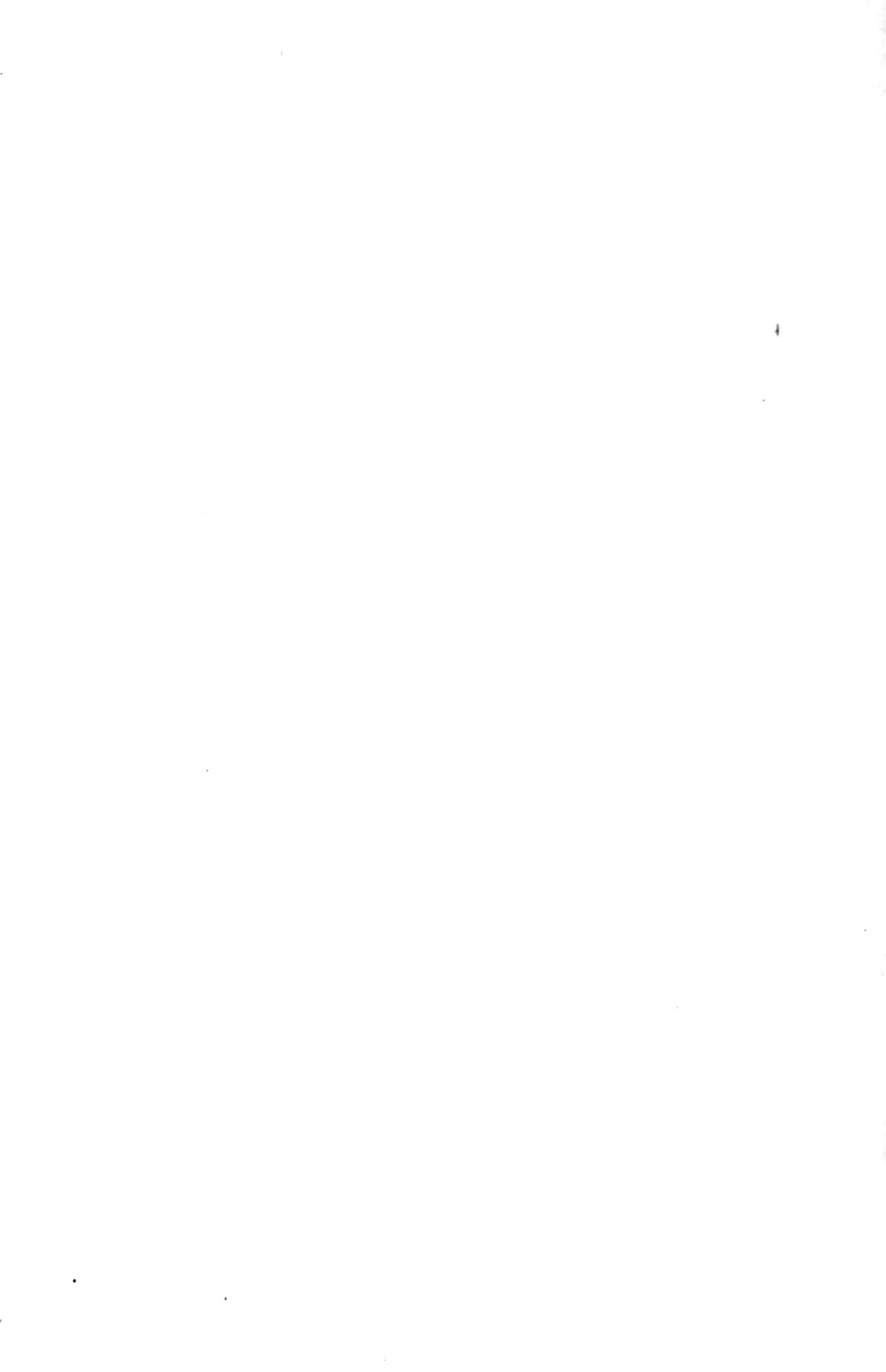


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ARNOLD ARBORETUM

HARVARD UNIVERSITY



BULLETIN

OF

POPULAR INFORMATION

SERIES 3

VOLUME V

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ARNOLD ARBORETUM

HARVARD UNIVERSITY

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POPULAR INFORMATION

SERIES 3. VOL. V

APRIL 23, 1931

NO. 1

Effect of Cold on Flower Buds of Trees and Shrubs. As a rule our native plants are so accustomed to the rigors and vagaries of our New England winters that few of them show serious injuries from the varying degrees of cold or heat affecting them during the months when they are dormant. It is true that the exposed catkins of Alders and Hazels may be wholly or partially destroyed and the scales covering the flower buds of our Flowering Dogwood (*Cornus florida*) may become so dried and stunted that they lose their accrescent power or vitality, and do not develop into the beautiful snowy flowerlike organs calling attention to the small inconspicuous blossoms produced by this tree, which reaches its natural northern limit of growth in eastern Massachusetts. Such winter injuries are not uniform and may be dependent upon the conditions of growth and maturing of tissues during the previous season or upon local environment. In shelter of woods the Flowering Dogwood may develop beautiful large white showy bud scales when those on exposed trees are stunted and make little growth. Of course many of our really hardy native plants may be heavily damaged by unusual freezing temperatures late in the season, so that a crop of flowers or fruits may be lost for that year and even young growing shoots may be lost and the tree be forced to develop a new growth from latent or suppressed buds.

As gardeners and horticulturists we have come to judge the severity of our winters largely by the behavior or condition of plants which have been brought to us from the Old World or, more rarely, those which have been introduced from other parts of our own country, chiefly from regions enjoying a milder climate than the average winter temperature of central and southern New England. Aside from the records left by thermometers, and judging merely by the general condition in the Arboretum, the past winter was, on the whole, fairly mild and so favorable as to warrant our expecting a good season for flowers and fruits. This is true of many species which are in situations less favorable than others of the same kinds. For example, we do not expect exotic

vines, shrubs or small trees to show the same degree of winter cold endurance in the low ground, near the Forest Hill gate, where the general shrub collection is located, as we would expect to find in the same species at the top or near the top of the adjacent Bussey Hill. While better soil drainage conditions may be found on the hill, a factor conducive to better ripening of wood in the autumn, the chief factor is the better air drainage or air flow which prevails on the higher land. The low ground in which the shrub collection is located is nearly surrounded by low hills or ridges forming a sort of lake into which the cold air settles and is pocketed, forming a basic stratum which may be several degrees colder than the zone of air a few feet higher.

In seasons when the winter temperature does not go much below zero (Fahrenheit) the effect of the difference in zones on certain plants may not be very apparent but if the recorded temperature falls to 12 or 15 below zero (Fahrenheit) serious damage to plant flowering may result, although leaves, twigs and branches may appear uninjured. This is well illustrated in the varieties of Peach, a native of China. In common with all early flowering trees and shrubs the flower buds are developed during the preceding summer. While some varieties of Peach have been developed in which the flower buds are considered more hardy than others a fall of temperature to 12 or 15 below zero is considered fatal to most of them, and 20 below zero is certainly so in virtually all cases. That the embryo flowers are dead may readily be ascertained by splitting open some of the blossom buds a day or two after the freeze. The hearts of the buds, representing the blossom portion, will be found dead and brown instead of being bright clear green as they should be if free from injury. Practical orchardists in the northern limits of peach growing recognize the advantage of planting Peaches where there is good air drainage as well as planting, if possible, on northerly slopes where spring growth would naturally be retarded and where there would be less danger of late frosts hurting the open flowers.

Peaches and allied species of trees promise a good full bloom this spring, and this applies to Japanese Cherries in general, as well as to the garden varieties of our common Sweet Cherry (*Prunus avium*) from Europe and Western Asia. The flower buds of *P. avium* appear nearly as tender as those of the Peach, this being one reason why this plant is rarely cultivated and seldom produces fruit in northern parts of New England and other cold sections of our country where varieties of the Sour Cherry (*Prunus Cerasus*) thrive.

The early spring months show a good deal of variation in the time of flowering of many of the precocious or very early flowering species, dependent on the number of warm days and degrees of temperature which prevail in any particular season. It may be interesting to note some of the species which have already blossomed or which are now in blossom in the Arboretum.

As usual, the White or Silver Maple is the first of the large trees to flower. This spring it blossomed during the last two weeks of



Viburnum fragrans

Photographed in the Arnold Arboretum, April 15, 1931,
by Professor Oakes Ames

March and early days of April and it is usually at about that season we should expect the flowers to appear. But we have records of well developed flowers appearing on January 24th, 1913, on February 23rd, 1915, and February 1st, 1916, these records usually being taken from the same tree. At the present time the Red Maple (*Acer rubrum*) is in blossom, displaying shades of color from honey yellow to deep red in different individuals. Our American Elm, too, is in flower and the flowers of some of our Poplars are passing or gone. The spring flowering Witchhazels are now past their blossoming stage, the earliest being the southern *Hamamelis vernalis*, some of the flowers of which may open during warm days in January. It is not so beautiful and interesting in blossom as the Chinese *Hamamelis mollis* which is so precocious that the flowers are occasionally severely damaged or are destroyed by hard frosts. An interesting shrub, though not especially beautiful, is the Leatherwood (*Dirca palustris*) native in northeastern America. Given proper chance for development it may form a short trunk branching to the ground or near it and producing pretty little bell-like yellow flowers scattered over the slender, tough barked, leafless twigs. It requires no special care in cultivation except freedom from too close crowding by other shrubs or vegetation or too much shading by trees.

Among the most interesting of the newer shrubs in full flower (April 15th) in the Arboretum collection, is *Viburnum fragrans*. This specimen is now 6 or 7 feet high, the leafless branches well covered with the small panicles of fragrant, salver-shaped flowers which are pink in bud but white or light pinkish white when open. Although first described by the botanist Bunge nearly 100 years ago (1835) this species appears not to have been introduced into cultivation in Europe or America until about twenty years ago when seeds were collected in northern China by the late William Purdom for this Arboretum and for the nursery firm of Veitch, in England. The late Reginald Farrer collected seeds in 1914 which were also sent to England, producing plants which were soon distributed in English gardens. It is said to be a shrub attaining 8 or 9 feet in height and is described by Farrer as bearing "profuse trusses of pearl-pink flowers in spring like lilac deliciously smelling of heliotrope". He also described it as "rare as a wild plant but generally cultivated in Kansu (China) for its loveliness and fragrance". This species is apparently going to rank with our earliest flowering shrubs. In England it has been called the Winter-flowering Viburnum and in the southern part of the British Isles it is stated that the bushes flower more or less throughout the winter, some blossoms attempting to open before the leaves fall from the branches. Farrer described the fruits as shining scarlet and of good flavor.

J. G. J.

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MAY 2, 1931

NO. 2

Graft-Blight of Lilac. The result of the discovery of the use of Privet in the propagation of Lilacs has been that to-day practically half of the Lilacs grown in America are privet-grafted. The remaining half of the Lilacs in this country are grown by various own-root methods.

As might well be expected, when one considers the various methods of propagation employed, there has been a certain amount of controversy among the nurserymen as to the most satisfactory method of lilac propagation. In fact while nurserymen in general almost universally condemn the grafting of Lilac upon common Lilac, there are two distinct schools of opinion among them supporting respectively the own-root methods and the methods involving the use of Privet. Each of these schools of opinion has backed its contentions with numerous assertions as to the relative superiority of Lilacs propagated by one of the methods considered, but neither group has subjected its beliefs to scientific analysis.

The extensive lilac collection in the Arnold Arboretum is constantly being added to by new plants received from a variety of nurseries as well as by plants propagated by cuttings in the Arnold Arboretum greenhouses. During comparatively recent years it has become increasingly evident that many of these newer plants were manifesting symptoms of disease, and the diseased plants eventually became so numerous and unsightly as to require a thorough investigation for the purpose of determining and eliminating the cause of the diseased condition.

The diseased Lilacs in question showed symptoms of chronic nutritional deficiency. The plants were very small and their growth exceedingly limited. When fifty diseased plants were measured during their sixth and seventh years of growth it was found that their average growth during the seventh year was an inch per plant. Practically none had blossomed even after nearly a decade of culture in some cases. When the leaves appeared in the spring they were usually very small and dark in comparison with leaves of normal Lilacs, and were gathered in little tufts at the tips of the thin, frail twigs. As the summer wore on the leaves became curled and very yellow, this yellowing beginning at the

tip and between the larger veins and proceeding eventually to involve the whole leaf. The leaves during this yellow stage were notably thicker than normal and markedly brittle. Leaf-cast began early during the summer and the plants usually were devoid of leaves by midsummer, although in some cases the dead leaves actually persisted on the twigs long after normal leaf-fall. The new growth in a given season was very limited. The buds were weak, the twigs frail, and the plants in an obviously hazardous condition to meet the exigencies of an unfavorable season.

The accompanying illustration is a photograph of a Lilac showing the disease in typical form. The curled, pale leaves are seen in their characteristic diseased condition, and the severity of the disease is very evident.

Early in the investigation of these diseased Lilacs it became evident that all of the plants in question had been propagated by grafting upon Privet. In fact the distribution of the disease in the Arnold Arboretum almost exactly coincided with the distribution of the privet-grafted lilac plants which had been received in recent years. It was soon observed and demonstrated that the disease was not contagious, that it was not due to unfavorable soil or moisture conditions, and that it was not restricted to certain lilac varieties, but that it was evident on old, long-proven varieties as well as on the newer French hybrid Lilacs. Since the disease under consideration was always associated with the grafting of Lilac upon Privet, and since it has been found that the disease is caused by such grafting, it has received the name "Graft-blight of Lilac".

On investigation it was found that graft-blight was not limited in its distribution to the Arnold Arboretum. It was seen in typical form in numerous nurseries and private collections of Lilacs in New England, New York State, New Jersey, Pennsylvania, and Ontario. Canada, while what was unmistakably the same disease was reported by correspondents in Oregon, Ohio, Colorado, and Germany. That large numbers of Lilacs were involved was evident both from the observations and from the reports.

In order to investigate the effect of grafting Lilacs upon Privet, a set of experiments in lilac grafting were planned and executed in the Arnold Arboretum greenhouses and nursery beds. Lilac scions of one of the most vigorous varieties in culture (Andenken an Ludwig Späth) were grafted upon a number of species of Privet, Ash, Forsythia, Chionanthus, and Lilac. These were compared in their development with the normal health of sister lilac scions grafted upon common Lilac, rooted in the soil directly, and growing on the parent plants. The grafts of Lilac upon Ash, Forsythia, and Chionanthus proved unsuccessful, those upon common Lilac were entirely successful, while those grafted upon the various species of Privet showed in characteristic form the same condition as the graft-blighted Lilacs in the Arnold Arboretum ornamental collection described above.

