often slightly tender, at least in New England, and in any event are best used to the rear of other shrubs which may have more to recommend them over a longer period of time.

With this critical attitude in mind, we can better examine the *Philadelphus* group, picking out important plants which have particular landscape value of one sort or another, and neglecting to mention many which are either inferior or at least not quite on a par with those selected.

In the table we have tried to list the best of the *Philadelphus* and, since several are similar, arranged them in groups accordingly. Undoubtedly, there are some left out, and individuals who know the group well would be able to add several more to the list, particularly in the hybrid groups. However, since each group has its own peculiarities, it is doubtful if any more general groups would be formed, and, from the landscape point of view, the plants selected certainly are representative. The table is simply assimilated in order to give at a glance the general ornamental characteristics of each group of *Philadelphus*.

### Height

In general, most of the *Philadelphus* are vigorous growers and free from insect and disease troubles. Certain species, of which *P. coronarius* is an example, are hardy over a very wide area of the United States, several species being native to this country. The large-flowered hybrid types are the ones which tend to winter kill in New England and other northern sections during very severe winters, but even these are hardy south of the Mason and Dixon line. Most of them will do fairly well in New England if given some protection. They are easy to grow and not exacting as to soil requirements. There are both tall-growing and low-growing kinds.

*Philadelphus maximus* is perhaps the tallest growing of the group, good old plants of this getting up to 30 feet in height. The lowest growing are the *P. cymosus* and *P. Lemoinei* hybrids, the latter probably being the lowest of all, seldom exceeding 4 to 5 feet in height.



Double-flowered *Philadelphus virginalis*, Albatre

## Flowers and Fragrance

Though in general the *P. coronarius* types usually bloom earlier than do some of the others (*P. hirsutus*, not mentioned in this list, is the first of all to bloom) the double-flowered types usually hold their flowers longer than the others though they commence to bloom as soon as do the majority. They all bloom within a two-week period and so cannot seriously be classed as "early" or "late." Usually they start just after the hybrid rhododendrons and just before the mountain laurel, this time being about the middle of June in normal years at the Arboretum though it is advanced about a week this year due to hot, dry weather. Ordinarily, *P. pubescens* might be classed as the last of the group to bloom.

Mock-Oranges, particularly the old-fashioned kind, are noted for their fragrance and because of this and their similarity in appearance to orange blossoms they thus get their names. Known long before the common lilac, the Philadelphus was originally called *Syringa*, and even today this common name has persisted. However, the botanical term *Syringa* has since been applied to the common lilac and so the better common name for the group of Philadelphus might well be mock-orange. Perhaps the most fragrant are *P. coronarius*, *P. tomentosus* and *P. Zeyheri*. One is about as good as another in this respect. This would mean that if fragrance was the main reason for using these plants, certain species are more outstanding than others and should be used with this in mind. The table lists the comparative fragrance of the different groups.

The majority of the Philadelphus bear their flowers in upright or drooping clusters or racemes. However, one group (*P. inodorus*, *floridus*, *grandiflorus* and *laxus*) have only about three flowers on each stalk and these do not bloom all at the same time, so, when in bloom, the plants are apparently covered with small, individual, single blossoms. This gives a truly interesting effect, since they are apparently more or less regularly spaced over the entire plant. This same group also is noted for its drooping branches, which face to the ground very well. *P. insignis*, probably the only one listed which is not in the trade, is the only one which has the flowers in panicles.

*Philadelphus virginialis* varieties are 3 to 7 flowered, depending on the variety. "Argentine," for instance, has 3 flowers, while "Virginial" and "Glacier" have usually 5 to 7 flowers in each raceme. The majority of the Philadelphus species have, of course, racemes of many flowers.

THE BEST SPECIES AND VARIETIES OF PHILADELPHUS (Mock-Orange)

Species	Height in feet	Form	Hardiness	Flower <sup>1</sup> diam. (inches)	Single or double flowers	Fragrance
<i>P. coronarius</i>				1 1/4	Single	Very fragrant
<i>P. coronarius deutziaeflorus</i>	6-12	Upright	Hardy	1 1/4	Double	
<i>P. cymosus Banniere</i>			Not perfectly hardy at Boston.		Single	
<i>P. cymosus Conquete</i>			Some injury during winter of 1933-34, but plants not killed to ground. Worthy of protection.	1 1/4-1 1/2	often with some double flowers	Fragrant
<i>P. cymosus Norma</i>	4-8	Upright				
<i>P. cymosus Nuee Blanche</i>						
<i>P. cymosus Rosace</i>						
<i>P. inodorus</i>	6-12	Drooping and mound-		1 1/2	Single and slightly	
<i>P. floridus</i>	6-12	like; branches facing		1 1/2	square in	Not fragrant
<i>P. grandiflorus</i>	6-12	to the ground perfect-	Hardy	1	shape	
<i>P. laxus</i>	6-8	ly		1 1/2		
<i>P. splendens</i>	6-15		Hardy	1	Single	Not fragrant
<i>P. gordonianus</i>	8-20	Upright	Hardy	1 1/4	Single	
<i>P. Lemoinei Avalanche</i>		Drooping	Probably not perfectly hardy but more so than <i>P. cymosus</i> varieties.	1	Single	Fragrant
<i>P. Lemoinei erectus</i>		Upright		1	Single	
<i>P. Lemoinei Mont Blanc</i>	4-5	Drooping		1 1/2	Double	
<i>P. Lemoinei Girandole</i>		Upright	As hardy as <i>P. cymosus</i>	1	Single	Fragrant
<i>P. microphyllus</i>		Upright			Single creamy white	
<i>P. pekinensis</i>	6-8	Upright	Hardy	1		
<i>P. insignis</i>	6-20			1	Single	Not fragrant
<i>P. maximus</i>	6-30	Upright	Hardy	1		
<i>P. pubescens</i>	6-20					
<i>P. pubescens</i>	6-12	Drooping	Hardy	1 1/2	Single	Fragrant
<i>P. tomentosus</i>	6-8	Upright	Hardy	1	Single	Very fragrant
<i>P. virginialis Albatre</i>			Not perfectly hardy at Boston.	1 1/4		
<i>P. virginialis Argentine</i>			May suffer in severe winters but worthy of protection.	1 1/2-2	Double	Slightly fragrant
<i>P. virginialis Bouquet Blanc</i>	6-8	Upright		1		
<i>P. virginialis Glacier</i>				3/4		
<i>P. virginialis Virginal</i>				1 1/2-2		
<i>P. Zeyheri</i>	6-8	Upright	Hardy	1	Single	Very fragrant

<sup>1</sup> All flowers are borne in racemes except in *P. insignis*, which are in panicles, and the group (*P. inodorus*, *P. floridus*, *P. grandiflorus*, *P. laxus*) usually has only about 3 flowers on each stalk. The *P. virginialis* types have from 3 to 7 flowers on a stalk depending on the variety.

An interesting group which was not mentioned in the list given in the table because they are none too hardy in New England are the *P. purpureo-maculatus* varieties (*P. Lemoinei* × *P. Coulteri*), noted because of the small spot of purple color at the base of each white flower petal.

### Shape

Most everyone is familiar with the tall, upright, often arching habit of the old-fashioned *P. coronarius*. For many years, particularly prior to the introduction of the hybrids and some of the species, this was taken as being indicative of the entire group. Today, however, if shape were the only character in which we were interested, we could get a Philadelphus (*P. coronarius nanus*) which is a dwarf growing, dense, compact, round-topped plant, seldom getting over 1½ feet tall; or fairly low arching Philadelphus that look considerably like deutzias except that they are considerably more graceful as for example certain *P. cymosus* or *P. Lemoinei* varieties like *P. Lemoinei* "Avalanche"; or still other round growing forms which face to the ground well like *P. inodorus* and *P. splendens*.

This group contains some of the best Philadelphus for general landscape use, simply because of their excellent, mound-like form. Their branches face to the ground well, making it possible to use them in the foreground or even as specimen plants where they may be observed all the time. Even when not in flower, their drooping branches and general rounded form is outstanding all the year and hence they can be well used where this characteristic is desired.

### Pruning and Use

Mock-Oranges, as well as many of the honeysuckles and forsythias, need some renewal pruning every few years. The older branches might well be thinned out at certain intervals. This need not be done all at once unless necessary, but at least over a period of years. Thinning out, cutting back the old or dying branches to the ground, is much the best method to use on these plants as a group. Certain species may tend to get bare of branches at the base and when this occurs a careful cutting back is in order. All members of this genus can stand severe pruning, since they are all vigorous growers, and, if the occasion demands may be cut down to the ground entirely and will come up in a comparatively short time.

Consequently then, though the Philadelphus are used primarily for their lovely flowers in June, there are certain types more fragrant than



The handsome *Philadelphus splendens*

others; there are certain types with larger flowers or more interesting flowers than others, and above all, there are different forms available, making them useful for different landscape purposes the entire year. Tall-growing species, like *P. pubescens*, might well be used in background plantings for the foliage is comparatively free of insect and disease pests. Others, like *P. splendens*, *P. Lemoinei* "Avalanche," etc., can be used as specimen plants. In hot, dry situations the *P. coronarius* type has been successfully used as a screen and even as a clipped hedge. A good, fast-growing, vigorous group of plants which can be used for various purposes and an excellent group on which to demonstrate that a few of the best well selected types will be perfectly adequate to exemplify the many offered in the trade today.