The lilac scions grafted upon the California Privet (*Ligustrum ovalifolium*) and the Amur Privet (*Ligustrum amurense*) were especially



Graft-blight of Lilac. The horizontal line approximately divides the privet section of the root-system from the adventitious lilac roots. The healthy appearance of the sucker is explained in the text.

significant. In the former case the grafted plants showed precisely the same diseased condition as Lilacs in the field suffering from graft-blight, while on the other hand, the Amur Privet grafts showed in a single season the whole course of symptoms, stunting, yellowing, leaf-curl, leaf-cast, and death, evidenced by California Privet grafts during the course of several years. Meanwhile the Lilac-on common-Lilac grafts and the own-rooted scions remained strong and healthy. A confirmation of these experiments resulted from examinations of many own-rooted and grafted Lilacs in nurseries. Here the symptoms of graft-blight were always associated with privet grafting. Finally further evidence resulted from the observation that even in privet-grafted Lilacs, occasionally a lilac sucker found to be on its own roots, is seen in perfect health although attached to a severely blighted plant.

Hence it was plainly evident from these experiments and observations that the cause of the disease observed in the Arnold Arboretum lilac collection lay in the practice of grafting the Lilac upon Privet, particularly upon the California Privet. To obtain further information a questionnaire was submitted to the majority of the larger lilac producers in America and to some in Europe.

This investigation yielded a number of interesting and significant facts regarding the commercial practices of lilac propagation. Since it was discovered by this means that half the Lilacs in culture in America were propagated by own-root methods, the practicability of own-root lilac propagation was at once evident. But it was found that privet-grafted Lilacs are much quicker in attaining marketable size than Lilacs grown from cuttings. This fact implies that the privet-grafted Lilac may be sold at a somewhat lower price than the own-root Lilac and still afford a reasonable profit on the nurseryman's investments. Hence the problem is plainly an economic one, and the solution lies in the hands of the purchaser of Lilacs.

The nurseryman who uses the privet-grafting method of propagating Lilacs does so, in most cases at least, with the conscious belief that such Lilacs will soon become own-rooted and throw off the privet stock. Many observations, however, show that this does not invariably happen. In fact, in the majority of cases privet-grafted lilacs are still dependent on their privet roots years after the most careful propagation on Privet. Graft-blight results, but since the symptoms are seen in the collection of the purchaser and not in the nursery of the propagator there is a tendency for the nurseryman to be unaware of the diseased condition or to attribute it to unfavorable soil or culture.

The purchaser of Lilacs is anxious to obtain permanent, long-lived, healthy plants. The additional cost of own-rooted Lilacs is but a small fraction of the original cost of the plants and a still smaller fraction of their value as ornamentals. Moreover there are nurserymen in every section of the United States who can provide the finer named varieties of Lilacs propagated by own-root methods. The nurseryman will produce what the purchaser demands. Hence the connoisseur of Lilacs will tolerate within his ornamental planting only own-rooted Lilacs, thereby escaping at once the winter-killing of privet-grafted Lilacs, the danger of pre-dominance of privet suckers, and the penalty of graft-blight.

K. S. Chester.

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NO. 3

Forsythias. Probably no hardy shrubs which have been introduced from the Old World into our gardens can equal or surpass the Forsythias in cheerful beauty, which is developed at a season when there are comparatively few other competitors so attractive. The beautiful golden glow of their early bloom attracts and pleases almost everyone who is acquainted with them, and they are destined to have wide popularity because of their attractive flowers, generally clean foliage, and comparative freedom from insect or fungous diseases. More important still as a circumstance in favor of popularity and wide distribution is the fact that the Forsythias may be propagated by division with greater ease or facility than most other trees or shrubs cultivated in our gardens. Least trouble will be found by propagating from cuttings of the ripe wood taken in fall or winter or very early spring and planted in the open ground. Of course where the ground freezes in winter and cuttings are taken at that season they may be kept fresh by heeling in or burying in moist earth in a cellar or pit until seasonable time to plant out. Good sturdy well rooted plants should develop before the following autumn. Propagation may also be effected by taking green cuttings in summer and growing them in a frame, a method entailing more trouble or labor than when cuttings of ripe wood are used.

As in nature's methods propagation may be easily brought about by the process of layering, and it will be found that a slender arching species, like *Forsythia suspensa*, commonly forms roots on the stems or tips, where they touch the ground, in this way forming new plants on the periphery of the original stem. Thus a single plant of an arching or trailing species may in time cover a large area if no competing plants interfere. The facility with which this genus of plants may be propagated makes their dissemination or distribution almost independent of the commercial nurseryman, excepting in the case of newly introduced species or improved forms which are new or little known.

Forsythias require little pruning except to cut away weak or old stems. It should be remembered that flower buds are formed during

the preceding summer, so that cutting back of the stems should be done immediately after flowering in spring. Pruning in autumn or winter involves the destruction of some of the best flowering branches for the next spring.

If it is desired to raise plants from seed it must be borne in mind that the resulting plants are not always just like the parent and some may be inferior. The seeds of Forsythias are large, flat and somewhat winged and are probably only disseminated by wind agency, or by being carried by water or moving soil during freshets.

All of the known species of Forsythia have yellow flowers, varying somewhat in size, form, and shade of color of blossoms in different species and varieties. To the botanist and close observer of Nature the flowers have peculiar interest in the fact that where grown from seed some plants have short styles (microstyle) while in others the styles are longer and more prominent (macrostyle). This is a provision of Nature to insure cross pollination of the species. The general habit of growth of the various types is one of the most important features to be considered by the planter.

The Forsythias have been described as hardy but there is a limit to their endurance of such cold as we often have in northern New England. While the plants may endure lower temperatures, in some cases the flower buds are very likely to be destroyed if subjected to a temperature of 15 or 20 degrees below zero (Fahrenheit). In a climate like that of the interior of northern New England, or that which prevails at Montreal or Ottawa, Canada, the Forsythias may be classed as only half hardy, being killed to snow line, at least, in winter. Occasionally the flower buds have been killed in the Arboretum while the plants have shown little injury. What we call hardiness may in some measure be affected by location, drainage, maturity of wood, length of season and other factors.

The earliest species to flower this season was *Forsythia ovata* which has been described as the hardiest of the genus. It is not yet well known in cultivation and whether the plants and flower buds will withstand 15 or 20 degrees below zero or lower remains to be proved by thorough test. As growing at the Arboretum it is a rather compact upright or arching bush, 6 to 8 feet high. Its habit is much like that of *F. intermedia* already well known and superior to *F. ovata* by reason of its larger, deeper yellow and more profusely produced flowers which, however, may be a week or ten days later.

Forsythia intermedia itself is not considered as a true species but is a hybrid of the rigid upright growing *F. viridissima* and the more free growing, slender, long-stemmed *F. suspensa*. Of this hybrid there are several cultivated forms, one of the best and most floriferous being that known as *Forsythia intermedia spectabilis*. It usually bears an abundance of rich golden yellow flowers. Another form, known as *F. intermedia primulina*, bears flowers of a pale yellow or primrose color. It is generally considered less desirable than *spectabilis* except by those who prefer the lighter shade of yellow color.



Prunus mandshurica

(Height 20 feet, spread 30 feet)

Photographed in the Arnold Arboretum, April 17, 1927, by Dr. E. H. Wilson

Those desiring a slender branched or trailing form of *Forsythia* should select *F. suspensa Sieboldii* which is stated to have been introduced into Europe from Japanese gardens nearly one hundred years ago (1833). There are several forms or varieties of this species in cultivation, a good and common one being known as *F. suspensa Fortunei* (*F. Fortunei* of some catalogues). But, although more floriferous, it lacks the peculiar slender vine-like effect of *F. suspensa Sieboldii* which may be used as a covering for arbors, trellises or as an effective pendulous covering over rocks, walls, etc. In such situations it may grow many yards in length, forming a graceful network or screen.

Early Flowering Apricots and Cherries. Altogether these early flowering trees and shrubs passed through the winter with very little injury from winter cold, although there were exceptions. In the Arboretum the Manchurian Apricot, *Prunus mandshurica*, flowered well this year, an event which is by no means annual as the flower buds are so often destroyed by winter freezes which kill the blossoms in Peach and some of the other species of *Prunus*. The flower buds are pink, the blossoms pale pinkish or white, the fruit yellow and about an inch in diameter. While attractive in flower this species also appears to be one with great possibilities for improvement in its fruit which may become a valuable addition to those we have already domesticated. Its habit of flowering decidedly earlier than the Peach is a factor against it in northern climates, although the tree itself appears larger and much more rugged than the average Peach. It was in full bloom in the Arboretum on April 18th this season. Some of the flower buds were destroyed during the past winter but not enough to affect the general beauty of bloom. Such injury may be ascribed to the fact that our tree under observation is located upon low ground where it may have been subjected to several degrees below zero (Fahrenheit). It is about 25 feet high with a diameter spread of branches of about 35 feet.

This season the Sargent Cherry, *Prunus serrulata sachalinensis*, might have been registered as in fullest bloom about April 22nd, the same date as recorded for full inflorescence of the same tree in 1927. The pink flowers of this species are rather fugacious and their beauty is past within three or four days if the weather is warm. It is a mistake to plant this tree in a small garden, with only eight or ten feet allowed for spread, because if given favorable conditions it may become a tree at least 40 or 50 feet high with an equal spread of branches which may be produced near the ground if allowed to do so or if the tree is not crowded by other competing plants. While the flowers have usually been described as pink there appears to be a good deal of variation in individuals raised from seed, some having flowers almost white, while in others the blossoms may have a rather unattractive light pinkish color. Reproduction for assurance of any particular shade of flowers would appear to require grafting or budding, though such plants may never attain the symmetry or proportions of those raised from seed. A good plan is to secure several seedlings where one is wanted and to select the most desirable one when they flower, disposing of the others.

J. G. J.

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NO. 4

Flowering Cherries. *Prunus subhirtella*, which probably attracts more attention in early spring than any other Cherry in the Arboretum collection has often been referred to in these Bulletins. It was at its best on April 27th. Although really in attractive flower several days earlier it was kept in check by the cool weather. *P. subhirtella* is a tree for which enthusiasts often allow a space of perhaps ten feet in their gardens, whereas a much greater area should be allowed for its full ultimate development. The largest plant near the Forest Hills Gate is now 25 or 30 feet high and has a spread of branches of 50 feet in diameter near the ground. This is another plant which does not always come ideally true from seed. Seedlings may produce plants of erect, spreading, or more or less pendulous habit and may bear flowers of poor form and substance compared with the parent, so that if such plants are used it is wise to have several of them from which to select the most desirable individual. The plants usually flower early so that selection may be made while they are small. Otherwise the best forms must be propagated by division, as by grafting and budding. This species may also be grown from cuttings but plants are not easily propagated in this way.

In making selections of forms or varieties of this species there are, besides the type, two of outstanding interest or attractiveness. The more common one, *Prunus subhirtella pendula*, is a favorite and best known in gardens, while *Prunus subhirtella autumnalis* is less known but is equally worthy of cultivation. Its pink flowers appear at about the same time and are inclined to be semi-double instead of single. It bears beautiful and abundant bloom in spring, but also has the habit of bearing a good many flowers in autumn, hence the varietal name which has been given to it. Its flower buds appear to be more easily damaged by winter cold than those of the typical *P. subhirtella*. Our notes taken in 1923 showed about 75% of the buds destroyed in winter while those of the type, growing by its side, appeared to be uninjured.

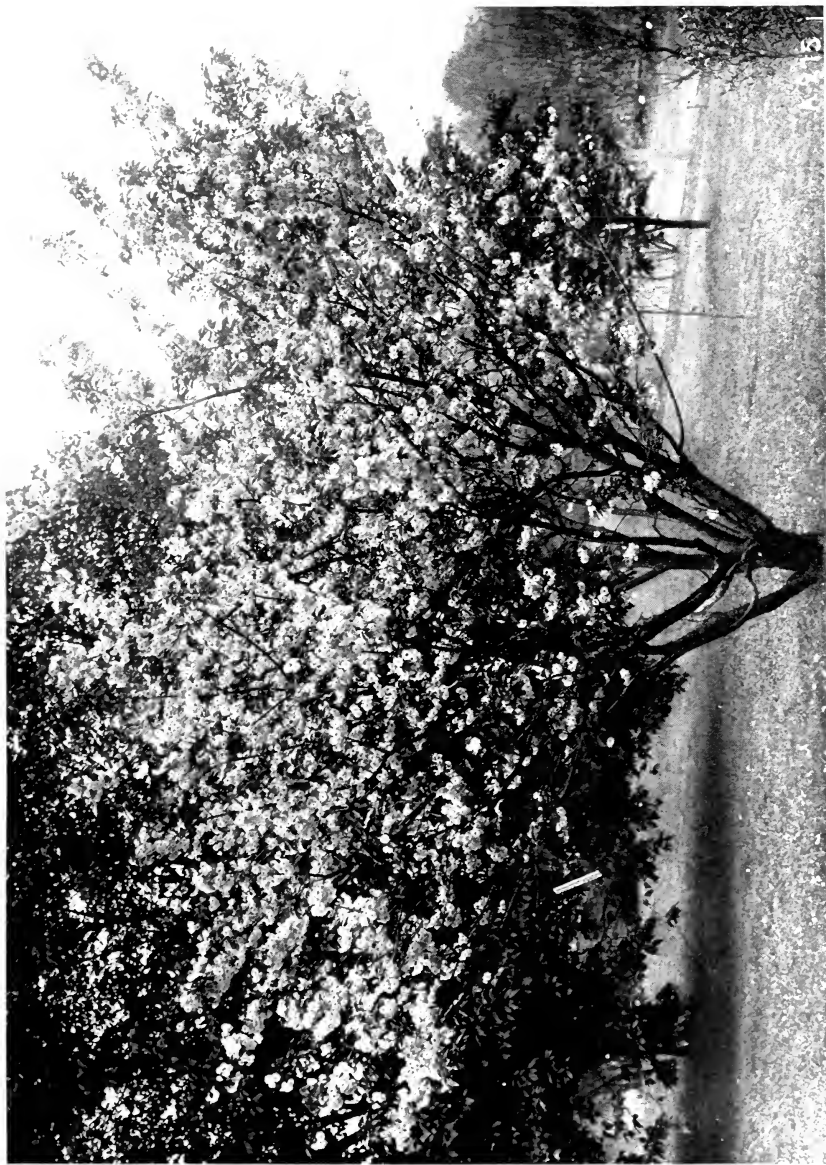
It is an interesting fact that practically all of the double-flowered forms of Cherries are appreciably later in flowering than the single flowered progenitors, so that no common date can be given which would cover the flowering period of all the forms related to a single species.