### Victor Lemoine

A general discussion of the Philadelphus group would not be complete without a word about Victor Lemoine, that great French nurseryman who has done so much to enrich our supply of ornamental plants. Many of the varieties of Philadelphus, highly valued in the trade today, can be traced directly to the nurseries of Victor Lemoine and his successors. Born of a long line of horticulturists in 1823, he graduated from college and learned his gardening practically, working for others until he was finally able to branch out for himself. Among the places at which he worked was that of Louis Van Houtte, at Ghent, Belgium.

Lemoine established his business in 1850 at Nancy, France. Since that time the firm became one of the leaders in the world for hybridizing and introducing new varieties of woody plants. The number of different plants with which he worked is astounding. Some of them include Gladiolus, Paeonia, the double-flowered Begonia, Deutzia, Diervilla, Delphinium, Heuchrea, Syringa, Philadelphus and many others. During his life, he was the recipient of many outstanding horticultural honors, including the George Robert White Medal, presented by the Massachusetts Horticultural Society in 1911. When he died in 1911, horticulture lost a man who did more than any one else in modern times in originating new varieties of ornamental woody plants.

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ARNOLD ARBORETUM  
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SOME OF THE RARER SUMMER BLOOMING SHRUBS

**The Stewartias.** At the Arboretum, the Stewartias started blooming at the end of June this year, though ordinarily they usually bloom a week or two later. They all have flaky, cinnamon-brown trunks, with white Camellia-like flowers. There are three types which can be considered here, namely *Stewartia pentagyna*, *S. pseudocamellia*, and *S. koreana*. The first mentioned is the only one of the group native to this country, found from North Carolina to Florida. It is a shrub or tree-like bush with ovate to oblong-ovate leaves about 2-5 inches long. The cup-shaped flowers are white and about 3-4½ inches across, while the beauty of the individual flowers is considerably augmented by the orange colored anthers. There is a variety, *grandiflora*, which is even more beautiful because of its purple stamens. This is apparently perfectly hardy at the Arboretum and another large plant on the campus at Vassar College at Poughkeepsie, N. Y., suffered no injury there at all during the severe winter several years ago. An added advantage of this plant is that the dark green leaves turn an orange to crimson color in the fall.

The Japanese representative of this group is *Stewartia pseudocamellia*. In Japan, where this plant is quite common around Nikko and in other mountainous regions, Wilson found it rather rare in cultivation and difficult to purchase, for some reason or other. The young plant has ascending branches forming a vase-shaped crown, but older trees become rounded at the top. The flowers are borne singly in the axils of the leaves of the current year's growth and there is a striking similarity between its flowers and those of a Camellia. In the fall, the leaves turn a blackish-purple color.

The Korean Stewartia, *S. koreana*, was first introduced in 1917 by

the Arboretum from seeds collected in Korea. The unfortunate thing about this plant was that it took eleven years before it bloomed, but it is probably the most hardy of the group and certainly the most symmetrical as a small tree. It is upright and pyramidal in shape with the leaves a good dark green color. The edges of the flower petals are slightly fringed and the stamens are a rich yellow.

**Albizzia julibrissin rosea.** Commonly called the silk tree, this is the most outstanding of the summer blooming shrubs at the Arboretum and has the most finely divided foliage of any of the woody plants hardy in the northern United States. The foliage reminds one of that of the Mimosa or sensitive plant. The native country of this tree may be in doubt, but it is found widespread in Asia from Persia through China to southern Korea, and has been naturalized in the United States from Virginia south to Louisiana. The peculiarity of this plant is that the stamens make the conspicuously showy parts of the flower.

The flowers are borne in stalked heads which are produced many together in the topmost leaf stalks of the current year's growth. The sepals and petals are inconspicuous and dominated by the thread-like, upright, pink stamens. The flowers are borne on the upper side of the branches and stand above the foliage. For this reason, they are very conspicuous, and certainly are different from the flowers of most other hardy woody plants. In the type, the stamens are white and less showy than in the variety *rosea*, and fortunately this variety is also the hardier.

The origin of this particular plant is interesting. Wilson observed it growing near a hotel in central Korea, which was near the northern limit for the plant. Feeling that seed from this tree would do better under Massachusetts conditions than seed of the same variety collected further south, he sent some seed to the Arboretum in 1918. Only a few seeds were collected, and the young seedlings were set out when four years old. Several were killed the first winter, but one came through and has only suffered during the most severe winters since. Each time it is injured, it sprouts again and comes back into good form. One of the best characteristics it has is the long blooming season. Starting in July, it continues to bloom usually well into September. Though rare yet in the trade, this plant is certainly worth a trial in the north where the winters are not too severe, and its unique and interesting flowers will make it one of the most outstanding plants in bloom during the summer.

↳ **Tripterygium Regelii.** This is one of those few woody plants which can be used either as a vine or as a shrub. Native in Korea and Japan,



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As a bush, *Tripterygium Regelii*.

where it often climbs to the tops of the tallest trees, this plant is valued in this country because of its interesting, creamy-white colored flower spikes in mid June. The individual flowers are small but extremely numerous, and the fruits are bladder-like. This plant is another introduction of the Arnold Arboretum, the seed first being sent to this country by Professor J. G. Jack from Korea in 1905. Though occasionally suffering slight winter injury, it is still a valued plant for summer bloom. It is not classed as a vigorous growing vine, but makes its best show of flowers possibly when treated as a shrub, and could be used considerably more in northern gardens.

**Acanthopanax ricinifolius.** This is a close relative of the shrubby *Acanthopanax Sieboldianus* (*A. pentaphyllum* in the trade) which does so well as a foliage plant when grown in the shade or against a stone building. The interesting thing about *A. ricinifolius* is that it is a standard tree, occurring wild in Japan often to a height of 80 feet or more. In Korea and central and western China, it is also valued as a timber tree. There is a large tree in the Arboretum apparently perfectly at home. The leaves are large and similar in shape to those of the Castor oil bean (*Ricinus*) from which it gets its name. Each branchlet terminates in a broad, round compound cluster of flowers which are rapidly followed by small, jet-black fruits. The large and handsome palmate leaves give this tree a tropical appearance, yet it is perfectly hardy, quick growing, and apparently thrives in ordinary garden soil.

If a tropical effect is desired, this tree might be an excellent thing to use. It is interesting to know that this plant is the only hardy member of the genus which grows into a tree, and that such an outstanding near relative of the popular *A. Sieboldianus* (*A. pentaphyllum*) is hardy here in the north.

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ARNOLD ARBORETUM  
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SUMMER BLOOMING VINES

**Trumpet creepers.** The trumpet creeper, *Campsis radicans* (*Bigonia* or *Tecoma radicans* in the trade) is one of the common summer flowering vines. Widely used, this lovely vine is a native of the southern United States. Even as far north as Boston, the trumpet creeper is hardy, though occasionally it does suffer somewhat during the most severe winters. Having been introduced into cultivation as early as 1640, it is only natural that numerous special forms and hybrids have crept into the trade, so that a short discussion of this group does not seem to be amiss.

There are two important species in the north, *Campsis radicans* or the native American type, and *Campsis grandiflora* (*C. chinensis*), the Chinese type. Unfortunately, this latter is not hardy at the Arboretum, but it has been grown successfully on Long Island. The Chinese form has more attractive flowers than the American one. Although the flower tube is shorter, the flare of the corolla is wider, thus making the individual bloom more conspicuous than in its American relative. Also, the flowers are not borne in a tight cluster as in the American type, but more loosely, making a much better display. Fortunately, there are hybrids between the two species which are fairly hardy in New England. These hybrid forms are usually known as *C. Tagliabuana* or *C. hybrida*. When introduced from seeds, there is naturally considerable variation in both flowers and in hardiness. One of the forms which has proved best at the Arboretum over a long period of years is the variety Madame Galen, which can be asexually propagated either by hard-wood cuttings or by top grafting on the native *C. radicans*.

The trumpet creepers climb by clinging with small root-like hold-

fasts similar to those on the common English ivy. Though some claim that they need additional support for clinging to stone work, this is not always the case. Two good examples of this vine clinging to the perpendicular walls of buildings without any support whatsoever are on the administration building at the Arnold Arboretum and also on the administration building at Vassar College. The vines have climbed to the roofs of both of these buildings and have never needed additional wire supports of any kind. Where these vines are grown near their northern limits, some of the branches may unfortunately die back at their tips. However, since they always bloom on the current year's growth and respond to pruning readily, they may be cut back rather heavily with little appreciable reduction in flowering.

A list of the important differences between the two species is interesting because it aids in the understanding of some of the variations appearing in the hybrids.

American Trumpet creeper ( <i>Campsis radicans</i> )	Chinese Trumpet creeper ( <i>Campsis grandiflora</i> )
Leaves hairy beneath, along the veins	Leaves smooth beneath
Flower tubular	Flower bell-shaped
Sepals relatively short	Sepals relatively long
Corolla lobes small	Corolla lobes large
Flowers usually orange-red	Flowers usually scarlet-red
Flower cluster compact	Flower cluster open
Aerial roots common	Aerial roots rare
Vines up to thirty feet long	Vines up to ten feet long

**Clematis.** There are at least five species of clematis which are outstanding for their summer bloom, and many more species and varieties which have not yet attained wide popularity. The first of the five species is *Clematis Jackmanni*, that large, purple-flowered clematis which was introduced into the United States about 1866 and now is common in cultivation even as far north as Boston. There are pale gray and reddish-flowered varieties.

The sweet autumn clematis, *C. paniculata*, introduced by the Arnold Arboretum in 1877, may not bloom until September, but in some places starts to bloom by the end of August. Its small, starry, white flowers are borne in the greatest profusion. Unlike Jackman's clematis, it is not killed to the ground except in the most severe winters. Neither of these are natives of America, but were introduced from abroad, Jackman's clematis as a hybrid from England (its parents

from eastern Asia), and the latter, *C. paniculata*, from Japan.

A native clematis, common in many places in the eastern United States along fence rows and the edges of woods is the virgin's bower, *Clematis virginiana*. Its European relative, *Clematis Vitalba* or traveler's joy, is a rank growing, small flowered vine, blooming profusely in the summer. Though the individual flowers are not large, they literally cover the plant and, for this reason, make an excellent show. Both can be used extensively in naturalistic plantings.

One lovely native, which should be given considerably more attention in northern gardens, is that little, scarlet-flowered *Clematis texensis*, the scarlet clematis. It is hardy as far north as Bar Harbor, Maine. It was first collected in Texas, about 1850. The urn-shaped flowers are a bright scarlet to a rose-pink, and although the plant dies to the ground each winter, it comes up very vigorously in the spring. It has been used a great deal in hybridizing work, but should be in greater demand by gardeners who like the unusual.

**Honeysuckles.** Everyone is familiar with the sweet-scented Hall's honeysuckle, *Lonicera japonica Halliana*, the flowers of which are white, gradually changing to yellow. They begin to open in June and continue into July. The less floriferous and less vigorous Henry honeysuckle, *Lonicera Henryi*, also blooms in the summer and has smaller, reddish flowers. A very interesting native species is the trumpet honeysuckle, *Lonicera sempervirens*, which is common in certain parts of New England, in the Adirondacks in New York, and further south. The flowers are long and trumpet-shaped, varying from orange-yellow to scarlet, with yellow and brilliant scarlet forms. An interesting fact regarding this plant is that the leaves are "connate" or joined together at the stem, so that it appears as if two opposite leaves formed a single one with the stem coming through the center. A good summer bloomer, conspicuous because of its bright colored flowers, but often injured by severe weather, this vine is not as vigorous a grower as the Hall's honeysuckle, and is often almost shrub-like. *Lonicera Heckrottii*, the ever-blooming honeysuckle, is even more shrubby in growth. The tubular flowers are purple on the outside and yellow within, a very interesting combination. Unfortunately, both of these plants are susceptible to severe infestations of plant lice and should not be grown unless this pest be kept in check by proper spraying.

**Fleece vine.** *Polygonum Auberti*, the fleece vine, has proved the better vine at the Arboretum when compared with its near relative, *P. baldschuanicum*. It commences to bloom the latter part of July. Introduced into cultivation in 1899, it has had a rather late start in

gaining popularity among other summer blooming vines. It produces foot-long masses of small, greenish-white flowers at the end of each branch. In New England and northern New York, the plant dies to the ground each winter, but grows so vigorously in the spring that it makes an excellent showing with its dainty flowers in the summertime. Being a twining vine, it readily ascends almost any kind of support given it and can be used to advantage in combination with the later blooming *Clematis paniculata*.

**Schizophragma hydrangeoides.** Classed as a summer blooming vine, this is somewhat similar to *Hydrangea petiolaris* which blooms in June, and, in fact, is much confused with it. However, it is inferior in habit and flower to the former. Though it may be good in some sections, it seems that the climbing hydrangea might well be given the preference.

**Memorial rose.** Though many rambler roses might be termed summer blooming vines, only one rose species will be mentioned here, namely *Rosa Wichuriana* or the memorial rose. This is a low growing, trailing vine, best used as a ground cover. The leaves are small and a bright shiny green, the flowers small and white. The plant is best used on banks, for it not only makes an excellent display, but at the same time tends to keep the soil from washing.

**Tripterygium Regelii.** Mentioned in the last issue of the Bulletin, this plant is also considered a summer blooming vine, although it is shrubby by habit and forms an excellent shrub if properly restrained.

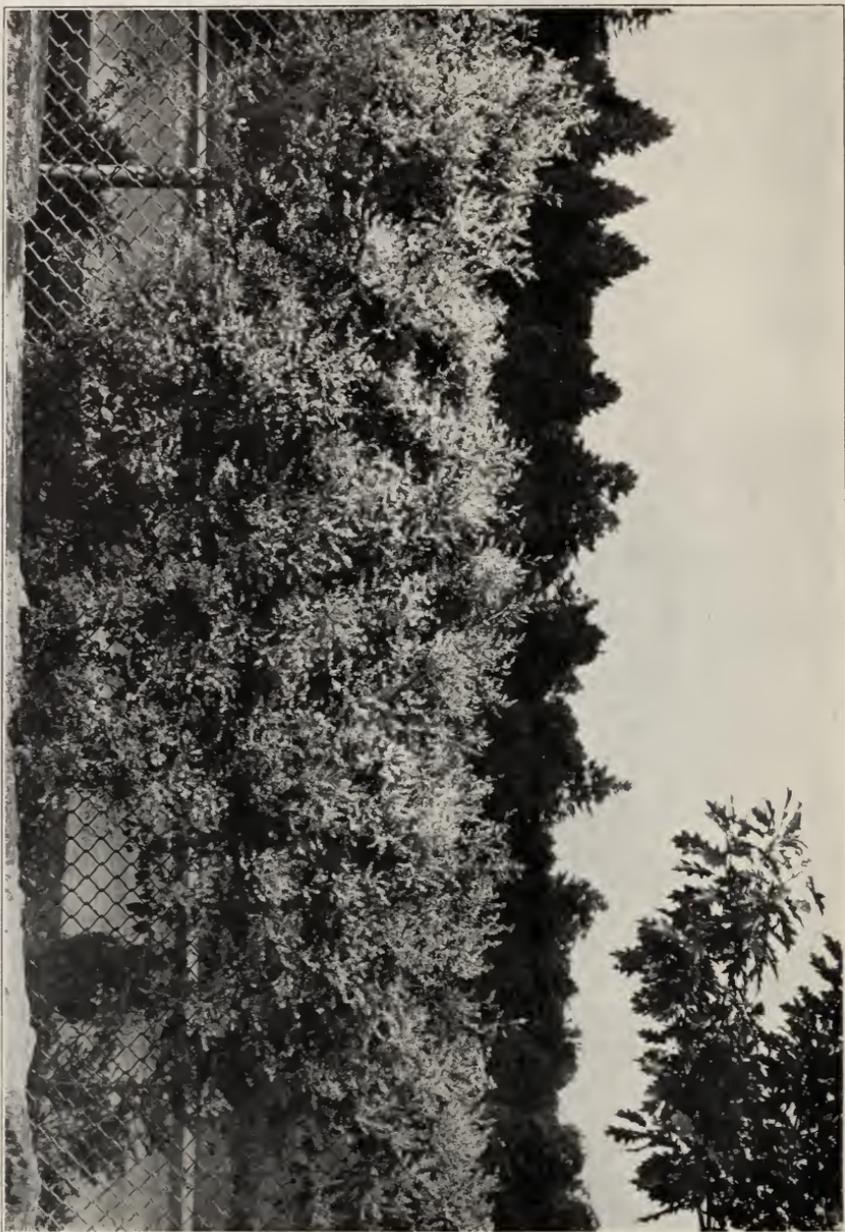
DONALD WYMAN



Flowers illustrating the three forms of *Campsis*.

Reading from left to right: *Campsis radicans*, *C. tagliabuana*, *C. grandiflora* (formerly *C. chinensis*).

Note the difference in the calyx lobes and corollas.



*Chirya* Pleece-Yine (*Polygonum Aubertii*)

L. C.

ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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WOODY PLANTS WITH ORNAMENTAL FRUITS

ORNAMENTAL fruits and autumn color are both of outstanding interest in the fall landscape. In fact we often plant primarily with these in mind. Interesting, bright-colored fruits are not limited to fall display alone, since the fruits of many plants start to ripen as early as June and are effective during the hot dry summer months when comparatively few of our woody shrubs are in bloom. Then, too, the ornamental fruits of many shrubs will remain on the plants long after the leaves have dropped in the fall, thus giving interest during the dreary winter months. Since there are such a large number of plants with ornamental fruits available, a general knowledge of the subject should help in making the home grounds more interesting during the trying months of the year.

All plants do not fruit well every year for various reasons. Take for example the flowering crabapples. These, like all apples, have abundant fruits one year and few fruits the following year, and little we can do will change this sequence. Every commercial orchardist is familiar with this "alternate bearing." Then, too, weather conditions have a great influence on fruit bearing as would be expected. Sometimes a plant is in too rich a soil, and all of its energies are spent in making vegetative growths, few towards flowering and fruiting. Here a good root pruning might aid. Sometimes the application of potash or phosphorous-bearing fertilizer aids in fruit production as it always does with grains and vegetables. Plants like the common bittersweet or the Japanese yew have the sexes on different plants, and the staminate plants will never bear fruit under any conditions. Naturally, disease and insect troubles will reduce the amount of fruit borne by plants. Borers in the trunks are also outstanding in this respect. All these things must be carefully considered when estimating the amount of fruit that any particular plant may produce annually.

Many of the best of our ornamental fruiting shrubs and trees are listed in the following pages, together with important notes about certain species. A careful study of these lists and notes will give a better understanding of what to plant for fruiting effect.