Prunus yedoensis, Yoshino Cherry, has had a very full load of its white blossoms this season and, on account of several days of cold weather, it has remained in good attractive flower longer than usual, notwithstanding winds and rainstorms, eight or ten days intervening between the opening of the first flowers about April 25th and the first dropping of petals. Hot days, such as sometimes occur at this season, would cause a preliminary dropping of petals within two or three days of flower opening. This species has been described as the dominant shade and flowering Cherry planted in and about Tokio, Japan, for the celebrated cherry blossom festivals which are annual events there. It is a sturdy species, forming a broad, horizontal branched, rounded top which may easily spread 50 feet or more across although it takes many years to reach such proportions. The origin of this tree is unknown, but by some specialists it has been called a possible hybrid between two Japanese species, a supposition which is hard to prove.

It is a curious fact that while descriptions and illustrations of Cherries in and about Tokio usually state or show the blossoms as pink, experience with the species, if it is a species, in America is that the color is white or has a very light pinkish trace in the petals when expanded, the buds being decidedly pink as seen from the backs of the petals. The famous Cherry plantation about the Potomac Basin in Washington, which is usually in good bloom about the second week in April, is apparently mainly the Yoshino Cherry. Its flowers are white or with but a faint trace of pink, as are those at the Arboretum. Our foremost authority (Rehder) in America, in his "Manual", describes the flowers as "white to pink", coinciding with the description of other students and writers in this country. The description of the Yoshino Cherry as given in one of the best known Japanese nursery catalogues is "single light pink of medium sized flower, best kinds for avenue planting and park for its quick growth and beautiful blossom and no park without this tree seems perfect, grows most freely in any soil".

This question of the differences in color as portrayed in most Japanese pictures and as actually developed on plants in this country is one which is puzzling and disconcerting to the average planter and it remains one which requires careful study and investigation.

The blossoms of the single flowered Cherries are fast fading away and as they lose their attractiveness the double-flowered forms, or hybrids, come into their most showy condition. This year that period appears to be during the second week of May. There are many named forms of these beautiful plants, some derived from species, others originating from hybrids, all grafted or budded and all probably much slower growing and never attaining the size of their naturally single flowered progenitors. They should generally be considered as short lived as compared with the types, but this is not always the case.



Prunus serrulata sachalinensis "Fugenzo"
Photographed in the Arnold Arboretum, June 9, 1924, by Dr. E. H. Wilson

Besides local conditions much depends upon the stocks upon which they are budded or grafted, a subject which may be referred to in later issues of these Bulletins. A beautiful double flowered species is the well known and often planted *Prunus avium plena*, which is often listed as *Prunus (Cerasus) avium multiplex*. Originally derived from the Sweet or Mazzard Cherry, of Europe and Western Asia, this form has developed flowers which have the aspect of very small fully double white roses borne in umbels of several clusters.

For those who wish for a suggestion of a selection of several of the best and hardiest of the Japanese double forms the following may be mentioned as very satisfactory. They are regarded as forms of the fairly hardy *Prunus serrulata*. Some forms of *Prunus Lannesiana* may perhaps be regarded as more beautiful but they are not so hardy as *P. serrulata*. Of this species there are now a good many forms offered in American nurseries, six of the best may be found under the following names: *Albo-rosea*, pink in bud changing to white; *Fugenzo*, rose pink; *Hisakura*, pale pink; *Horinji*, pale pink, clustered; *Kirin*, rose colored, large flowered, late; *Shogetsu* (= *P. serrulata sachalinensis superba*) pale pink, large, late. The Japanese name of the last is said to signify "moonlight through Pine branches".

There are many others which may be grown in our climate, though with less confidence in their immunity from winter injury, particularly those belonging to the *Prunus Lannesiana* group, of which the double or semi-double form known as *P. Lannesiana sirotae*, sold by some Japanese nurseries as a "*Mount Fuji*", with large, fragrant, pure white blossoms, is probably the finest known of all double Cherries.

Recently we received an inquiry from a correspondent who wishes to know the species and varieties of choice Japanese Cherries which will grow at an altitude of 1500 or 2000 feet in northern New York State. The answer to such a question is that probably none of them would live and thrive and blossom in that latitude and that altitude, where the temperature frequently falls to from 10 to 20 below zero (Fahrenheit). If the trees were not killed or badly injured, their flower buds would almost always certainly be destroyed every winter unless the season happened to be exceptionally mild for the region. Possibly the more northerly forms of such a species of variety as the Sargent Cherry, *Prunus serrulata sachalinensis*, which some botanists think should be regarded as a distinct species (*Prunus Sargentii*), might be able to withstand the rigors of our cold north country but such particularly hardy plants remain to be introduced and proved.

While a few of the double flowered Cherries are to be seen near the Forest Hills Gate the best specimens are to be found in a group on top of Bussey Hill.

The Japanese or Flowering Quince, *Chaenomeles lagenaria* and various forms, often known as *Pyrus japonica* in nurseries and persistently called *Cydonia japonica* in "Standardized Plant Names" are in flower now in the shrub collection.

J. G. J.

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NO. 5

Plant Hybrids. Many of our most valuable ornamental shrubs have been produced by natural or artificial hybridization. Among the best examples are the hybrid Lilacs and Rhododendrons. Most of the numerous varieties of Lilacs have been produced by hybridization and selection by Lemoine in France. These hybrids are for the most part confined to crosses within the species *Syringa vulgaris*. Hybrids cannot be made between the Villosae and Vulgares Lilacs and neither of these groups will cross with the Tree Lilacs. Within the Vulgares group hybrids are known between *S. vulgaris* and *S. oblata* and between *S. persica* and *S. vulgaris*. The latter hybrid, *S. chinensis*, first originated spontaneously but was subsequently produced by crossing the parental species. Rhododendron hybrids were produced for the most part by English plant breeders, although many crosses between species have occurred spontaneously in cultivation. The best known varieties of *Rhododendron* have been produced by crossing the American *R. catawbiense* with European or Asiatic species. Most of the species of Rhododendrons are interfertile and in some cases hybrids have been made between the true Rhododendrons and the Azaleas.

In the genus *Philadelphus* we have numerous examples of hybrids between species and it seems probable that all species in this genus are interfertile. Several hybrids are known between American and Asiatic species. These parental species must have been separated long before the Glacial Period, yet when they are brought together and crossed they produce perfectly fertile hybrids. Similar cases are known in the Rhododendrons and Apples.

The Arnold Arboretum offers unusual opportunities for the plant breeder because of the extensive collection of both American and Oriental species. Many of these have never before been brought together in the same collection so that they have never had an opportunity to cross naturally or to be combined by the plant breeder. In many cases it is impossible to cross distinct species but in certain genera or subfamilies crosses between species are easily obtained and in certain cases even generic hybrids are possible.

In the Pomoideae a number of generic hybrids are known to occur. Near the Forest Hills Gate is a large tree of *Sorbopyrus* which is a hybrid between *Sorbus* and *Pyrus*. Along the Willow path there is a small specimen of *Amelasorbus*, a natural hybrid between *Amelanchier* and *Sorbus*, which was discovered in Idaho by J. G. Jack. Another generic hybrid in this group of plants is *Sorbaronia*, a hybrid between *Sorbus* and *Aronia*. This hybrid is in the Shrub Collection. It has been found growing spontaneously in several regions in North America. Hybrids have also originated spontaneously between *Crataegus* and *Mespilus* and between *Pyrus* and *Cydonia*.

In this subfamily there are many ornamental trees and shrubs, as Apples, Pears, Flowering Quince, Sorbus, Amelanchier, Coton-easter, and *Crataegus*. It is possible that additional hybrids can be made between some of these genera. This spring a number of crosses have been made between *Amelanchier* and *Pyrus*, the Japanese Quince and the Pear, between *Cotoneaster* and *Crataegus*. It is to be expected that many of these crosses will be unsuccessful, but if a few hybrids are obtained they should be of considerable interest and probably of some ornamental value.

The Lilacs offer some interesting opportunities for the plant breeder. Most of the earlier breeding work has been confined to the species *S. vulgaris*. There are, however, two other species which are very valuable, especially if they can be combined with the flowering habit of the common Lilac. *Syringa pubescens* is the most fragrant of all Lilacs but the flowers are not showy and the shrub is not graceful in its habit of growth. If this species could be combined with *S. vulgaris* it should give us an entirely new type of Lilac.

Syringa pinnatifolia is one of the most attractive Lilacs in its habit of growth but the flowers are borne in small clusters. This species combined with either *S. pubescens* or *S. vulgaris* should produce some interesting hybrids. The Persian Lilac is also a valuable species for the plant breeder although when crossed with *S. vulgaris* it produces a sterile hybrid so that the cross cannot be carried beyond the first generation. Many of these sterile hybrids are valuable, however, because they flower freely and although they set no seed they can be propagated by grafting or by cuttings.

The Technique of Crossing. The methods used in making crosses between species or varieties are dependent on the natural method of pollination. Plants are chiefly insect pollinated, wind pollinated, or self pollinated. Most plants with conspicuous flowers are insect pollinated while those with inconspicuous flowers are usually wind pollinated. Among the former are the Apples and related genera, while the wind pollinated plants include the Conifers, the Oaks, and most of the grasses. All grasses are not wind pollinated, contrary to the statement in botanical textbooks, and among the economic genera Wheat, Oats and Barley are all normally self pollinated.



Sorbopyrus auricularis var. *bulbiformis*

Photographed in the Arnold Arboretum, May 21, 1924,
by E. H. Wilson

In order to cross two species or varieties it is first necessary to prevent the normal pollination. With insect pollinated plants this is easily done by removing the anthers and petals just before the flower opens. The insects will not usually visit a flower which has the petals removed so that there is only a slight chance for pollination to occur. Apple flowers for instance are emasculated by removing the calyx together with the petals and anthers just before the flower opens leaving the stigmas exposed. Pollen from the male parent is then applied to the stigmas and the cross is made. It is advisable to leave a check branch on which the flowers have been emasculated and not pollinated to see if seeds set, due to insect or wind pollination. If the check branches do set fruit there is no assurance that the pollinated flowers will produce hybrids. This method of emasculation is known to be satisfactory with Apples and related genera, but it may not be applicable in all cases. If the stigmas are large and moist there is a chance that smaller insects will visit them and thus effect pollination. For such cases the flowers should be covered with a paper bag after emasculation and kept covered until the petals would normally drop.

In the case of wind pollinated flowers, it is necessary to cover the female flower before the stigma is receptive. For instance, in corn the ear is covered with a bag before the silks appear. When the silk is developed the bag is removed just long enough to dust on the pollen which has been collected and then covered again until all chance of wind pollination has passed. In the Pine the small cones are covered in the same way and when they are receptive the pollen from another species is applied and the cone again covered.

Lilacs are easily crossed by pulling off the corolla to which the anthers are attached and brushing the exposed stigma with a freshly opened anther from a mature flower of the other parental species or variety. Lilies are also easy to cross although many species seem to be intersterile. The anthers and petals are removed from the female parent just before the flower opens and the stigma covered with pollen from the male parent. In the case of the Lily it is probably best to cover the flower with a bag since small insects may carry the pollen to the stigma even when the petals are removed. A number of crosses have been made at the Arboretum using E. H. Wilson's Regal Lily as one of the parents, but since it takes from 3 to 6 years for a Lily to flower from seed it is too early to know the results of this work.

At best the breeding of new varieties of shrubs and trees is a long process. The hybrids cannot be expected to flower for several years at least and in some cases one must wait ten years or more to determine the flowering characters of the hybrid. Often a second generation is necessary in order to obtain the desired combination of characters and another five or ten years must elapse before the results are known. Nevertheless, it is a fascinating occupation and full of interesting surprises. One great advantage of working with trees and shrubs is that any hybrid obtained can be propagated by cuttings or by grafting even if it does not breed true from seeds or is sterile.

Karl Sax.

ARNOLD ARBORETUM

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NO. 6

Various Shrubs. With the distribution of this Bulletin special attention should be called to various shrubs now passing or still in good flowering condition. Our native Hobble-bush, *Viburnum alnifolium*, has been in blossom for two weeks and has been conspicuous with its white, bract-like, sterile flowers. This shy, northern, shade-loving, woodland shrub may be induced to grow under cultivation if given a cool and somewhat shaded location such as it has near the Birch group in the Arboretum. Near it, in the *Viburnum* group, the visitor will find the much and deservedly advertised *Viburnum Carlesii* in passing bloom with its clusters of pinkish white, fragrant flowers. *V. bitchiuense*, close by, has similar flowers but they are borne in more open cymes, the petals being wider spreading. The plant is less compact and less attractive than *V. Carlesii*. The flowers of these two *Viburnums*, especially those of *V. Carlesii*, suggest *Daphne Cneorum* by their delightful odor and appearance, except that the flowers of the *Daphne* are of a deeper color. A fine group of this pretty, evergreen, little shrub is in full inflorescence along the roadside near the Hickory and Chestnut group, between the Centre Street gate and Hemlock Hill. Farther along this same road may be seen the purple bloom of *Rhododendron canadense*, more familiarly known as Rhodora. In the same family, Ericaceae, belongs an interesting little Heather, *Erica darleyensis*, with rosy-red flowers and dark red anthers. It is passing but has been flowering for several weeks past and, indeed, some blooms may be found in sheltered places almost every month in the winter. It is said to be of hybrid origin between the common *Erica carnea* and *E. mediterranea* and is reported to be as hardy as the first named parent. A good patch of it is to be seen on Bussey Hill. There, also, the beautiful pink-flowered *Rhododendron Schlippenbachii* is dropping its flowers. This native of Korea and Japan is nearly matched, in a horticultural sense, by the now well-known, and deservedly popular *R. Vaseyi*. Although resembling each other, these two species are placed in different sectional groups of the genus *Rhododendron* by systematic botanists. *R. Vaseyi* has somewhat smaller flowers varying in color from deep rosy-pink to pale pink or white, a varietal name, *R. Vaseyi album*, having been given to the latter. Seed-

lings vary considerably so that it is well to grow a number and select the best. if it is not practicable to propagate a specially desirable form by division. The variability shown in this species offers a good illustration of the possibilities of obtaining improved forms by simple selection of seedlings without artificial interference by the hand of man.