## SUMMER FRUITS

### Red

<i>Acer ginnala</i>	Amur maple
<i>Ailanthus altissima</i> ( <i>A. glandulosa</i> )†	Ailanthus
<i>Ailanthus altissima</i> ( <i>A. glandulosa</i> ) erythrocarpa†	“
<i>Cornus kousa</i>	Kousa Dogwood
* <i>Cornus mas</i>	Cornelian-cherry
* <i>Crataegus arnoldiana</i> †	Arnold Hawthorn
* <i>Daphne Mezereum</i>	February Daphne
* <i>Elaeagnus multiflora</i> ( <i>E. longipes</i> )	Cherry Elaeagnus
* <i>Lonicera bella</i>	Belle Honeysuckle
* <i>Lonicera Korolkovii</i>	Blueleaf Honeysuckle
* <i>Lonicera Morrowii</i>	Morrow Honeysuckle
<i>Lonicera syringantha</i>	Lilac Honeysuckle
* <i>Lonicera tatarica</i>	Tatarian Honeysuckle
<i>Lonicera thibetica</i>	Tibetan Honeysuckle
<i>Nemopanthus mucronata</i> †	Mountain-holly
<i>Prinsepia sinensis</i>	Cherry Prinsepia
<i>Prinsepia uniflora</i>	White Prinsepia
<i>Prunus avium</i>	Mazzard
* <i>Prunus tomentosa</i>	Nanking Cherry
* <i>Rhus glabra</i> †	Smooth Sumac
* <i>Rhus typhina</i> †	Staghorn Sumac
<i>Ribes alpinum</i> †	Mountain Currant
<i>Rosa Hugonis</i>	Father Hugo Rose
* <i>Rosa Rugosa</i>	Rugosa Rose
<i>Rubus odoratus</i>	Flowering Raspberry
* <i>Sambucus pubens</i>	Scarlet Elder
* <i>Shepherdia argentea</i> †	Silver Buffaloberry
<i>Shepherdia canadensis</i> †	Russet Buffaloberry
<i>Sorbus americana</i> †	American Mountain-ash
* <i>Sorbus Aucuparia</i> †	European Mountain-ash
* <i>Sorbus decora</i> †	Showy Mountain-ash
* <i>Viburnum Wrightii</i>	Wright Viburnum

### Blue

* <i>Cornus alternifolia</i> †	Alternate leaved Dogwood
<i>Cornus Amomum</i>	Silky Dogwood
* <i>Cornus controversa</i>	Pagoda Dogwood
<i>Lonicera coerulea</i>	Sweetberry Honeysuckle
* <i>Mahonia Aquifolium</i> †	Oregon Hollygrape
* <i>Mahonia repens</i> †	Creeping Hollygrape
<i>Vaccinium pennsylvanicum</i>	Lowbush Blueberry
<i>Vaccinium vacillans</i>	Dryland Blueberry
* <i>Viburnum dentatum</i>	Arrowwood

### Black

Aronia melanocarpa	Black Chokeberry
Berberis heteropoda‡	Turkestan Barberry
Prunus Sargentii (P. serrulata sachalinensis)	Sargent Cherry
*Prunus serotina	Black Cherry
*Prunus virginiana‡	Common Chokecherry
Rhamnus cathartica	Common Buckthorn
Rhodotypos scandens (kerrioides)	Jethead
Ribes odoratum	Golden Currant
*Sambucus canadensis	American Elder

### White

*Cornus alba	Tatarian Dogwood
*Cornus racemosa (C. paniculata)	Gray Dogwood
*Cornus stolonifera	Red Osier Dogwood
*Symphoricarpus albus laevigatus (S. racemosus laevigatus)	Garden Snowberry

### Miscellaneous

Amelanchier laevis	Dark purple	Allegheny Serviceberry
*Cornus mas flava	Yellow	
*Cotinus coggygria (Rhus cotinus)	Greenish	Common Smoketree
*Cotinus coggygria purpureus (Rhus cotinus purpureus)	Purple	Purple Smoketree
*Daphne Mezereum alba	Yellow	White February Daphne
Fraxinus americana iodocarpa	Red purple	American Ash var.
Ginko biloba‡	Greenish	Maidenhair-tree
Koelreuteria paniculata	Greenish	China-tree
Kolkwitzia amabilis	Brown	Beautybush
*Lonicera Morrowi xanthocarpa	Yellow	
*Lonicera tatarica lutea	Yellow	Yellow Tatarian Honeysuckle
*Malus brevipes	Yellow to red	
Morus alba	White, red, black	White Mulberry
Morus rubra	Purple	Red Mulberry
Pterocarya fraxinifolia	Light green	Caucasian Wingnut
Pterocarya Rehderiana	Light green	Rehder Wingnut
Ptelea trifoliata	Light green	Common Hoptree
Rhamnus Frangula	Purple	Glossy Buckthorn
Robinia fertilis	Purple	
Robinia Kelseyi	Purple	Kelsey Locust
*Viburnum alnifolium	Changing from red to blue-black	Hobblebush
*Viburnum Sieboldii	“ “ “ “	Siebold Viburnum
*Viburnum tomentosum	“ “ “ “	Doublefile Viburnum

\* Of outstanding value.

‡ Mentioned in notes.

## FALL AND WINTER FRUITS

### Red

<p>Arctostaphylos uva-ursi            *Aronia arbutifolia†            Benzoin aestivale            **Berberis aggregata†            **Berberis chinensis†            *Berberis dictyophylla†            *Berberis Gilgiana†            Berberis koreana†            **Berberis Thunbergii†            *Berberis Vernae†            **Berberis vulgaris†            **Cotoneaster Dielsiana†            **Cotoneaster divaricata†            **Cotoneaster Francheti†            **Cotoneaster horizontals†            *Cotoneaster microphylla†            *Cotoneaster racemiflora soongorica†            *Cotoneaster salicifolia floccosa†            *Cornus florida†            **Crataegus arnoldiana†            Crataegus crus-galli†            *Crataegus mollis†            Crataegus oxyacantha†            **Crataegus phaenopyrum (C. cordata)†            *Evonymus alata†            *Evonymus atropurpurea†            *Evonymus europaea atrorubens†            Evonymus obovata†            Gaultheria procumbens            **Ilex opaca†            **Ilex verticillata†            Lonicera Maakii podocarpa            Magnolia species            *Malus atrosanguinea†            *Malus "Hopa Crab"†            Malus pumila Niedzwetzkyana†            *Mitchella repens            *Photinia villosa†            **Rhus copallina†            **Rhus glabra†            **Rhus typhina†            **Ribes fasciculatum†            **Rosa multiflora†</p>	<p>Bearberry            Red Chokeberry            Spicebush            Salmon Barberry            Chinese Barberry            Chalkleaf Barberry              Korean Barberry            Japanese Barberry            Verna Barberry            European Barberry            Diels Cotoneaster            Spreading Cotoneaster            Franchet Cotoneaster            Rock Cotoneaster            Rockspray            Songarian Cotoneaster            Willowleaf Cotoneaster            Flowering Dogwood            Arnold Hawthorn            Cockspur Thorn            Downy Hawthorn            English Hawthorn            Washington Hawthorn            Winged Euonymus            Wahoo            European Burningbush            Running Euonymus            Wintergreen            American Holly            Common Winterberry            Late Honeysuckle            Magnolias            Carmine Crab            Hopa Crab            Redvein Apple            Partridgeberry              Shining Sumac            Smooth Sumac            Staghorn Sumac            Winterberry Currant            Japanese Rose</p>
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*Cotoneaster racemiflora soongorica* has coral pink fruits.

** <i>Rosa rugosa</i>	Rugosa Rose
** <i>Rosa setigera</i>	Prairie Rose
** <i>Rosa virginiana</i> ( <i>R. lucida</i> )	Virginia Rose
<i>Rosa Wichuraiana</i>	Wichura Rose
** <i>Sorbus americana</i>	American Mountain-ash
** <i>Sorbus Aucuparia</i>	European Mountain-ash
** <i>Sorbus decora</i> †	Showy Mountain-ash
** <i>Symphoricarpus Chenaultii</i>	
** <i>Symphoricarpus orbiculatus</i> ( <i>S. vulgaris</i> )	Coralberry
** <i>Taxus baccata</i> †	English Yew
** <i>Taxus cuspidata</i> †	Japanese Yew
** <i>Taxus media</i> Hicksii†	Hicks Yew
** <i>Viburnum dilatatum</i>	Linden Viburnum
** <i>Viburnum Opulus</i>	European Cranberrybush
** <i>Viburnum trilobum</i>	Cranberrybush

### Blue

<i>Chionanthus virginica</i>	White Fringetree
* <i>Clerodendron trichotomum</i> †	Harlequin Glorybower
<i>Juniperus horizontalis</i>	Creeping Juniper
** <i>Juniperus virginiana</i>	Redcedar
* <i>Symplocos paniculata</i>	Asiatic Sweetleaf
<i>Vaccinium corymbosum</i>	Highbush Blueberry
* <i>Viburnum dentatum</i>	Arrowwood

### Black

<i>Berberis heteropoda</i> †	Turkestan Barberry
<i>Cornus sanguinea</i>	Bloodtwig Dogwood
<i>Cotoneaster foveolata</i> †	
<i>Ilex crenata microphylla</i> †	Littleleaf Japanese Holly
<i>Ilex glabra</i> †	Inkberry
<i>Ligustrum amurense</i> †	Amur Privet
<i>Ligustrum ovalifolium</i>	California Privet
** <i>Ligustrum vulgare</i>	European Privet
** <i>Rhamnus cathartica</i>	Common Buckthorn
** <i>Rhodotypos scandens</i> ( <i>R. kerrioides</i> )	Jetbead
<i>Rosa spinosissima</i>	Scotch Rose
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum
* <i>Viburnum cassinoides</i> †	Withe-rod
<i>Viburnum lantana</i>	Wayfaring Tree
** <i>Viburnum Lentago</i>	Nannyberry
<i>Viburnum pubescens</i> †	