The genus *Rhododendron* is divided or subdivided into various groups according to the views of different botanists. In the Arboretum under the name *Rhododendron* are included groups which some authors would classify under *Azalea*, *Rhodora*, and other genera. These segregations under separate generic headings may appear simple and satisfactory when considering local species or those of a special region, like Eastern North America. But when all the species of Asia are considered, the separating features which were satisfactory for a local flora become tangled with connecting links so that it may become difficult to divide the whole group into separate genera that are distinct. This broad grouping into one generic botanical heading under *Rhododendron*, the oldest Linnean botanical name, would seem all the more justifiable when we consider that Rhododendrons have been crossed with Azaleas, and Azaleas with Rhodora. As classified in the popular mind, the true Rhododendrons are evergreen shrubs or small trees bearing terminal clusters of showy flowers. They can never become universally popular or so widely distributed as Lilacs, for example, because of greater difficulty of propagation, expense, slow growth, and particularly on account of requiring so-called acid soils of a certain character found only in a relatively small part of our whole country.

The best flowering of evergreen, broad-leaved Rhododendrons usually occurs in the latter part of May or early June. There are few really hardy species adapted to this climate, but hybridization has produced a great many named kinds that are more or less amenable to our conditions. On May 8th, a plant known as *Rhododendron venustum* was in full bloom in the Rhododendron collection at the foot of Hemlock Hill. A broad-spreading but low plant 3 or 4 feet high, it was covered with large trusses of deep pink or rose-colored flowers and was very conspicuous among its neighbors which are not yet in blossom. It has been growing in the Arboretum, and has proved hardy, for more than twenty years. It is rather interesting that this plant should be so hardy here for it is a hybrid between *Rhododendron caucasicum* and the Himalayan *R. arboreum*, neither of which is really satisfactory in our climate, although they may live and produce flowers, and occasionally do very well. *R. caucasicum*, with yellowish-white to pink flowers, is the hardier, while *R. arboreum* is too tender for cultivation in our northern climate. *R. venustum* originated in England over 40 years ago. It appears to be rarely listed or grown in this country, but it is frequently advertised in English and other European catalogues, commonly under the name *R. Jacksoni*, which is a synonym of *R. venustum*. Growing beside this plant in the Arboretum is another in blossom but with white or faintly pinkish white flowers. It was imported from Germany in 1908 under the name of *Rhododendron* "Diana" and is apparently of the same hybrid origin as *R. venustum*, but much less satisfactory because the plant seems weaker and the flower buds



RHODODENDRON YEDOENSE POUKHANENSE

Raised in the Arnold Arboretum from seed collected on Poukhan, Korea,
in 1905 by J. G. Jack (Drawing by Blanche Ames Ames)

are too often destroyed in winter. It is very pretty at this time but is hardly worth cultivating except for earliness of bloom, and then in regions with a climate less severe than that of Boston. It does not now appear to be listed in nursery catalogues.

Probably no group of trees and shrubs offers greater opportunities than the Rhododendrons, evergreen and deciduous, for development by hybridizing, though such work may be understood by comparatively few people.

Those wishing to see Kaempfer's Azalea, *Rhododendron obtusum Kaempferi* in good flowering condition should visit the Arboretum at this time as the species is now in full blossom (May 18). With cool weather, such as we have been having this spring, these plants should keep in showy and attractive condition for about two weeks, but hot, sunny days cause rapid fading. Individuals when planted together show variation of several days in the time of opening of the first flowers, but local environment will be found much more of a factor in hurrying or delaying inflorescence, a cool north slope or shade continuing the season of bloom for days after the passing of blossoms of plants in a warm location.

The Korean Poukhan Azalea, *Rhododendron yedoense poukhanense*, is at this date (May 18) still in full bloom on Bussey Hill, its mass of rosy purple, or pale lilac purple, flowers forming the most conspicuous feature among the surrounding shrubbery. Other Azaleas will follow, so that several visits must be made to this location in order to appreciate all of them.

The visitor to Bussey Hill will find the later flowering Japanese Cherries still in attractive bloom. Other small plants belonging to the broadly inclusive genus *Prunus* are blossoming along the main road leading to the top of Bussey Hill. On the hill are several species of *Cytisus*, often called *Genista*, mostly bearing golden yellow flowers. Among the best of these may be mentioned *C. ratisbonensis*, which, under favorable conditions, may attain 3 or 4 feet in height; *C. purgans*, erect and somewhat smaller than the last; *C. elongatus*, the flowers duller yellow than the others and marked with reddish brown, and *C. Beanii*, a hybrid between *C. purgans* and *C. Ardoini*, the latter rarely cultivated in this country. *C. Beanii* is a low, broad-spreading little shrub, very attractive when covered with its bright golden yellow blossoms. *C. purpureus*, a small shrub with purple flowers, is in strong contrast to the yellow flowered species. It has been used in hybridizing with those with yellow flowers and one or two interesting intermediate forms have been produced.

Before this Bulletin is issued many of the Crabapples will have passed their best flowering condition and the Lilacs will be the centre of attraction in the Arboretum.

J. G. J.

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Davidia involucrata. Near the top of Bussey Hill, close to the Azalea Path, *Davidia involucrata*, the Dove Tree, is flowering (May 11-23). This is the first time that it has borne at all profusely in the Arnold Arboretum and even now it is floriferous on only one side. *D. involucrata* is a native of China, having been discovered some sixty years ago by Abbé Armand David in Szechuan on the borderland of Tibet. Subsequently the range was extended to Hupeh and Yunnan. The first botanical description was published by Dr. Henri Ernest Baillon in 1871 when the genus *Davidia* was launched and dedicated to its discoverer. In 1897 it was introduced to European horticulture by Père Farges, who sent seeds to Maurice L. de Vilmorin. In 1906 the first flowers were produced in France. At this time, in "Revue Horticole", the flowers and habit of the Vilmorin plant were figured.

Davidia is classed with the Tupelo, *Nyssa sylvatica*, in the family Nyssaceae. Originally it was thought to be a close ally of the Flowering Dogwood, *Cornus florida*, and was given the status of a distinct sub-family in the family Cornaceae. The inflorescence is remarkable, because the solitary female flower, protruding laterally from a bisexual inflorescence, is surrounded by the closely massed male flowers and appears to be lost in a wilderness of dehiscing anthers. One wonders what the course of evolution has been which resulted in a solitary pistillate flower being encompassed by numerous staminate flowers. Surely the prodigality of pollen under such circumstances indicates self-sterility and an assurance that there shall be sufficient pollen produced to reach, unfailingly, the stigmas of the solitary pistillate flower in a near-by or distant inflorescence. But with regard to this we have not yet succeeded in finding any information.

For technical details regarding the genus, one may turn with profit to Rehder's article on *Davidia* in Bailey's "Standard Cyclopedia of Horticulture", or to W. J. Bean's "Trees and Shrubs Hardy in the British Isles", where a thoroughly satisfactory treatment is given, together with historical notes.

The specimen in the Arnold Arboretum is a small, shrubby tree about twenty feet high with a spread of fifteen feet near the base. It has the aspect of having suffered severely from winter killing in the early years of its development, as it consists of several obliquely erect stems rising from and near the ground. As the flowers mature the stamens elongate, and the filaments become whitish. When the flowers are young, the anthers are deep purple, forming a dense pompon-like cluster subtended by large showy bracts. It is these bracts, usually two, although sometimes three in number, which constitute the chief attraction of the plant. These bracts are thin and flaccid with irregularly toothed margins and, when the anthers dehisce, are whitish with hardly a tinge of green.

The accompanying illustration was drawn from the plant now flowering in the Arboretum and represents the var. *Vilmoriniana*. The variety differs from the species in having smooth, rather than felted, leaves. Our plant is a descendant of the only one raised by Vilmorin at Les Barres from the thirty-seven seeds sent by Père Farges in 1897 from China. In 1901, before Vilmorin's solitary plant flowered, four cuttings and one layer were made from it and in 1902 the layer was sent to Professor Sargent. This record authenticates our plant as true var. *Vilmoriniana*.

There is some question, however, regarding the validity of the variety. Indeed the transitional stages that may be traced between hairy and smooth leaves are of a nature to cast suspicion on the value of the characters that have been used to separate the variety from the species. E. H. Wilson believed that trees with smooth leaves were different from trees with hairy or lanate leaves, although he found both kinds commingled when he collected seeds for Veitch, 1899-1902. It has been stated that the variety is horticulturally inferior to the hairy leaved *D. involucrata*, but there is hardly enough evidence to substantiate this statement.

We are told that in its native land, when laden from top to bottom with enormous white floral bracts, some of them attaining a length of eight inches or more, *D. involucrata* presents a wonderful aspect. But from an aesthetic point of view it has little to recommend it. Its claim to a place in the garden rests on the bizarre form rather than on the beauty of the inflorescence. As an ornamental it is surpassed by Flowering Dogwood *Cornus florida*. Botanically, however, it is among the most interesting of the introduced species which depend for their beauty on the development of showy bracts subtending the flowers and is a curiosity deserving to be included in every collection of woody plants.

As yet *Davidia* is rare in American gardens and it is impossible to give reliable information regarding its hardiness and amenability. Our experience indicates that Boston is about the northern limit for its cultivation. In Rhode Island *Davidia* has proved more tractable than in Massachusetts and it is our opinion that success will attend efforts to introduce it in regions where the winter climate approximates that of southern New England. It is highly probable that some plants will prove to be constitutionally more hardy than others and that skillful



selection may be rewarded by the discovery of resistant strains. As seeds are now being offered by seedsmen, an opportunity for comparative observation is at hand. The origin of the seeds, however, should be ascertained, as in its native country plants of *D. involucrata* from the southern part of the geographical range may prove less hardy than those that grow near the northern boundary of distribution.

Propagation is by seeds, cuttings in summer of half ripened wood grown under glass, and by layers. It is said that propagation by seedlings is more satisfactory than by cuttings as the plants resulting from cuttings show reduced vigor. Germination of the seeds is rather slow. Indeed some of the records indicate that from one to two years may pass before the seedlings appear after sowing of seed. Seeds should be frozen before being placed in the ground as freezing seems to shorten the period of dormancy. Frozen seeds will usually germinate in from twelve to fifteen months. Oakes Ames,

EXPLANATION OF THE PLATE

Davidia involucrata Vilmoriniana. A drawing from the plant sent to Professor Charles Sprague Sargent in 1902 by M. L. de Vilmorin. The inflorescence at the left shows a supernumerary bract. (*Drawn May 22, 1931, by Blanche Ames Ames.*)

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American Crabapples. In the Arboretum, following the Cherries, the Flowering Crabapples are the plants of dominant popular interest, overlapping and connecting late cherry blossom and lilac times. They passed through the winter in good condition and during the last two weeks have been conspicuous by their abundance of beautiful flowers. The first trees to blossom opened their flowers about May 3rd. These earliest flowering apples belong to several species and named forms or hybrids that originated in the Old World. They have a season of inflorescence coincident with that of most of the varieties of our cultivated common Apple, the *Malus pumila* of our orchards, a species now found naturalized in pastures and woods although a native of Europe and western Asia. The many kinds of common Apple show a marked variation in time of flowering. As a rule those with early ripening fruits, like "Early Harvest", "Astrachan", etc., open their flowers with the earliest of the ornamental Japanese and Chinese Crabapples, while some varieties that mature their fruit late in the season correspond in flowering time with the later, showy flowering species from the Orient. Noticeably later flowering than the Crabapples of the Old World are those species which are indigenous to eastern and central North America. This is a group which cannot be separated by any tangible differences in aspect or foliage recognizable by the casual observer, and yet is so distinct botanically that at a glance the botanist is usually able to pick out trees of American origin, even without seeing the fruit whose structure, the core being free at the apex, is quite distinct from that of all other species.

By following the proper procedure, as outlined by Professor Sax in the last Bulletin, the Old World and the New World species may be, and have been, hybridized with some very interesting results. But the act of bringing these species together or in close proximity has allowed Nature to develop an intermixture without help or interference by man. While some are already known, we are yet on the threshold of these foreign and native mixtures and a century hence there is certain to

have been developed races of trees of horticultural interest very different from those we know at the present day.

The name "Crabapple" has come to be associated, in the average mind, with trees bearing small fruit, but some of our American species produce fruits three inches in diameter. These fruits have sometimes been used in making preserves, jellies, or cider, but many are astringent and are considered rather unpalatable and of poor quality when judged with regard to their eating or culinary purposes. Undoubtedly they will be greatly improved in future years when they will have become mixed with the best fruiting types of the Old World species now in cultivation. At the present time they are chiefly valued and cultivated for their usually pink or rosy-colored, deliciously fragrant flowers. There are a number of species in cultivation, all characterized by having pink, fragrant flowers, and fruits which often have a sticky or waxy covering and give off a strong, sweet, aromatic fragrance when fully mature in the Autumn. Not one of these species of eastern North American Crabapples is found native within the limits of the New England States, but they may be found from western New York southward to Florida and westward to Nebraska, Iowa, Kansas and eastern Texas. All of the wild apple trees found in our New England woods and pastures and along our waysides are escapes from long cultivated orchards of varieties of *Malus pumila*, which has also been known as *Malus Malus*. Linnaeus placed Apples and Pears in the genus *Pyrus* but in the Arboretum that generic name is now restricted to the Pears, while his *Pyrus Malus* (the Apple) became *Malus Malus* in some botanical lists.

By the action of man in introducing foreigners or outsiders into our flora, the future holds a prospect of a wonderful tangle of curious Apples and Crabapples whose parentage it will not be easy to trace. Already we have in cultivation interesting hybrids of the Iowa Crabapple, *Malus ioensis*, and the common cultivated Apple. One of the best known of these is the Soulard Crabapple, *Malus Soulardi*, which shows considerable variation but is usually characterized by having dense clusters of short pedicelled flowers, pink and white in color, which give off a pleasant, sweet, violet-like fragrance. It has been found in various states in the Mississippi Valley, from Minnesota to Texas, and is usually regarded as of the hybrid origin already suggested. The fruits are sweet-scented and often two inches in diameter. While *Malus ioensis* is interesting in itself and through the supposed hybrids which have been developed from it, its great fame rests on the fact that it is the mother of the beautiful semi-double or double flowered variation known as the Bechtel Crab, *Malus ioensis plena*, which has also been described in horticultural literature and listed in catalogues as *Malus* (or *Pyrus*) *angustifolia flore pleno*. In the English "Gardeners' Chronicle" it was called a Pear, under the synonym *Pyrus coronaria flore pleno*. *Pyrus coronaria* formerly was made to include a number of what are now considered distinct species of American Crabapples. This double-flowered form of *Malus ioensis* is said to have been found nearly 100 years ago, or before 1840, but it is not known to have been formally introduced into general cultivation until 1888, and was not brought into the Arnold Arboretum collection until



MALUS IOENSIS PLENA

Photographed in the Arnold Arboretum, May 26, 1931,
by Professor Oakes Ames

1897. It did not originate with Bechtel but derives that name from the fact that it was first extensively introduced to the nursery trade and general cultivation by E. A. Bechtel's Sons, Staunton, Illinois.

Questions regarding this plant are so often asked that the following note written by W. C. Egan, of Illinois, for the "Garden Magazine", June, 1913, should be of interest:- "In 1898 I wrote to Mr. Theo. Bechtel, of Staunton, Ill., for particulars regarding its history and he kindly replied as follows: 'Sometime in the 'seventies, when my father, the late E. A. Bechtel, was conducting a little nursery four miles west of Staunton, Ill., we used to hear the most wonderful tales of a flowering tree, or clump of trees, situated some six or eight miles northeast of us in what was known as 'Upper West Prairie', but as the wild tales were too much to be believed, coming from a class of old settlers whom we knew to be given to exaggeration, we paid no attention to the matter until about ten years ago, when we made a trip during the blooming season and saw what a valuable thing had stood there, as near as we could find out from old settlers, about forty years. We at once made arrangements with Mr. Woodbridge, in whose pasture the original clump of trees were standing, to propagate and introduce them to the trade. As the trees were identical with the single-flowered wild crab growing around and in the same clump, we had to mark these during blossoming time, so as not to make any mistake in procuring buds or cions. The indications all go to show that it is an accidental sport from the single flowering crab.'"

Thus this product of Nature, uninfluenced by human agency, producing beautiful little double rose-like, pink-colored, violet-scented, flowers, developed from the single normal five-petaled type, and was preserved from possible destruction by fire, animals or the axe. The doubling of the flowers is at the expense of the numerous stamens which become lessened by becoming petaloid. The doubling is not so complete as to replace all the stamens and, occasionally, on this tree with semi-double flowers, small fruits may be found.

As has already been stated, a few years ago several of our Eastern American Crabapples were indiscriminately listed under the single name of *Malus (Pyrus) coronaria*. Comparatively recent studies have recognized a number of distinct species in this group and these have been named and must eventually become more or less familiar in our nurseries and gardens. *Malus coronaria* still remains, in a restricted sense, as a species, but it is probable that for some time purchasers may get some other plants under this name. This species has a strong resemblance to *Malus ioensis*, differing chiefly in having smoother leaves and somewhat oblate or depressed globose fruit, whereas the fruit of the Iowa Crabapple is oval or broadly ellipsoid. It is an interesting fact that in about 1900 a semi-double flowered form of this species was found near Waukegan, Illinois. It has been named *Malus coronaria Charlottae*. Its blossoms are not so double and therefore not so miniature rose-like as Bechtel's Crabapple. The flowers are paler, expand slightly wider, and are very pale pink or almost white when fully opened, although the unopened buds are of an attractive pink color. Most persons who have compared them agree that it does not equal Bechtel's Crabapple in beauty or desirability. J. G. J.

ARNOLD ARBORETUM
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OF
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SERIES 3. VOL. V

JUNE 18, 1931

NO. 9

Bush Honeysuckles. The name Honeysuckle is a term popularly applied to various plants of different genera, not only in this part of the globe but also in other countries where the English language prevails. Locally, in New England, it is often given to the flowers of indigenous Azaleas, and the Trumpet Creeper, (*Tecoma radicans*) imported into our gardens from further south, is not infrequently known as a Honeysuckle or Trumpet Honeysuckle. Generally, however, in this part of America, the term Honeysuckle is understood to refer to the various species of the genus *Lonicera*, a group of such wide dissimilarity in aspect that it has been proposed by some botanists to divide it into several genera. But certain aspects of foliage and structure of flowers and fruits, common to all, serve to bind them together into a recognized typical group.

Originally named by Linnaeus for Adam Lonicer or Lonitzer, a German botanist and physician who died in 1586, the genus is now recognized as containing between 175 and 200 species, all natives of the northern hemisphere and, as yet, unknown from south of the equator. Of the many species that have been recognized and described only a small proportion are regarded as hardy or adapted to cold northern conditions. Some of the more common of these hardy species have, when brought together, produced some interesting hybrids, developed through natural processes or aided by the hand of man. Altogether the Honeysuckles may be ranked as of the first order of usefulness in the work of the horticulturist or landscape gardener.

There are two Chinese Bush Honeysuckles which have been long introduced into our parks and gardens and are among the earliest in spring to produce flowers. These are *Lonicera fragrantissima* and *L. Standishii*, half-evergreen or late deciduous shrubs which attain six to eight feet in height and a greater spread of branches. To the casual observer they may appear to be uninteresting plants as they do not offer any conspicuous features either in flower or fruit. But a close acquaintance with them, at their best season, will show small white or yellow-

ish-white flowers which give off a very strong, sweet fragrance, like *Epigaea* or Mayflower, which is discernible some distance away when the flowers are plentiful. Sometimes flowers are produced in the late autumn and they may reappear occasionally during very mild times in winter. In this climate the normal flowering period is April, blossoms continuing to appear through May or until or after, the red fruits are ripe, about the first of June. They may, however, continue to ripen for several weeks. At the present time, June 5, in the Arboretum, scattered flowers may still be found, together with ripe fruit. This fruit is red, thin skinned, pulpy, sweetish, several seeded, oblong or oval in shape and sometimes about half an inch long. The flower buds are sometimes destroyed in very severe winters and even the plants may lose some of the upper parts of their branches. Without protection they might be considered too uncertain in hardiness for regions north of the Peach zone.

In habit the plants are somewhat similar, becoming broad-spreading bushes 7 to 8 feet high and with an equal or greater diameter. *Lonicera Standishii* is considered somewhat hardier than *L. fragrantissima*, although both may appear to thrive equally well under good drainage conditions. These species have long been in cultivation in this country, especially in some of our parks. They might not profitably be accorded a place in very small gardens, where the limited space is wanted for more showy things, but they certainly would give an added interest to larger plantations.

Most of the Honeysuckles have what may be called unpalatable fruits, but there is an exception in *Lonicera villosa*, a low growing shrub, native of the cold northern parts of northeastern North America, and found southward, in cold environments, to Pennsylvania. This species bears fruits covered with a dense blue bloom, ripening in the Boston region at the end of May or in June and bearing a strong resemblance to medium sized fruits of some of our native Blueberries (*Vaccinium*). This fruit is classed as edible, has a rather pleasant flavor, and has been known to be gathered and sold as Blueberries. The flowers are greenish-white, much hidden by the leaves. Although an interesting native the species is of no particular interest for the average garden, where showiness is the prevailing desire.

The old established Tatarian Honeysuckle, (*Lonicera tatarica*), is a close competitor of the common Lilac for public recognition in old gardens. The latter has the advantage of having had a longer introduction to cultivation, being recognized as having been domesticated as early as 1597, while the Tatarian Honeysuckle is recorded as having been brought into gardens in 1752, or over 150 years later, from its native home in Turkestan and southern Russia. It is a plant which shows a greater variation than the common Lilac, when raised from seed, and at the Arnold Arboretum there are probably as many inquiries about this variable and cosmopolitan species as about any in common cultivation. The small globose berries are normally bright red, occasionally translucent yellow, and are freely eaten by some of the birds, which eject the hard, horny seeds after the pulp has been absorbed or digested. In this way the Tatarian Honeysuckle has become naturalized and may



LONICERA AMOENA ARNOLDIANA

Photographed in the Arnold Arboretum, June 2, 1931,
by Herbert W. Gleason

be found along roadsides and fences, in abandoned fields as are Apple, Barberry, Buckthorn, Privet and Sweetbriar Rose, all disseminated by birds and other animal agencies.

When in flower these escaped Tatarian Honeysuckles may show marked variation from the cultivated forms in adjacent gardens. While the color of the flowers is normally pink, pure white flowered forms have long been in gardens and even these show so much variation in size and substance that they have been given several varietal names. Thus we have variety *grandiflora*, with very large pure white flowers, *alba* with medium sized white flowers, and *parvifolia* with small white flowers. If attempts are made to raise the typical pink flowered plant from seed, one is liable to get forms not desired as well as forms which vary sufficiently from the mother plant to merit a distinct designation for horticultural purposes. Such deviations from the type when found naturalized are a common cause for perplexity to the finder until he is assured that the plant under observation is simply a variant from the mother type already well known in gardens. No attempt should be made to produce any especially desirable plant from its seed, as there would be a probability of not getting just what was wanted. Exact duplication could be secured only by division from the selected individual, as by cuttings of green or of mature wood, or by layering. In the last analysis few introductions of its class in recent years can compete with the Tatarian Honeysuckle in general usefulness for park or garden planting. It is very hardy, enduring 20 or 30 degrees below zero, Fahrenheit, and is adapted to a wide range of soils, in sharp contrast to the restricted areas and conditions required by such a group of plants as Rhododendrons. Where planted with other allied species, which flower at the same time, hybridization by insect agency may easily occur. A number of such hybrids are known in cultivation; others have been passed by as unworthy of attention or preservation. Careful selection and pollination by man should produce surer and more desirable results than haphazard processes of nature.

Among the best of the known hybrids of *Lonicera tatarica* is a cross with *L. Korolkovii*, a native of Turkestan. This hybrid has been given the name of *Lonicera amoena* and several worth while variants have been recognized and named. One of these is *Lonicera amoena arnoldiana* which originated in the Arnold Arboretum over thirty years ago. It is a slender shrub 6 to 8 feet high, with graceful branches, rather small oblong bluish-green leaves, white flowers flushed with pink, and is annually very floriferous. It is well worthy of a place in the larger garden but must be propagated by division, rather than by seeds, in order to secure exact duplicates.

This hybridization among our Honeysuckles has hardly been more than touched as yet, but it suggests the great field of hidden novelties and improvements in future work, aside from the introduction of possible new species.

J. G. Jack.

ARNOLD ARBORETUM

HARVARD UNIVERSITY

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OF

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JUNE 24, 1931

NO. 10

Botanical Drawings by John Singer Sargent. Through the kindness of his sisters, Miss Emily Sargent and Mrs. Francis Ormond, the Arnold Arboretum has received six original drawings by John Singer Sargent. The collection is interesting from a botanical point of view because it shows how accurately Sargent interpreted plant structures that attracted his attention, and it is important from an artistic point of view because it contains examples of his early efforts as well as some of his later sketches from the series made in Florida within comparatively recent years. With the exception of two drawings which may be referred to an early period, and one carefully elaborated drawing of the later period, the collection consists of rough sketches that represent attempts to catch, on the spur of the moment, some pleasing or interesting peculiarity of a vine or fruit. Even the hasty sketches are of exceptional importance as they demonstrate precise observation and exhibit a more faithful interpretation of vegetative characters than is usually attempted by artists who lack biological training. It has seemed worth while to devote a number of the Bulletin to these drawings as they constitute an important addition to the Arboretum Library, and include one subject that deserves to be reproduced and explained. This subject, which is the most interesting of the Sargent drawings in the Arboretum collection, is a carefully worked up study of the roots of *Ficus aurea*, a strangling fig, that had become entangled with a discarded wagon wheel. The extraordinary association of fig roots and wheel must have made a strong appeal to Sargent, because the sketch was executed with meticulous fidelity to the original and constitutes a record that would not be out of place in a textbook of botany. The subject is botanically unusual and hardly one that we should expect to find attracting the attention of a great portrait painter.

A brief account of the life history of a strangling fig may help toward an understanding and a better appreciation of the drawing. *Ficus aurea* usually begins life as an epiphyte, that is, it springs from a seed

Quoted in Boston Transcript July 18, 1931.
" " Gard Chron. July, 18, 1931.



that has been dropped, by a bird or some other agency, on the limb of a tree or in the leaf axil of a palm. In the beginning the plant is a true epiphyte, having no connection with the ground. After the seed germinates, the roots, being geotropic, begin to grow downward. At first they are slender, but as they develop there takes place an increase in diameter. After the roots enter the ground in their downward passage, the fig ceases to be an epiphyte in a strict sense and becomes a true terrestrial plant, the support for the leafy crown being largely composed of an interlacing and anastomosing system of tough roots. In time, if the fig prospers, the roots completely enclose the trunk of the host tree or palm and a so-called strangling action begins. In the later stages of this strange association, the tree on which the fig began its development appears to emerge from a rigid gray sheath. Finally the host tree dies leaving the fig perfectly independent. During the formation of the root system, rocks or other objects that are in the way, are often enmeshed and securely held. Sargent's drawing shows a wheel that had become firmly held by encircling roots.

In a tropical forest the independent fig tree appears to have grown from a seed that had lodged in the ground. Unless its peculiar nature were understood, one would find difficulty in explaining its structure. As is true of the Banyan (*Ficus bengalensis*) the roots of *F. aurea* descend from the lengthening branches and form a series of prop-like supports. By this means the growth of the tree results in a wide-spreading crown. When this peculiarity of growth is allowed to continue a large area of ground may be covered by a single plant.

In "The Silva of North America", vol. VII, an interesting note regarding *Ficus aurea* is given by Charles Sprague Sargent, and is in part as follows: "What is probably the largest specimen of *Ficus aurea* in the United States grows on a wooded hummock, locally known as 'The Hunting-ground', about ten miles west of the mouth of the Miami River and close to the shores of Bay Biscayne. This remarkable tree covers about a quarter of an acre of ground with its numerous distinct stems formed from roots developed from the branches of the original trunk, and its dense wide crown of foliage". When a large specimen of this species is encountered, it is difficult to believe that the source was a small epiphytic plant that began its development, perhaps many feet above the ground, on the branch of another tree.

The strange behavior of *Ficus aurea* is in the closest relation to the requirements for light. Experiments have conclusively proved that light is essential for successful development. If seeds fall on the forest floor and lie in dense shade they remain dormant. This explains the epiphytic habit of the species in tropical jungles where only those seeds which fall in well lighted situations on the branches of trees are able to germinate. Occasionally, however, in clearings and open places it has been found that *F. aurea* is quite capable of growing independently, and along rocky bluffs and on canal banks young plants may be found that are not epiphytic.