### White

* <i>Baccharis halimifolia</i> †	Groundselbush
* <i>Cornus racemosa</i> ( <i>C. paniculata</i> )	Gray Dogwood
<i>Cornus rugosa</i> (or light-blue)	Roundleaf Dogwood
* <i>Symphoricarpus albus laevigatus</i> ( <i>S. racemosus laevigatus</i> )	Garden Snowberry

### Miscellaneous

<i>Callicarpa dichotoma</i>	Lilac violet	Chinese Beautyberry
<i>Callicarpa japonica</i>	Violet	Japanese Beautyberry
<i>Colutea arborescens</i>	Greenish	Common Bladder-senna
<i>Cornus florida xanthocarpa</i>	Yellow	
** <i>Crataegus pruinosa</i> †	Dark purple	Frosted Hawthorn
<i>Evonymus Bungeana</i> †	Pink	Winterberry Euonymus
** <i>Hippophae rhamnoides</i> †	Orange	Common Sea-buckthorn
** <i>Ilex opaca xanthocarpa</i> †	Yellow	
<i>Maclura pomifera</i> †	Greenish	Osage-orange
** <i>Malus arnoldiana</i> †	Yellow	Arnold Crab
<i>Malus baccata</i> †	Yellow to red	Siberian Crab
* <i>Malus brevipes</i> †	Yellow to red	
** <i>Malus floribunda</i> †	Yellow to red	Japanese Flowering Crab
* <i>Malus micromalus</i> †	Yellow to red	Midget Crab
<i>Malus prunifolia</i> †	Yellow to red	Chinese Apple
* <i>Malus toringoides</i> †	Yellow to red	Cutleaf Crab
** <i>Myrica carolinensis</i> †	Gray	Northern Bayberry
<i>Oxydendrum arboreum</i> †	Grayish	Sourwood
** <i>Pyracantha coccinea</i> †	Orange	Scarlet Firethorn
* <i>Rhamnus Frangula</i> †	Dark Purple	Glossy Buckthorn
* <i>Viburnum dilatatum xanthocarpum</i>	Yellow	
* <i>Viburnum Opulus xanthocarpum</i>	Yellow	

\* Of outstanding value.

† Mentioned in notes.

\*\* Of outstanding value during the fall and a greater part of the winter.

### VINES WITH ORNAMENTAL FRUITS

<i>Actinidia arguta</i> †	Green	Bower Actinidia
* <i>Ampelopsis brevipedunculata</i> ( <i>A. heterophylla</i> )	Pale lilac to green to dark blue or porcelain	Porcelain Ampelopsis
* <i>Celastrus articulata</i> † ( <i>C. orbiculatus</i> )	Yellow to red	Oriental Bittersweet
* <i>Celastrus scandens</i> †	Orange	American Bittersweet
* <i>Clematis Flammula</i> †	Whitish	Plume Clematis
* <i>Clematis paniculata</i> †	Whitish	Sweet Autumn Clematis
* <i>Clematis tangutica</i> †	Whitish	Golden Clematis
* <i>Clematis virginiana</i> †	Whitish	Virgins-Bower
* <i>Clematis Vitalba</i> †	Whitish	Travellers-Joy
* <i>Evonymus radicans vegeta</i> † ( <i>vegetus</i> )	Orange	Bigleaf Wintercreeper
<i>Lycium halimifolium</i> †	Red	Matrimony Vine
<i>Parthenocissus (Ampelopsis)</i> <i>quinquefolia</i>	Blue	Virginia Creeper

Parthenocissus (Ampelopsis) tricuspidata	Blue	Boston Ivy
Polygonum Auberti†	Brownish	Fleece Vine
Schisandra chinensis†	Scarlet	
Solanum Dulcumara	Red	Climbing Nightshade
Tripterygium Regelii†	Greenish	
Vitis Coignetiae	Black	Glory Vine

**PLANTS OF VALUE FOR FLOWER BUT WITH INEFFECTIVE FRUITS  
(capsules, pods, nuts, etc.)**

Abelia grandiflora	Kalmia species
Acer species (except A. ginnala)	Kerria japonica
Aesculus species	Laburnum species
Amorpha canescens	Leucothe Catesbaei
Azalea species	Liriodendron Tulipifera
Caragana arborescens	Malus ioensis plena
Catalpa species	Philadelphus species
Cercis species	Phlox subulata
Chaenomeles (Cydonia)	Physocarpus opulifolius
Cladrastis lutea	Potentilla species
Clethra alnifolia	Rhododendron species
Daphne cneorum	Robinia species
Deutzia species	Rosa Harisonii
Diervilla (Weigela) species	Salix species
Enkianthus campanulatus	Sophora japonica
Forsythia species	Sorbaria species
Fothergilla species	Spiraea species
Halesia species	Syringa species
Hamamelis species	Tilia species
Hibiscus syriacus	Vinca minor
Hydrangea species	Wisteria species
Hypericum species	

*Notes and Comments*

**Sexes separate:** One of the most important causes for certain of our important ornamental plants "not fruiting" is simply the fact that the sexes are on separate plants and both male and female plants must be in close proximity to insure the fruiting of the pistillate plant. This is true in **Baccharis, Ginkgo, Hippophae, Ilex, Maclura, Myrica, Nemopanthus, Ribes alpinum, Ribes fasciculatum, Schisandra, Shepherdia and Taxus.** When only one specimen plant is desired, then it may be that a small staminate plant could be planted with the pistillate form, giving the general impression of one plant. This would probably be sufficient to insure good fruiting. Or, if several plants are to be used, the staminate form can be planted at the rear and the pistillate forms (usually about

three to six pistillate plants to one staminate plant) could be grouped in the front where they would be more conspicuous.

**The bittersweet** (*Celastrus*) exemplifies another angle of this same problem. Many people all over the country have bought this lovely vine with the expectations of enjoying the gorgeous fruits in the fall, only to be disappointed year after year with no fruit whatsoever. They have applied fertilizers to the roots and pruned them and done everything to get fruit, but certain plants are of the staminate form and naturally will never bear fruits. There are other plants which may be slightly polygamous, that is, these plants will have a sufficient number of the staminate flowers to properly fertilize the pistillate flowers and so result in good fruits, and it is these plants which should be bought. Naturally the best time to buy such plants is when they are in flower. Other types in the same category as the *Celastrus* are *Actinidia arguta*, *Ailanthus*, *Morus*, *Rhus* and *Vitis*, and some nurserymen claim that *Ilex opaca* is also in this group. Consequently, when buying plants of this nature for their fruit, do not buy young plants grown from seed before they have fruited for in such a group there will undoubtedly be many staminate forms which will never bear fruits. Rather buy plants which have been propagated asexually from fruiting plants bearing both kinds of flowers, or individually inspect the plants for both kinds of flowers before they are taken from the nursery row.

***Ailanthus altissima***: Only pistillate forms of this plant should be used because staminate plants have a very bad odor when in flower and do not have the good fruits in the late summer. Most of the pistillate plants have sufficient staminate flowers on them to insure fruit production. An excellent form for fruit is the variety **erythocarpa**. *Ginkgo biloba* is an example of a case where the pistillate tree should never be used, since the unattractive round, greenish fruits about the size of a small crabapple, are decidedly ill-smelling and most obnoxious.

***Baccharis halimifolia***: The sexes are separate (see note on sexes separate) and the fruits are in feathery masses like those of the asters. This plant is excellent for planting at the seashore where it withstands saltwater spray remarkably well.

***Berberis***: Many barberries carry the black stem rust of wheat, but fortunately there are certain ones which do not. Rust immune barberries are limited to ***B. Thunbergi*** and its several varieties. Certain other species are fairly resistant to the disease and can be shipped into quarantined states with a permit. These include most of our common evergreen barberries, the ***Mahonias***, and some new deciduous types which certainly are worth a trial. These are ***B. dictophylla albicaulis***, ***B. Gilgiana***, ***B. koreana***. Though other species which carry the rust and against which there are restrictions for shipping have been mentioned in this Bulletin, the above mentioned species are of new ornamental interest to us because they can be shipped and so can be used in sections of the country where this disease is prevalent.

***Celastrus***: All *Celastrus* are climbers and have the sexes separate (see note on sexes separate). The fruits of the **oriental bittersweet** are in short lateral clusters and the yellow capsules drop soon after opening, leaving the red fleshy aril surrounding the seed. The fruits of the **American bittersweet** are in nodding ter-



Most beautiful crabapple in fruit, *Malus forficoides*.

minal clusters and the capsules do not drop at all. One cannot be considered as a better ornamental vine than the other, for both have their place. In *Celastrus* and *Evonymus* the seed is imbedded in a brightly colored fleshy covering called the aril, surrounded by the capsule which opens at maturity.

**Clematis:** The fruits of these plants have a long feathery style attached to the small brown seed, making the whole effect one of fluffiness. This is much more marked in some varieties than in others.

**Clerodendron trichotomum:** This large leaved plant is a most interesting one for late summer effect. The flowers are somewhat like those of the "bouncing-bet," white to reddish. Though the blueberry-like fruits actually drop soon after maturity, the bright red calyx remains for several weeks and gives the plant a striking appearance. In older plants the branching is horizontal. The plant is tender in the north while young, often killing to the ground during severe winters. In any event, it is best planted in sheltered situations.

**Cornus alternifolia:** This plant is native in the woods of the northeastern United States and with its lovely sympodial branching the blue fruit clusters make it a good ornamental shrub. Unfortunately, it is susceptible to a serious twig blight for which there is yet no known remedy. **Cornus controversa**, introduced from Asia, has all the characteristics of **C. alternifolia** and at the same time is a much more vigorous grower.

**Cornus florida:** The flowering dogwood is an excellent example of the perfect ornamental tree. It has bright showy flowers in the spring; good green foliage all summer long which is not troubled by any serious disease or insect pest; good red clusters of fruits of considerable ornamental value and most attractive to birds; excellent red autumn color; and a good horizontal branching system which is attractive all the year and particularly so in the winter. Plants such as this, of interest at every season of the year, cannot be used too much.

**Cotoneaster:** The cotoneasters are all subject to fireblight, borers and scale. In Highland Park, Rochester, N.Y., it is claimed that fireblight is readily controlled by spraying during the summer with Bordeaux mixture. In any event, if these three troubles could be kept in check, cotoneasters would be excellent plants for their red or black fruits. Unfortunately, these troubles are all very serious, once they become established in a planting, and accordingly we must not become over enthusiastic about planting large groups of cotoneasters. Some cotoneasters are prostrate and form excellent ground covers like **Cotoneaster apiculata** and **C. horizontalis**, both of which have lovely red fruits, and some are taller shrubs growing up to six feet in height like the black-fruited **C. foveolata**. Perhaps one of the best of the cotoneasters, noted for its fruit of brilliant scarlet, is **C. racemiflora soongorica**.

**Crataegus:** There are a very great many hawthorns with ornamental red fruits, but they are susceptible to several disease and insect troubles. For this reason they need an unwarranted amount of care during the spring and summer, so that for the time being, it is best to limit selection to a very few. The Washington-thorn, (**C. cordata**), is one of the best for small fruits. These are a brilliant red and remain on the plant all winter. Larger fruited plants are **C. arnoldiana**

and *C. mollis*, both of which have been used considerably in landscape plantings.

**Lycium halimifolium:** Though not a true vine, this plant is often treated as such, or as a semi-shrub, for sprawling bank plantings.

**Malus:** In an earlier issue of the Bulletin, the crabapples were fully discussed. Most crabapples are valued for their fruits, and of a large number, *M. toringoides* is perhaps the best in fruit, though there are many other outstanding ones. Although *Aronia*, *Cotoneaster*, *Malus*, *Photinia*, and *Pyracantha* are all subject to fireblight, borers and scale, they are among the most outstanding plants for ornamental fruit. In sections where fireblight has proved troublesome, it may be unwise to plant any of these in large quantities.

**Morus:** The sexes are separate (see note on sexes separate) and the fruit is similar in form to that of the common blackberry. It is relished by birds, but the tree is a nuisance when planted so that the fruits fall on a white concrete pavement.

**Polygonum Auberti:** This vine is not placed in this list primarily for its fruits, which are simply unattractive small brown capsules, but it does flower during late August at a time when little else is in bloom. It is immediately followed by *Clematis paniculata*, which has attractive flowers, as well as fruits in September.

**Sorbus:** The mountain-ash has been commonly planted as a specimen tree. It is unfortunately very susceptible to borers at the base of the trunk, and once they become well established the tree is doomed unless remedial action be taken. All mountain-ash should be carefully inspected at regular intervals for such borers, and, if present, should be eradicated at once if the tree is to be enjoyed for a long period of time. The European mountain-ash is perhaps one of the most common ornamental trees for fruit, but a red-fruited species with larger fruit, *S. decora*, is becoming increasingly popular.

**Tripterygium Regelii:** This plant can be considered either as a sprawling shrub or as a vine. The fruits are not particularly outstanding, but the flower clusters are. These are borne in July in large, creamy-white pyramidal masses and the plant is often hardy as far north as Bar Harbor, Maine.

**Viburnum cassinoides:** This plant is a very interesting one because as the fruit matures it changes color from yellow-green to pink and finally to blue-black. Since the individual berries are borne in clusters, there are times when there are several colors in one cluster. The same is true of *Viburnum alnifolium*, *V. lan-tana*, *V. Lentago*, *V. Sieboldii* and *V. tomentosum*. In *Rhamnus Frangula* the flowers continue to open from early summer until fall, resulting in the continually ripening fruit. Hence there are some green, some red, and some black berries on the plant at the same time. This creates an interesting effect, even though the profusely borne fruits are only as large as those of the honeysuckles.

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ARNOLD ARBORETUM  
HARVARD UNIVERSITY



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AUTUMN COLOR

THE eastern United States is fortunately located in one of the few regions of the world where brilliant autumn coloration of foliage prevails. There is only one small region in the southern hemisphere, and that in South America. In the northern hemisphere, there is a large region in eastern Asia, including central and northern Japan, and a small region in the southwestern part of Europe. In North America, the region characterized by brilliant autumn foliage extends from the Gulf of St. Lawrence to the southern United States and westward to the Great Plains, areas of extensive deciduous forests. Here the general climatic conditions are often just what is needed to produce that lovely phenomenon of nature—the autumn coloration of deciduous foliage.

In North America the most brilliant displays of autumn color are of course in southeastern Canada, northeastern United States and in certain other areas of high altitude. The further south one goes the less brilliant is the display of autumn color particularly in areas along the seacoast. In the higher altitudes of the south such as the Blue Ridge Mountains, the color is usually just as brilliant as in the northeastern United States.

In some years, the autumn color is much more pronounced than in others. There are always plants, the foliage of which turns yellow in the fall, but it is the brilliant reds and gorgeous scarlets which, in combination with the yellows, make autumn color of outstanding beauty. It is chiefly the reds and scarlets which are intensified by the right climatic conditions.

Leaves are green because they contain a complex material called chlorophyll. This is essential to the growth of all plants, except the

saprophytes and a few parasites, for it is through the action of chlorophyll that the plant can manufacture the food that it requires from crude chemicals in the presence of light and heat. Chlorophyll is a highly complex chemical material, being continually manufactured in the leaf and at the same time being continually broken down. Ordinarily, the rate of its breakdown about equals the rate of its manufacture. In the fall, the rate of chlorophyll manufacture is gradually reduced, although the rate of its decomposition is maintained. The exact cause for this phenomenon is problematical, but the accumulation of waste products in the leaf may be the principal cause.

#### **Why leaves are yellow**

A certain stage is reached where there is little if any chlorophyll manufacture. Most of the chlorophyll already made eventually is destroyed. This is the reason why leaves are yellow, for the two yellow pigments usually present, carotin and xanthophyll, are continually masked by the chlorophyll. When most of the chlorophyll is destroyed, these pigments become apparent. These same coloring materials are present in large quantities in egg yolk, carrots, and in some yellow flowers.

When green plants are taken into dark places, such as a cellar, the leaves often turn yellow. Also, young shoots appearing for the first time under the dark conditions of the cellar are usually yellow. This is explained by the fact that chlorophyll is manufactured only in the presence of light. When light is absent, plants are unable to manufacture new chlorophyll and the yellow pigments become predominant as soon as all the previously manufactured chlorophyll has been destroyed.

The gradual cessation of chlorophyll manufacture and the final breakdown of all that previously made, completes the first stage in autumn coloration. This is the reason for certain plants becoming yellow. There are some plants, like most of the magnolias for instance, the leaves of which do not turn yellow, but change from green directly to brown. For some reason, the breakdown of the chlorophyll does not start soon enough or is not complete enough to result in the appearance of the yellow pigments. The yellow color does appear in the foliage of many other plants regardless of the weather conditions. There is an interesting high degree of individuality in certain species. Red maple, for instance, usually turns a good red in the fall, but certain individuals always color yellow. The same can be said of sugar maples and several other plants. This is a most interesting physiological problem worthy of further investigation.

### Why leaves are red

The gorgeous beauty of most autumn color combinations results from the brilliant reds and scarlets, together with the yellows. The sassafras, some of the maples, oaks, sumacs, sourwood, tupelo, and other plants are particularly outstanding for their brilliant red autumn color. These plants are most interesting in that the brilliance of their color apparently varies from year to year. The red in their leaves is caused by a third pigment called anthocyanin, which results in some way from the accumulation of sugars and tannins in the leaf. In some of the maples valued for their sugar production, it is probably the sugars which cause this red color. The oaks, however, being rich in tannins probably owe their high autumn coloration to the presence of these.

There are two factors necessary in the production of red autumn color. The first is light. There must be warm, bright, sunny days in the fall, during which time the leaves naturally manufacture a great deal of sugar. Secondly, such days must be followed by cool nights, during which the temperature is below 45° F. Plant physiologists have shown definitely that, under such conditions, there is little or no translocation of sugars and other materials from the leaf to other parts of the plant. In other words, when cool nights occur, following warm, bright, sunny days, sugars and other materials are "trapped" in the leaves. The accumulation of these products results in the manufacture of the red anthocyanin.

The combination of these factors is well understood when one observes a certain tree that may be red only on that side exposed to the sun. Other leaves not directly in the sun's rays may be green or yellow. Leaves exposed to the sun have been able to manufacture more sugars, which when accumulated and "trapped" in the leaves by cold night temperatures may result in the red color. It is interesting to note that trees and shrubs growing in swamps and other low places are often among the first to color in the fall, simply because it is in such places that cold air first settles on still nights.