Although *Ficus* is a large genus comprising more than six hundred species with representatives in both hemispheres, only two species are

natives of the United States. Some of the best known species of the genus are: *F. carica*, the edible fig, probably a native of the Mediterranean region, cultivated from prehistoric times; *F. religiosa*, the Buddhist's sacred Peepul tree, found near temples and shrines in India and Siam and now a much planted shade tree in tropical countries; and *F. bengalensis*, the famous Banyan tree of India. Both *F. bengalensis* and *F. religiosa* sometimes become troublesome when they germinate from seeds that have lodged in the crevices of the walls of buildings. *F. religiosa* has been known to break down the strongest type of masonry in countries where the tree is so sacred that nobody will destroy it.

During the preparation of the fourth number of the Bulletin, a search was being made in the Library of the Arboretum for colored plates of the Yoshino cherry of Japan. The search led to the "National Geographic Magazine" where on page 191 of the forty-second volume, attention was drawn to the reproduction of a photograph showing the roots of a strangling fig holding an old wagon wheel. It was not only a photograph of the same wheel which had engaged Sargent's attention, but a view of it taken from almost the same location from which Sargent had made his drawing. Through the kindness of the "National Geographic Magazine", the Bulletin is permitted to reproduce the photograph and thus make possible a comparison between it and our reproduction of Sargent's drawing. Fortunately the photograph which was made at Cutler, Florida, localizes Sargent's work and indicates those details which the artist suppressed in his interpretation of the scene.

OAKES AMES.

EXPLANATION OF THE PLATE

Ficus aurea. Photograph from John C. Gifford. Reproduced by special permission from the "National Geographic Magazine", vol. 42, p. 191. (1922).

SUPPLEMENT PLATE

Ficus aurea. Reproduced from an original drawing by John Singer Sargent. (Original drawing $9\frac{3}{4} \times 7$ inches.)

A. 1000 -
Florida



ARNOLD ARBORETUM

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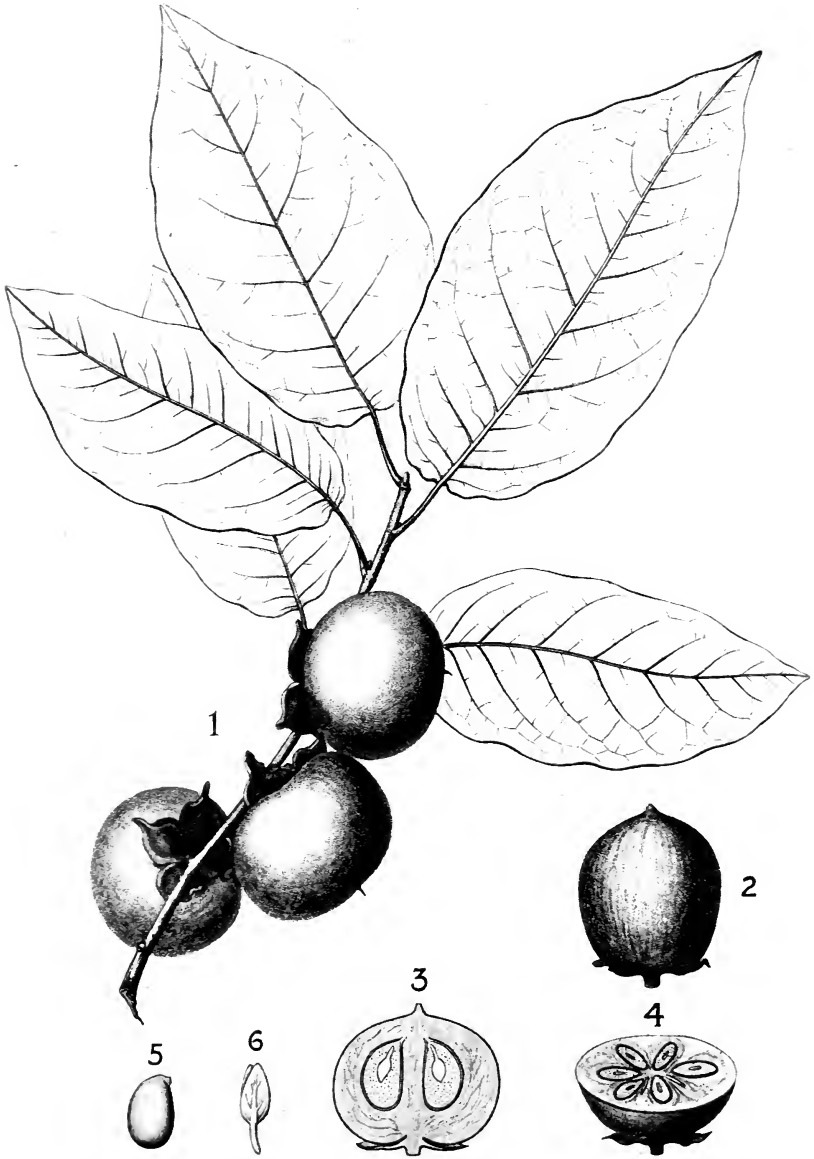
NO. 11

Persimmons. One of the trees that is occasionally sent to the Arboretum for identification is the common American Persimmon (*Diospyros virginiana*). This interesting tree seems to be little known in the North and is often passed unnoticed among many other trees, of different families, but with somewhat similar foliage. The Persimmon, when allowed opportunity for full development, becomes a handsome, tall, medium sized tree with regular branching habit and dark green, somewhat lustrous, alternate, simple, entire-edged leaves which keep in good condition throughout the summer and into the autumn without much change in color, although they occasionally become orange or scarlet. The bark of the trunk is dark gray, or brown tinged with red, and is deeply divided into thick, square plates. It is not generally known that the Persimmon is a native of New England, having been found apparently wild in Rhode Island and Connecticut. It is a tree which is better known and is more plentiful farther south, extending to Florida and Texas.

At the Arboretum the trees are now (June 24) in full flower but the flowers are so hidden by the leaves that the average observer would hardly notice them. The flower buds are four-angled and about one-third to one-half of an inch long. The bell-shaped corolla is composed of four white, fleshy petals, united at the base for one-half to two-thirds of their length, forming a broad barrel-shaped tube, constricted toward the apex and topped by the four free ends of the strongly reflexed lobes of the corolla. At its base each flower rests on four leafy calyx lobes. These usually persist with the fruit. Male and female flowers are usually produced on separate trees in the axils of the leaves and suspended below them. The male flowers, which are smaller than the pistillate, are usually borne in small cymose clusters of two to five or six on slender pedicels; the female flowers, larger than the male, are solitary, on much stouter pedicels and are subtended by much larger calyx lobes. The male flowers fall to the ground soon after opening and shedding of pollen. While the flowers commonly occur as male (or

staminate) and female (or pistillate) on separate trees, rarely both male and female may be found on the same tree, and the imperfect stamens found in pistillate flowers may sometimes produce a little pollen or, occasionally, flowers may be perfect. This feature in the flowering is an important consideration in attempts to grow trees for the fruit, because it is essential to have pollen-producing blossoms where we have possibly fruiting trees, in order to bring about cross-pollination and fertilization of the fruit blossoms. Otherwise they would appear sterile. On this account it is usually a wise plan to have several Persimmon trees growing together, at least one being known as staminate, in order to secure abundance of pollen for fertilization. If, in cultivation, a number of trees are propagated from one mother stem by buds or grafts, it may become necessary to introduce another so-called variety or a pollen bearing seedling into the plantation in order to secure satisfactory pollination. A bud or graft from a known pollen bearing tree inserted upon a pistillate tree may produce satisfactory results. A pollen bearing, flowering branch hung among the flowers of a pistillate tree may help in the problem of fertilization. The blossoms secrete much nectar and this is greedily sought by honey bees and other insects at flowering time.

The American Persimmon is perfectly hardy in the latitude of Boston, and in old gardens in and about Boston occasionally good, large trees are found, sometimes 40 or 50 feet high, although they are often unrecognized. For many years the American Persimmon has been grown or selected with the object of gaining improved fruit. This native fruit has been recognized as edible since the visits of very early voyagers to America. De Soto, as early as 1539, learned from the Indians in Florida the value of the fruit and it was appreciated by his men as a welcome addition to their scanty fare. The earliest published record of the fruit appears to have been made by him in 1557. The tree was introduced into England before 1629. The Persimmon in the northern part of this country often produces fruit of a strong, astringent quality, especially in the early autumn and before the fruit has been frozen several times. By careful selection and propagation and the elimination of the individuals which produce the poorer quality of fruits, the American Persimmon has been brought to a fair state of perfection for fruit, although it is still lacking very much the improvement which has been brought about by the Japanese and Chinese in the species which grow in the Orient. The best of these is known as *Diospyros kaki*, the fruit of which has many shapes, in many varieties, and strongly suggests the fruit of some of our best tomatoes. Unfortunately, so far as tried, *D. kaki* has not proved hardy enough in the district about Boston to produce fruit, although it has become a practical orchard tree farther south, at least as far north as Virginia. Orchards of Chinese or Kaki Persimmons are common near Peiping (Peking), China, which is in the latitude of Philadelphia. As in the case of the Oriental species, the fruits of the American Persimmon vary considerably in color and form, usually they are pale orange or red, with a light gray bloom, becoming yellowish brown. They are sometimes oblate or flattened and in other cases slightly oblong. While



DIOSPYROS VIRGINIANA

Fruit—1, Fruiting branch; 2, oblong fruit; 3, vertical section of fruit;
4, cross section of fruit; 5, seed; 6, embryo.

About two-thirds natural size.

From drawing by C. E. Faxon for Sargent's "Silva of North America".

usually containing 1 to 8 large, flattened seeds, some trees are found on which the fruits are seedless or which rarely produce seeds, a desideratum sought by the plant breeder and in which Japanese and Chinese have been eminently successful with their species. In the natural state they vary very greatly in size, from that of a small cherry to that of a large plum, or about an inch and a half in diameter, or, in cultivation, up to two inches in diameter. On some trees they become so soft when fully ripe that in falling to the ground they are crushed by their own weight, while on other trees, growing under identical conditions, they remain very hard even after severe freezing. Some trees in the South produce fruit which is sweet and luscious without the action of frost, and on adjoining trees it preserves its acidity when ripe, never becoming really edible. So, by merely selecting the best which we find in nature, very important advances may be made in starting a campaign for the improvement of these fruits. This has been recognized by some enterprising growers and nurserymen and such perfectly natural selected forms are now offered by them. The American Persimmon is one of the most promising of our native trees as a subject for experimentation and improvement. Such work is certain to lead to very interesting and valuable results. Of the already named selections most of them seem to have come from Indiana and Missouri.

Freezing is popularly regarded, in the North, as essential to eliminate the astringent quality in the berries, for the fruit of *Diospyros* is botanically known as a berry. The astringent quality may be in time totally eliminated so that we may get fruits in the future which are edible in a green state, as is sometimes the case in the Chinese Persimmon. This astringent quality in the fruit is recognized as tannin and in some cases is used in certain industries. An indelible ink has been made from the fruit and the dried, roasted and ground seeds have been used as a substitute for coffee. In central China oil obtained from the unripe fruit of the Chinese Persimmon is used to make hats and umbrellas waterproof; the fruits are dried and preserved as figs are preserved. Seeds of *Diospyros* are reported to lose their power of germination soon after they have been taken from the fruit and exposed to the drying influence of the air. On this account it has been recommended to keep the seeds within fresh or dried fruits until near the time for planting. The American Persimmon tree develops a distinct tap root and on this account and the general lack of fibrous roots it is reported as not easy to transplant. However, ordinary care is all that is necessary to success, provided the plants have good roots. As particularly desirable forms cannot reliably be reproduced from seed, grafting or budding must be practised in propagating them. Some trees in nature develop sprouts from adventitious buds on roots, thus forming colonies of stems with all the same features as the original.

The wood of the American Persimmon is hard and close-grained, and the so-called heartwood, which is so slow in forming that a hundred years may pass before it is definitely developed, becomes almost black in old individuals. It is from trees of this genus, which is known to include from 175 to 200 named species, that the ebony of commerce is derived, particularly from *Diospyros Ebenum*, which is found in India and Ceylon and in the Dutch East Indies.

J. G. JACK.

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NO. 12

Late Summer Flowering Trees. As the summer advances and June passes into July, the trees and shrubs which blossom late become scarcer and those which develop conspicuous bloom at this season are well worth studying by those desiring good late flowering species. In former years our native Common Chestnut (*Castanea dentata*) was one of the most conspicuous objects in the landscape in middle and southern New England during the early part of July. But the masses of flowers of this fine tree are now only memories to the older generation of our people and they are unknown to the young people of today. The last of the old native trees in the Arboretum have gone because of the attacks of the Chestnut Blight (*Endothia parasitica*) and there may never again be chestnut trees in the Arboretum which would equal them in size and proportion.

The Chinquapin or Dwarf Chestnut (*Castanea pumila*) in the Arboretum was planted as a small group of a dozen or more plants twenty-five or thirty years ago and these little trees have successfully withstood the attacks of the blight, though they are not immune to it. Beginning its flowering in the last half of June, it becomes most conspicuous towards the end of the month and continues to produce a diminishing inflorescence until about the middle of July. It is classed as a shrub or small tree in its native habitat, which extends from Pennsylvania to Florida and Texas. While it becomes larger in parts of the Southwest, in the Arboretum the stems are usually not more than ten or twelve feet high. Occasionally the blight causes the death of a stem which is usually replaced by others which arise from the base or stump. The flowers are followed by small burs concealing small brown nuts, (about half an inch in length) which contain sweet, fine flavored kernels. This interesting species offers attractive material for the plant hybridizer. Indeed the late Dr. Van Fleet developed a hybrid between this species and our Common Chestnut which produced distinctly larger fruit than that which grows naturally on the Chinquapin.