### Dull autumn coloration

A warm, cloudy fall, sometimes with much rain, will restrict the formation of bright colored foliage. With insufficient sunlight, the sugar production is greatly reduced, and with warm nights, what little sugar has been manufactured in the leaves can be readily transported to the trunk and roots where it has no effect on the color of the foliage.

The leaves of many evergreens change color in autumn. Some of the junipers and arborvitae are listed in the following groups. Some

pinces may turn yellow, but usually such color lasts only for a short time, the leaves quickly turning brown. This is particularly true of those evergreen leaves which are normally shed each year, and although the autumn color may not be conspicuous in many evergreen plants, nevertheless it is evident on close examination.

All leaves eventually turn brown. This is not an autumn color, but is merely the result of the death, and in some cases the decay of the plant tissue. Sometimes, the leaves turn brown while they still remain on the tree, as in the American beech and in some of the oaks. In other cases, like the sugar maple and the spicebush, the leaves drop from the plants while they are still brightly colored and turn brown afterwards.

Autumn color is then a physiological phenomenon which is very complex. There are plants the leaves of which will always turn yellow regardless of current climatic conditions, but many of the plants with red fall foliage will be striking in appearance only when warm, sunshiny days prevail, followed by nights with temperatures below 45° F. The sugar formation in the leaf, the amount of sunshine received by the plants, and the temperature of the air are three variable factors which to a large degree control autumn coloration.

The following lists include some of the ornamental woody plants which are valued for their autumn color and some which are not.

#### Shrubs and trees with good Yellow autumn color

<i>Acer pennsylvanicum</i>		Striped Maple
<i>Acer saccharinum</i> ( <i>A. dasycarpum</i> )		Silver Maple
<i>Acer saccharum</i>	Yellow and red	Sugar Maple
<i>Aesculus parviflora</i>		Bottlebrush Buckeye
<i>Benzoin aestivale</i>		Spicebush
<i>Betula</i> species		Birch
<i>Carya cordiformis</i> ( <i>Hicoria cordiformis</i> )		Bitternut
<i>Carya ovata</i> ( <i>Hicoria ovata</i> )	Yellow brown	Shagbark Hickory
<i>Celastrus</i> species		Bittersweet
<i>Cercis canadensis</i>		American Redbud
<i>Cladrastis lutea</i>		Yellow-wood
<i>Dirca palustris</i>		Leatherwood
<i>Fagus grandifolia</i> ( <i>F. americana</i> )	Golden brown	American Beech
<i>Fraxinus americana</i>	Yellow to red purple	White Ash
<i>Ginkgo biloba</i>		Maidenhair-tree
<i>Hamamelis mollis</i>		Chinese Witch-hazel
<i>Hamamelis vernalis</i>		Vernal Witch-hazel
<i>Hamamelis virginiana</i>		Common Witch-hazel
<i>Hypericum</i> species		St. Johnswort

<i>Liriodendron Tulipifera</i>		Tuliptree
<i>Phellodendron amurense</i>		Amur Corktree
<i>Populus alba</i>		White Poplar
<i>Populus grandidentata</i>	Orange yellow	Large-tooth Aspen
<i>Populus nigra italica</i>		Lombardy Poplar
<i>Populus tremuloides</i>		Quaking Aspen
<i>Quercus imbricaria</i>	Yellow brown	Shingle Oak
<i>Rosa rugosa</i>	Yellow to orange	Rugosa Rose
<i>Rosa virginiana (R. lucida)</i>		Virginia Rose
<i>Ulmus americana</i>		American Elm
<i>Zelkova serrata</i>		Sawleaf Zelkova

### Shrubs and trees with good Red autumn color

<i>Acer ginnala</i>		Amur Maple
<i>Acer rubrum</i>		Red Maple
<i>Amelanchier species</i>		Serviceberry
<i>Aronia arbutifolia</i>		Chokeberry
<i>Berberis (many species)</i>		Barberry
<i>Cornus alba</i>		Tatarian Dogwood
<i>Cornus Amomum</i>		Silky Dogwood
<i>Cornus florida</i>		Flowering Dogwood
<i>Cotoneaster divaricata</i>		Spreading Cotoneaster
<i>Crataegus phaenopyrum (C. cordata)</i>		Washington Thorn
<i>Evonymus alata</i>		Winged Euonymus
<i>Evonymus atropurpureus</i>		Wahoo
<i>Evonymus obovata</i>		Running Euonymus
<i>Fothergilla major</i>	Red and yellow	Large Fothergilla
<i>Hamamelis japonica</i>		Japanese Witch-hazel
<i>Liquidambar styraciflua</i>		Sweetgum
<i>Nyssa sylvatica</i>		Tupelo
<i>Oxydendrum arboreum</i>		Sourwood
<i>Parthenocissus quinquefolia</i> ( <i>Ampelopsis quinquefolia</i> )		Virginia Creeper
<i>Parthenocissus tricuspidata</i> ( <i>Ampelopsis tricuspidata</i> )		Japanese Creeper
<i>Quercus (many species)</i>		Oak
<i>Rhododendron Vaseyi (Azalea vaseyi)</i>		Pinkshell Azalea
<i>Rhus species</i>		Sumac
<i>Sassafras officinale (S. variifolium)</i>		Common Sassafras
<i>Spiraea prunifolia</i>		Bridalwreath
<i>Syringa oblata dilitata</i>		
<i>Vaccinium species</i>		Blueberry
<i>Viburnum dentatum</i>	Glossy red	Arrowwood
<i>Viburnum dilatatum</i>	Russet Red	Linden Viburnum
<i>Viburnum Lantana</i>	Deep red	Wayfaring-tree

<i>Viburnum Lentago</i>	Purple red	Nannyberry
<i>Viburnum prunifolium</i>		Blackhaw
<i>Viburnum tomentosum</i>	Velvety, dull red	Doublefile Viburnum

**Shrubs and trees with Bronze to Purple autumn color**

<i>Cornus racemosa</i>		
( <i>C. paniculata</i> )	Reddish to purple	Gray Dogwood
<i>Forsythia viridissima</i>	Reddish purple	Greenstem Forsythia
<i>Fraxinus americana</i>	Red purple to yellow	White Ash
<i>Gaultheria procumbens</i>		Wintergreen
<i>Juniperus horizontalis plumosa</i>		
<i>Juniperus virginiana</i>		Red Cedar
<i>Leucothoe Catesbaei</i>		Drooping Leucothoe
<i>Ligustrum obtusifolium Regelianum</i>		
( <i>L. ibota Regelianum</i> )		Regel Privet
<i>Mahonia repens</i>		Creeping Hollygrape
<i>Pachistima Canbyi</i>		Canby Pachistima
<i>Rubus hispidus</i>	Reddish purple	Swamp Dewberry
<i>Symphoricarpos Chenaultii</i>		
<i>Thuja occidentalis ericoides</i>		
<i>Thuja plicata</i>		Giant Arborvitae
<i>Viburnum acerifolium</i>		Mapleleaf Viburnum

**Shrubs and trees with no autumn color**

<i>Ailanthus altissima (A. glandulosa)</i>	Ailanthus
<i>Akebia quinata</i>	Fiveleaf Akebia
<i>Amygdalus Persica</i>	Peach
<i>Baccharis halimifolia</i>	Groundselbush
<i>Clematis (many species)</i>	Clematis
<i>Daphne Mezereum</i>	February Daphne
<i>Elaeagnus angustifolia</i>	Russian-olive
<i>Evonymus Bungeanus semipersistens</i>	Midwinter Euonymus
<i>Hibiscus syriacus</i>	Shrub-althea
<i>Ligustrum vulgare</i>	European Privet
<i>Lonicera fragrantissima</i>	Winter Honeysuckle
<i>Lonicera syringantha</i>	Lilac Honeysuckle
<i>Lonicera thibetica</i>	Tibetan Honeysuckle
<i>Lycium halimifolia</i>	Common Matrimony-vine
<i>Magnolia stellata</i>	Star magnolia
<i>Polygonum Auberti</i>	China Fleecyvine
<i>Potentilla species</i>	Cinquefoil
<i>Robinia pseudoacacia</i>	Common Locust
<i>Salix blanda</i>	Wisconsin Weeping Willow
<i>Salix pentandra</i>	Laurel Willow
<i>Sophora japonica</i>	Japan Pagoda-tree
<i>Vitex Negundo</i>	Negundo Chaste-tree

## Wisterias and Forsythias

Visitors to the Arboretum next spring who enter by way of the Forest Hills gate will notice two important changes in the plantings.

1. The trellis on which the wisterias were growing at the south end of the shrub collection has been removed entirely. This trellis, erected about thirty years ago, has failed badly and in the interests of safety alone had to be removed. The shrub collection is situated in a low spot which repeated temperature records have shown to be about the coldest spot in the Arboretum. The winter temperatures are as much as twelve degrees lower than on surrounding higher ground. Many times, the wisteria flower buds have suffered injury during severe winters, when they might have come through satisfactorily had the plants been placed on higher ground in a more sheltered position.

The entire wisteria collection has been moved to nearby higher ground next the old Bussey dormitory, where the temperature on the coldest nights is from 8 to 12 degrees higher than in the shrub collection. In this new situation the soil is good, and ample protection is given from severe winter winds by a planting of pine trees. A rustic arbor has been erected specifically for these wisterias and eventually they can be observed to much better advantage than on the old trellis.