The European Chestnut is not hardy enough to be considered as suitable in plantations for Massachusetts, but there is at least one Chinese species which produces superior fruit and which has shown probable adaptability to our climatic conditions. This is *Castanea mollissima* which has been grown in China for untold centuries and has been so selected or improved by the Chinese that there are now forms which produce nuts equal in size to any others known. Frank H. Meyer, indefatigable collector for the U. S. Department of Agriculture, found the Chestnut Blight upon this species in China, so that that country is considered the home of the disease. But, although not immune, the trees are able to survive in spite of infection. In the Arboretum the trees blossom at about the same time as our native species, perhaps a little later. They are now 15 or 20 feet high, with a broader spread of branches, the stems branching at or near the ground, so that the plants have the effect of very large, strong, full-branched shrubs. The species is to be valued for its fruit rather than for its flowers or wood. There are other species in eastern Asia, at least one of which becomes a large tree which furnishes excellent lumber.

At a little distance the Sorrel-tree or Sour-wood (*Oxydendrum arbo-reum*) native from Pennsylvania to Florida and west to Indiana and Louisiana, and the only known species in the genus, has something of the aspect of a chestnut tree when in flower and covered with its numerous panicles of whitish flowers. These Andromeda-like blossoms, however, are more conspicuous and much more attractive than those of the Chestnut. The comparatively short-branched tree has a more narrow and erect aspect than the average Chestnut. The Sorrel-tree is a good subject to plant with Rhododendrons, Kalmias and other ericaceous plants, to which family it belongs. The large, bright green leaves form a handsome foliage effect during the summer, turning scarlet in the autumn. In our New England gardens the trees appear to be generally free from disfigurement by insect attacks or diseases caused by fungi. Under best natural conditions the tree may become 60 feet in height. In cultivation it may begin flowering when only 5 or 6 feet high.

No species of tree is so decidedly showy in this climate in July as *Koelreuteria paniculata* which, in some catalogues, has been given the name of Varnish-tree, China-tree and Pride of India. All of these common names, and especially the last two, have been applied to other trees belonging to different genera, so that the use of any of them without the accompanying name of "Koelreuteria" might easily prove misleading. "Varnish-tree" is perhaps the name most common of the colloquial names in use, but this name also is misleading inasmuch as it is more properly applied to the Lacquer-tree (*Rhus verniciflua*) of Japan and China, which yields a resinous juice that is poisonous to the skin when handled and which is the source of the famous lacquer or varnish used on Japanese furniture. This *Koelreuteria* is a tree which may attain 30 or more feet in height. The leaves are alternate, pinnate or somewhat bipinnate, with 7 to 15 leaflets, the compound leaf often being from a foot to a foot and a half long. The large, broad, loose panicles of small flowers are terminal on the branches and are carried



KOELREUTERIA PANICULATA

Photographed in the Arnold Arboretum, July 23, 1931,
by Herbert W. Gleason

well above the foliage. They are of a brilliant golden yellow color and are very effective against a background of green foliage. The flowers open gradually so that the tree when in bloom is showy throughout July. The blossoms are followed by large, somewhat angled, inflated capsules which become conspicuous after the passing of the inflorescence. So far, in the Arboretum, the foliage has shown little disfigurement from attacks by insects or fungi.

Of the few late flowering trees which are adapted to the climate of eastern Massachusetts, the Sorrel-tree and the Koelreuteria are decidedly among the best and most showy. The Koelreuteria appears cosmopolitan and adapted to a variety of soil conditions, while the Sorrel-tree range is more restricted because of its preference for acid soils, in common with most other plants of the heath family.

A somewhat conspicuous tree at the present time is *Maackia amurensis*, a leguminous species, introduced from Mandshuria and Japan. It is a small or medium-sized tree, probably attaining 40 to 50 feet in height with rather dull green pinnate foliage. The flowers are borne in terminal, erect, compact racemes, usually several together forming a panicle. The small papilionaceous blossoms are of a dullish white color, the standard being mostly greenish yellow. The flowers are apparently very nectariferous for they are visited by large numbers of bees which tear the petals more or less in their eagerness to get at the secreted sweets. There is a so-called variety of this species known as *M. amurensis Buergeri*, which has been brought from Japan and which appears to be more floriferous than the type. Whether this is a distinct varietal feature or one which may show variations under domestication, remains to be proved. In any case the species, while a conspicuous feature in plantations when in flower, does not produce blooms for intimate or near acquaintance comparable with many other plants of the same family. It may well be considered as much less desirable than the so-called Pagoda-tree (*Sophora japonica*) frequently found in American gardens. Commonly considered as Japanese and much planted in Japan, this tree is now believed to be a native of China and Korea. It is a favorite street and shade tree in many parts of China. A fine avenue may be seen on the grounds of the Temple of Heaven in Peiping (Peking). Under favorable conditions this *Sophora* may become a tree 75 feet high. This species does not blossom in the latitude of Boston until August and good flowering often continues into September. In fact, the flowers are sometimes so late that the pods do not ripen well before hard frost overtakes them and the seeds are often not sufficiently ripened to be viable. The flowers, which are produced in large terminal, loose panicles, are usually yellowish or creamy white, although sometimes slightly pinkish. The Pagoda-tree, so called because often planted in China in the vicinity of pagodas, is, in the Arboretum, the last of the larger trees to produce conspicuous flowers before they are checked by autumnal frosts. It is a hardy tree which should be more often planted in large plantations and parks and squares. A grotesque dwarf, twisted-limbed and pendulous-branched form (*S. japonica pendula*) of the Pagoda-tree is often grafted on a tall stem and trained into umbrella shape.

J. G. JACK.

ARNOLD ARBORETUM
HARVARD UNIVERSITY
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The Art of Budding. Although the name may suggest springtime, budding, as a horticultural practice, is carried on during the late summer. At that time of year the bark of young branches is fairly loose and can be made to slip away from the wood. This makes it possible, for instance, to take buds from a rare hybrid lilac and tuck them under the bark of an ordinary lilac bush, where, if properly cared for, they will grow out the next spring. A few years later the bud will have developed into a branch bearing flowers of the same type as the bush from which it came.

Budding is the easiest method by which many of our woody plants can be propagated and is used in nearly all large nurseries. Every July and August millions of peach and apple buds are removed from their parent twigs with deft strokes of the knife and set onto seedling stocks. Workmen in the big fruit nurseries become so skilled that they can transfer over a thousand buds in one working day.

Though budding is such a common and simple operation, few amateurs ever master it, for it is an art, and like any other art is best learned under the personal direction of a master craftsman. There are, however, a number of precautions which can be set down in black and white. They will not by themselves make anyone an experienced "budder" but they should enable the interested amateur to eliminate a large percentage of failures and, with a little practice, to become competent.

The necessary equipment is very simple; 1, a sharp knife for removing the buds and cutting the bark; 2, a dull wedged-shaped instrument for forcing open the bark; 3, raffia or tape for rapping around the bud. Almost any sharp knife will answer the first requirement, though nurserymen use special budding knives. These vary in design but all have a dull blade or edge for prying out the bark, in addition to a cutting blade. The one in the illustration has its ivory handle tapered at the end to a broad flat edge, which is used as shown in figure 2.

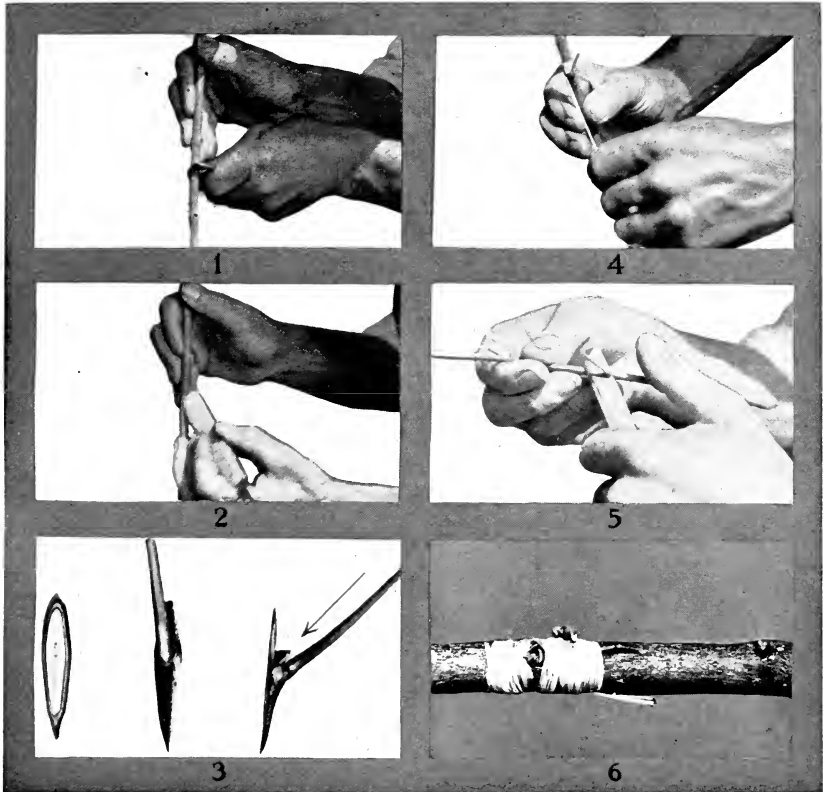
As has been said, the work is done almost entirely at this time of year, from the last of July through most of August. A few trial cuts in the bark of a young twig will show whether it is ready for budding. If the bark comes away from the wood easily when the wedge is inserted, the twig is in the right condition. If possible, do the work on a cloudy day, for then there will be less chance of drying out the exposed tissues.

In choosing buds one should select healthy twigs of the current year's growth, avoiding those long whip-like growths which spring out far down on the branches and trunks of old trees and grow with great vigor. They are as a rule too full of sap for the best results. The length of bud stem cut will depend upon the kind of tree which is being budded, but as a rule it will be one or two feet long. As the bud stems are cut stand them in a pail of water until ready for the actual operation itself. The bud stem is prepared for use by cutting off the leaves, allowing a piece of each leaf stalk to remain for use as a handle. The actual buds are in the joint between the base of the leaf stalk and the main stem.

The buds are cut off from the bud stem as shown in figure 5, pulling the knife toward one, guiding it a little deeper under the bud, and sloping it upward quickly at the end of the stroke to provide a clean triangular edge below. An expert removes the buds in a series of quick flashes of the knife and then places them between his lips where they can be kept moist until the cut is ready on the stock. Some of the wood of the twig will come away with the bud; a small oval pad of wood can be seen adhering to the under side of the bud in figure 3. Nurserymen sometimes remove this wood before using the bud and directions for cutting it off will be found in old treatises on the art of budding. Modern horticultural experiment has shown that this is not at all necessary and that the chances of success may even be greater if nothing is done to it.

The cut made to receive the bud is a simple T, done with two strokes of the knife. The up and down cut is made first and then the cross stroke at its upper end. The cut should be deep and well through the bark. It will do no harm if the cut goes down into the wood itself. It is necessary to make the cut in the inter node, as shown in figures 1, 2, well out of the way of neighboring buds and on the north side of the stock if possible. It should also be made as far down on the stock as working conditions will permit, to lessen the chances of sprouts coming out from below the bud.

With the end of the budding knife (or any other similar wedge) peel back the gray outerbark and the green innerbark, they will probably come off in one sheet. Force the bark gently away from the white wood beneath until there is room for the bud, then take the bud from between your lips, where it has been carefully kept moist all this time, and gently but firmly push it into the cut, in exactly the same way that you would push your foot into a tight shoe. Lengthen the cut if it is too small for the bud, if it is much too large make another cut. The bud is now ready to be wrapped and tied in place. Raffia in lengths



BUDDING A LILAC.

1, Making the first cut in the stock; 2, forcing back the bark; 3, three views of a bud, cut and ready for insertion, in the side view the arrow points to the actual bud; 4, wrapping the bud; 5, cutting the bud from the bud-stem; 6, enlarged view of the completed operation, the leaf-stem removed to show the bud more clearly.

of a foot or so is commonly used for this purpose, and since it works better when wet is often carried in the water pail with the bud stems. Take a strand of raffia and holding the loose end down on the twig, where it will eventually be covered over, make two or three quick twists around the twig above the bud. Be careful not to cover the bud itself. Then wind the raffia several times about the twig immediately below the bud and secure it by putting the raffia through the next to last loop (left loose for the purpose) and pulling it tight. Cut off the dangling end of raffia and the bud is ready for the winter.

Nothing more needs to be done until spring time, neither wax or any other covering is necessary. It will be well not to water the stock too heavily, for if the bud should be stimulated into growth it would be winter killed when the cold weather came. In the early spring cut off the stock just above the bud. When growth starts, the rising sap will stimulate the bud and with a whole root system to draw on for food it will grow out amazingly. After cutting off the old raffia the operation will be complete.

Care should be taken to prevent the stock from sprouting out from below the bud. Should such sprouts gain headway they would eventually choke out the branch which had developed from the implanted bud and the whole effect of the operation would be lost. The bush should therefore be examined occasionally and any branches which have started out lower down on the stock should be removed.

If the operation has been made low enough on the stock, it will be possible, by hilling earth around the bush, for the budded branch to send out roots of its own. Some plants, like lilacs, grow much better on their own roots, others do not. But all this is another story and will have to be dealt with separately in a later Bulletin.

W. H. JUDD

EDGAR ANDERSON

Plants of Current Interest. By far the most interesting plant in the Arboretum this month is the hardy dwarf variety of *Albizzia* (*A. julibrissin rosea*) which is in flower on the south slope of Bussey Hill. The true *Albizzia julibrissin* is a tropical Asiatic tree, it is not hardy in the north, but since its introduction into the United States by Michaux, has become one of the commonest features of parks and gardens along the Gulf Coast. Its much hardier variety, *A. julibrissin rosea*, is a large bush or small tree with flowers of an even brighter pink than the species itself. It has been in flower since mid-July and promises to continue until the first of September.

August finds most of the conspicuous flowers in the shrub collection concentrated in the northwest corner. There will be found the large collection of flowering heathers, and three unusual shrubs belonging to the Verbena family, *Clerodendron*, *Vitex*, and *Callicarpa*. *Vitex Negundo* var. *incisa* is a particularly lovely sight this month with its long sprays of finely cut foliage and its panicles of gray blue flowers. It is a hardy species closely related to the Chaste-Tree (*Vitex agnus-castus*) which is often found in old southern gardens.