The removal of the old trellis allows for more circulation of air through the shrub collection. Even more important, it permits one to get a good view of the rows of shrubs in the shrub collection from the Forest Hills entrance, a view which was previously entirely blocked by the trellis. At the same time, this change places the wisterias under far better growing conditions, where it is expected that they will flower more profusely than they have during the past few years.

2. For several years the large planting of *Forsythia suspensa* at the southeastern end of the lilacs has failed to bloom properly. The plants being badly overgrown, it became impossible to give them sufficient renewal pruning. The planting has become a dense mass of undergrowth with nearly 50% of dead wood. The shrubs are to be cut back to ground level in order to permit young vigorous plants to sprout from the old stumps. This is the only logical way to renew such a densely overgrown mass. Specimen plants in the collection have not been touched, but the lovely bank of drooping forsythia in mass will not be conspicuous at flowering time for several years. After this, the increased flowering of this bank planting will justify our present drastic measures.

Both these changes have been necessary for some time and are now made in the interests of growing better plants.

## Natural color photography at the Arnold Arboretum

A special gift from one of the generous supporters of the Arnold Arboretum last spring has enabled us to develop color photography here on a rather comprehensive scale. Throughout the growing season, a series of natural color photographs of the outstanding plants in the Arboretum was made as they came into flower or fruit. In the fall, a special effort was made to photograph as many plants as possible to show full autumn color. This project has taken much time and rather heavy expenditures were involved. The season's work resulted in a collection of over six hundred lantern slides in natural colors. Since the process is an expensive one, the intrinsic value of the slides themselves is rather great and hence they are not available for loans.

These slides, illustrating plants in their true colors, have a high esthetic and educational value. Realizing this the Arboretum takes pleasure in announcing that for nominal cost one of its staff members will present to interested organizations any one of the following lectures illustrated by these slides:

“The Arnold Arboretum, America's greatest garden.”

“Attractive shrubs with gay berries.”

“Autumn coloration.”

“Flowering trees and shrubs pictured in their order of bloom.”

For conditions and details address the Arnold Arboretum, Jamaica Plain, Massachusetts.

### Hedge demonstration plot

We are glad to announce the planting of a hedge demonstration plot, planned to show clipped hedges, each about 25 feet long, representing 115 plant species and varieties. This plot is on South Street in front of the Bussey Institution building near the Arboretum greenhouses. Since these hedges have just been planted, most of the deciduous species have been cut to the ground. Consequently they will not attain good hedge size for at least two years. Detailed information concerning this plot will be given in the Bulletin next spring. This note is published to record the fact that this innovation has been started and to give public recognition to the following nurseries which generously contributed the necessary plants. Without their aid, this project could not have been initiated on such a comprehensive scale.

Bay State Nurseries, Framingham, Massachusetts	750 plants
Kelsey-Highlands Nursery, East Boxford, Mass.	131 plants
Henry Kohankie & Son, Painesville, Ohio	40 plants

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A FEW EVERGREENS

**Picea omorika:** The Serbian spruce is noted for its excellent dark green foliage and its pyramidal upright habit of growth. The foliage is dense and the branches, particularly on older specimens, are often drooping, adding considerably to the beauty of the tree. It might be said that this is the best of the spruces for ornamental planting, and, fortunately, it is now becoming available in many nurseries in the eastern United States.

It was introduced into this country by the Arnold Arboretum in 1881, when seed was sent here by Dr. Carl Bolle of Berlin. It has formed large forests in southeastern Europe, and in this country it should be used much more than it is in ornamental plantings, particularly as a specimen tree.

**Picea orientalis:** Another excellent spruce for ornamental planting is the Oriental spruce, valued for its dark green foliage and dense pyramidal habit of growth. Its needles are only one half as long as those of *P. omorika*. In the Arboretum this tree is unfortunately attacked by borers which often kill the central leader. Since it is best grown as a single leader tree, this trouble is often serious.

Both of these species are rather slow growing, but have great possibilities in ornamental work. They are considerably more valuable to us than either the Norway spruce or the Colorado blue spruce.

Ten years ago, the following statement was published in this Bulletin concerning these last mentioned trees, and it is certainly true today.

“Unfortunately the two Spruce trees which for years have been and are still generally planted in the northeastern part of the country, the so-called Norway Spruce of Europe (*Picea Abies* or *P. excelsa*) and the Rocky Mountain Blue Spruce (*Picea pungens*) from Colorado and east-

ern Utah to northern New Mexico and Wyoming, have not proved successful in the eastern states. Fifty or sixty years ago the Norway Spruce was very generally planted in southern New England where, however, it commences to fail at the top when about thirty years old and soon becomes ragged and unsightly, the leading shoot dying or failing to make a satisfactory growth and all the upper part of the tree gradually becoming thin, with the result that there is hardly a park or country place in New England where the sad spectacle of such half-dead trees cannot be seen. Easily raised from seed which is readily obtained, young plants grow rapidly, and they are therefore profitable plants for nurserymen to handle; and the public, in spite of the American experience with this tree, continues to buy it. In some of the states it is raised by state agencies and given away or sold at a nominal price, or is planted by the state in reforestation operations. Perhaps no other species of Pinaceae has produced so many dwarf forms and some of these are handsome and interesting plants.

“The Colorado Blue Spruce is still one of the most popular conifers in the northern United States where it is propagated and planted in immense numbers in spite of the fact that it early loses its value as an ornamental tree. It is very hardy, is easily raised and grows rapidly. The young plants are of good shape and dense habit, their lower branches resting on the ground. For the nurseryman the Blue Spruce has everything to recommend it; the easy germination of the seeds, quick growth and unusual beauty of the young plants lead to the certainty of a quick sale. To a planter looking for something more important than a plant for a city garden or a small suburban yard this tree has certainly proved a failure. This is not surprising for *Picea pungens* growing in small groves near streams in the valleys of the Rocky Mountains long before it attains its full size is a thin, scraggy, miserable looking tree with a few short branches near the top of the stem. This tree was discovered in 1862 and was planted the following year in the Harvard Botanic Garden.”\*

\*There is a plant in the Arboretum over sixty years old, and it is kept here as a warning for planters who are deceived by the beauty of young plants.

**Cedrus libani:** The Cedar of Lebanon has had an interesting history at the Arboretum. It shows clearly how much it pays to make a selection of seed from hardy sources, particularly of a species which may prove tender. Prior to 1902, the Arboretum had repeatedly tried to grow this interesting tree, so rich in biblical history. Each time, though seedlings came through one or two winters, they were event-

ually killed. Until 1902, most of the seed has been obtained from the general region around Palestine. However, the species was known also in Asia Minor on the Anti-Taurus mountain range, far north of the Lebanon range in Palestine, and in a much colder climate. Professor Sargent, realizing the possibilities of collecting seeds from hardier plants, had some collected from this more rigorous habitat, and in the spring of 1902 they yielded a large number of seedlings. Since that time, all have proved perfectly hardy, even in the most severe winters and themselves have yielded hardy seedlings. They have suffered neither from drought nor cold, except for occasional leaf burning. However, a few have been lost in transplanting, since they are unusually hard to move. Some of these trees in the Arboretum are now almost forty feet high. They are living examples of the successful use of geographic studies in the selection of seed sources. The Arboretum takes pride in being able to claim the credit for introducing this exotic tree into the northeastern part of the United States where previously it would not grow.

**Thuja plicata:** In the coastal region of the northwestern states and British Columbia, the Giant Arborvitae grows to great size and is one of the most important timber trees in North America. Fortunately, it ranges eastward to Idaho and northern Montana, a region which is very cold. Seed collected from this locality yields seedlings which prove hardy in Massachusetts and northwestern New York state. It is the largest and handsomest of the arborvitae, its foliage having a peculiar shining lustre which is outstanding. Another important point in its favor is that in the winter, its foliage does not turn a dead brown as does that of most of the other arborvitae. Rather, it turns a good bronze color, which is held a greater part of the winter. Plants of the Giant Arborvitae, grown from hardy parents, are a most valuable asset to any garden in the winter time.

**Sciadopitys verticillata:** In 1928, E. H. Wilson wrote of this plant as follows: "The Japanese Umbrella Pine is among the most notable conifers that can be grown in the climate of Massachusetts. It is of dense, pyramidal habit with ascending-spreading branches. The leaves are borne in clusters around the stem, one tier above another, suggesting a parasol, hence its common name. They unfold bright green but soon change to black-green and remain so throughout the winter. The strap-shaped leaves, each from 3 to 4 inches long, are thick and leathery in texture with a white line on the under side. It likes a cool situation and good soil and would appear to thrive better in New England than in the British Isles. There are several fine specimens here and

there in Massachusetts, notably in Newburyport. By the old regime in Japan, this was one of the seven famous trees, the illegitimate felling of which was a capital offence. The wood is white, fragrant, very durable in water, and is used much in Japan for making bathtubs and small boats. Like certain other trees it does not grow old gracefully, and in the adult tree with its narrow, often spear-shaped, crown it is hard to recognize the stately ornamental plant we know in gardens. A monotype, it is confined mainly to the mountains of central Japan, being very abundant on Koyasan, a mountain not far distant from the ancient capital of Nara. The Umbrella Pine is easily raised from seeds but grows slowly. No other form of propagation is known, but on account of its great hardiness and distinct appearance nurserymen ought to raise it in quantity. It was one of the plants introduced into America by Dr. G. R. Hall in 1862."

DONALD WYMAN

**These Bulletins will now be discontinued until the spring of next year.**

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