ARNOLD ARBORETUM

HARVARD UNIVERSITY

BULLETIN

OF

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Arboreta and Botanic Gardens in the United States. The location of individual arboreta and botanic gardens in the United States has so often been a problem for research in the Arnold Arboretum Library that it has seemed quite probable the general reader might value the collection of scattered material into a general list to guide him to the specialized plant communities in his locality. For this study a botanic garden has been defined as an establishment where plants are grown for the purpose of furthering botanical ends, either economic, scientific or aesthetic. The following list includes the arboreta and botanic gardens established through private enterprise for public benefit, those connected with universities, schools, churches and commercial concerns, some of the larger agricultural experiment stations that have or plan to have generous plantings of species of woody or herbaceous plants, the plant collections in public parks where there has been some attempt to classify the indigenous flora or established various genera, as well as those arboreta which are privately owned, some of which are accessible to the public through the generosity of the owners. Space prohibits the citation of our national parks but their value is already so well known they need no recommendation here. This list has been compiled from a more or less limited examination of the literature in this one institution and is therefore by no means exhaustive, it may also include a few plantings unworthy of inclusion, but it will serve as a nucleus for a more complete list in the future. Cooperation is solicited from all who can supplement this list with further data.

ARIZONA	LOCATION	DIRECTOR
Boyce Thompson Southwestern Arboretum	Superior	Franklin J. Crider
Desert Laboratory	Tucson	D. T. MacDougal
ARKANSAS		
Arkansas Agricultural Experiment Station, University of Arkansas	Fayetteville	J. R. Cooper

CALIFORNIA	LOCATION	DIRECTOR
Albert White Park	Riverside	
Balboa Park	San Diego	
Bard Botanical Gardens	Hueneme	
Blaksley Botanic Garden	Santa Barbara	Elmer J. Bissell
Golden Gate Park	San Francisco	John McLaren, Supt.
Huntington Botanic Gardens	San Marino	William Hertrich
Mission Cliff Gardens	San Diego	John Davidson, Supt.
Montarioso Botanic Garden	Santa Barbara	
Pacific Botanic Garden, Stanford University	Palo Alto	
Rancho Santa Ana Botanic Garden	Anaheim	Susanna B. Bryant, Owner
Sierra Madre Arboretum	Sierra Madre	
Succulent Garden	Santa Maria	F. J. McCoy, Owner
United States Experiment Station	Chico	
University of California Botanic Garden	Berkeley	T. H. Goodspeed
COLORADO		
Myron Stratton Estate (Proposed)	Colorado Springs	
CONNECTICUT		
Elizabeth Park	Hartford	
Marsh Botanic Garden	New Haven	H. S. Graves
Osborn Botanical Laboratory Garden	New Haven	G. E. Nichols
DISTRICT OF COLUMBIA		
National Arboretum (Proposed)	Washington	F. V. Coville
Rock Creek Park Arboretum	Washington	
United States Botanic Garden	Washington	G. W. Hess
Washington Cathedral Gardens	Washington	
FLORIDA		
Chapman Field Arboretum	Miami	David Fairchild
Mountain Lake Sanctuary and Gardens	Iron Mt., Lake Wales	E. W. Bok Memorial
United States Experiment Station	Coconut Grove	David Fairchild
University of Florida Agricultural Experiment Stations	Gainesville	Wilmon Newell
GEORGIA		
Wormsloe Gardens (Private ownership, open)	Savannah	
IDAHO		
University of Idaho	Moscow	
ILLINOIS		
Joliet Park System (including Pilcher Arboretum)	Joliet	W. G. MacLean Supt.
Marquette Park	Chicago	
Morton Arboretum	Lisle	Joy Morton, Owner



PINETUM, HIGHLAND PARK, ROCHESTER, N. Y.
Photograph by R. E. Horsey

ILLINOIS (continued)	LOCATION	DIRECTOR
Pilcher Arboretum	Joliet	
<i>See</i> Joliet Park System		
INDIANA		
Butler University Arboretum	Indianapolis	
(Proposed)		
Dunes State Park	Porter County	
IOWA		
Grinnell College Botanic Garden	Grinnell	
Iowa State College Botanic Garden	Ames	B. S. Pickett
State Park System		
(Exceed 38 in number)		
KENTUCKY		
Transylvania University	Lexington	
Botanic Garden		
MAINE		
Knox Arboretum	Warren	N. W. Lermond
MARYLAND		
Bell Station, U. S. D. A.		
<i>See</i> United States		
Experiment Station		
Homewood Botanic Garden,	Baltimore	D. S. Johnson
Johns Hopkins		
United States	Bell	B. Y. Morrison
Experiment Station		
University of Maryland	College Park	H. J. Patterson
Experiment Farms		
MASSACHUSETTS		
Arnold Arboretum	Jamaica Plain	Oakes Ames, Supervisor
Boston Park System (including	Boston	William P. Long, Park Commissioner
Franklin Park, Boston Common,		
Public Gardens etc.)		
Franklin Park		
<i>See</i> Boston Park System		
Harvard Botanic Garden	Cambridge	R. H. Woodworth
Lexington Botanic Garden	Lexington	S. F. Hamblin
Lowthorpe School of	Groton	R. S. Sturtevant
Landscape Architecture		
Pinetum of Walter Hunnewell	Wellesley	
(Private ownership, open)		
Proctor Arboretum (Private)	Topsfield	T. E. Proctor, Owner
Riverside Park	Springfield	
Smith College Botanic Garden	Northampton	Wm. G. Ganong
Wellesley College, Alexandra	Wellesley	Helen Davis
Botanic Garden		
MICHIGAN		
Beal Botanic Garden, State College	East Lansing	H. T. Darlington
Leila Arboretum	Battle Creek	T. C. Shepherd
Nichols Arboretum and Botanical	Ann Arbor	H. H. Bartlett
Garden, University of Michigan		



JAPANESE BLOSSOMS AND POND IN THE ARNOLD ARBORETUM
Photograph by George W. Root

	LOCATION	DIRECTOR
MICHIGAN (continued)		
Palmer Park Arboretum, Belle Isle Park	Detroit	
W. K. Kellogg Bird Sanctuary and Arboretum (Proposed)	Augusta	G. H. Corsan, Sr., Manager
MINNESOTA		
Minneapolis Wild Botanic Garden	Minneapolis	
Minneapolis Park System	Minneapolis	
MISSOURI		
Mark Twain Memorial Park Association	Florida	E. M. Lamson
Missouri Botanical Garden	St. Louis	G. T. Moore
NEBRASKA		
Arbor Lodge State Park	Nebraska City	Frank Williams, Supt.
NEW JERSEY		
New Jersey Agricultural Experiment Station	New Brunswick	J. G. Lipman
NEW YORK		
Albany Park System	Albany	
Brooklyn Botanic Garden	Brooklyn	C. S. Gager
Buffalo Botanic Garden, South Park	Buffalo	
Central Park	New York	
Country Life Press Gardens	Garden City	
Durand-Eastman Park <i>See Rochester Park System</i>		
Glen Cove Arboretum (Private)	Glen Cove	
Highland Park <i>See Rochester Park System</i>		
Hodenpyl Arboretum (Private)	Locust Valley	A. G. Hodenpyl, Owner
Inwood Park	Manhattan	
Letchworth Park Arboretum	Portageville	
New York Agricultural Experiment Station	Geneva	U. P. Hedrick
New York Botanical Garden	Bronx Park	E. D. Merrill
New York State College of Forestry	Syracuse	
Palisades Interstate Park	New York	
Bear Mountain (1000 acres)		
Blauvelt (800 acres)		
Harriman (42,500 acres)		
Hook Mansion (1000 acres)		
Storm King (700 acres)		
Rochester Park System (including Durand-Eastman Park and Highland Park)	Rochester	C. C. Laney, Commissioner
"Roslyn" (Private)	Roslyn	Childs Frick, Owner
"Skylands" (Private)	Sterlington	Clarence Lewis, Owner
Vassar College Arboretum	Poughkeepsie	H. E. Downer, Supt.

NORTH CAROLINA	LOCATION	DIRECTOR
Chapel Hill Arboretum, University of N. C.	Chapel Hill	W. C. Coker
NORTH DAKOTA		
North Dakota Agricultural Experiment Station	Fargo	P. F. Trowbridge
OHIO		
Bryan Park (Proposed)	Yellow Springs	
Dawes' Arboretum	Newark	Henry Dawes, Owner
Fine Arts Garden	Cleveland	
Holden Arboretum, Cleveland Museum of Natural History (New)	Kirtland	
John Davey Memorial Arboretum	Kent	
Mill Creek Park	Youngstown	
Mt. Airy Forest Arboretum (Proposed)	Cincinnati	
Ohio State University Botanic Garden	Columbus	A. E. Waller, Curator
Wade Park Garden Center	Cleveland	
Zoar Gardens	Zoar	Community ownership
OREGON		
Oregon State Agricultural College School of Forestry Arboretum	Corvallis	G. W. Peavey, Dean
PENNSYLVANIA		
Aldie Arboretum (Private)	Philadelphia ?	Wm. R. Mercer, Owner
Awbury Park	Germantown	
Bartram Garden	Philadelphia	
Boxley Arboretum	Chestnut Hill	
Breeze Hill (Private ownership, open)	Harrisburg	J. H. McFarland, Owner
Bryn Mawr College Botanic Garden	Bryn Mawr	
Compton Arboretum	Chestnut Hill	Miss L. T. Morris, Owner
Fairmount Park	Philadelphia	
Humphrey Marshall Arboretum	Marshallton	
John Evans Arboretum	Ithan Creek	
Lehigh University Arboretum	Bethlehem	
Longwood Gardens and Pierce Arboretum (Private ownership, open)	Longwood	Pierre S. Dupont, Owner
Mont Alto Arboretum	Mont Alto State Forest	
Narbrook Park	Narberth	
Painter Arboretum (Private)	Lima	
Presque Isle Peninsula State Park	Presque Isle	
Schenley Park	Pittsburg	
Swarthmore College Arboretum	Swarthmore	J. C. Wister
University of Pennsylvania Botanic Garden	Philadelphia	R. H. True
Westtown School Arboretum	Chester County	
Woodlands (Famous for Michaux's trees)	Philadelphia	Woodlands Cemetery Co.

RHODE ISLAND	LOCATION	DIRECTOR
Goddard Park	Potowomut	
Roger Williams Park	Providence	E. K. Thomas, Supt.
SOUTH CAROLINA		
Cypress Gardens	Charleston	
Goshen Plantation (Private)	Augusta	Mrs. Joseph Spear, Owner
Magnolia Gardens (Private ownership, open)	Charleston	C. N. Hastie, Owner
Middletown Place Gardens (Private ownership, open)	Charleston	Mrs. Pringle Smith, Owner
SOUTH DAKOTA		
South Dakota Agricultural Experiment Station	Brookings	N. E. Hansen
TENNESSEE		
A. F. Sanford Arboretum (Private)	Knoxville	A. F. Sanford, Owner
Memphis Park System Arboretum	Memphis	
TEXAS		
Helge-Ness Arboretum	Austin	
Texas Botanic Garden, Texas State University	Beaumont	H. P. Traub, State Horticulturist
UTAH		
Smith Arboretum (Private ownership, open)	Logan	
VIRGINIA		
Blandy Experimental Farm	Boyce	Orland E. White
Maymount Park (Dooley Estate)	Richmond	
Mount Vernon	Mount Vernon	Colonel H. H. Dodge, Supt.
WEST VIRGINIA		
Waddington Farm Arboretum	Wheeling	R. S. George
WISCONSIN		
Wychwood	Lake Geneva	Mrs. Charles L. Hutchinson

—ELIZABETH D. BENNETT

Plants of Current Interest. During September the center of interest shifts to the western border of the Arboretum. Just inside the Walter Street gate the Golden Larch (*Pseudolarix amabilis*) ripens its beautiful cones. With their large green scales, set wide apart, they look more like great green flowers than like seed cones of a conifer. Inside the Center Street gate the Chinese Burning Bushes (*Evonymus*) are unusually conspicuous this year, *E. planipes* in particular has never been finer and is covered with brilliant drooping fruits of crimson and orange. Farther up the same road, nearly at the top of the Overlook on Bussey Hill the Bluebeard Bush (*Caryopteris tangutica* Maxim.) is just coming into flower. Like many other members of the Verbena family its flowers are a beautiful soft blue and do not appear until late in the summer.

ARNOLD ARBORETUM

HARVARD UNIVERSITY

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Transplanting Spruces and Yews. Those visitors or students in the Arboretum who have faithfully followed development through the season may have noticed the recent transplanting of some Spruces and Yews to new locations, the object being to give an exposure more favorable to the known or probable requirements of the group, or to give more ground area for development. In the cases of some exotic Spruces, four to six feet high, it was sought to place them on a cool and not too dry north slope, in the Peters Hill section of the Arboretum, instead of upon the sunny southern exposure where they have made rather slow growth.

Those interested in Spruces in their native habitats, particularly where the trees extend their range on hills, in temperate or south temperate zones, as in the southern Rocky Mountains, must have noticed the healthy, dense spruce and fir stands on slopes facing the north, usually in marked contrast to the irregular and often depauperate growth on warmer slopes facing the south, this growth often being composed of other kinds of trees more adapted to hot, dry situations where Firs and Spruces would make poor development. While these conditions may be considered as the rule in nature, there are species which appear cosmopolitan and adapted to a wide range of soil and climatic conditions, a good example being the Norway Spruce (*Picea Abies* = *P. excelsa*) which has a natural range in Europe extending from the Pyrenees, in Northern Spain, and the Alps and Balkans, north to Norway, Sweden and western Russia.

Transplanting large Spruces in September and October, or later in mild weather, may be accomplished with every chance of success if proper care is taken in digging and handling. Lifting with a mass of soil about the roots of course is most advantageous. The plants in the Arboretum were lifted and transferred with about a square yard of soil or a ball three feet in diameter, and one and a half to two feet in depth. This secured a good mass of roots although many slender roots and rootlets were cut off and remained in the ground. Trees so planted should continue growth next spring with very little interruption. If the ground is very dry it is a good plan to wet it before digging and again to wet it after replanting. This treatment before digging will make the soil adhere better about the roots, and any exposed rootlets remain

covered with minute particles of earth which give a protective advantage. By wetting down the ground after planting the soil becomes better compacted about the rootlets. They are then better able to withstand winter conditions by functioning to take up water to replace that lost by transpiration through the foliage.

The Yews transplanted were a form of the well known Japanese Yew, *Taxus cuspidata*. This form has been given the name of *Taxus cuspidata Thayerae*, or Thayer Yew. It is a plant very recently added to the horticultural trade, although originating some years ago on the Bayard Thayer estate in Lancaster, Massachusetts. The original was a plant selected from many other seedlings raised from seed collected from several trees of the typical arborescent form of *Taxus cuspidata*, with central trunk and broadly conical form. From these seedlings a single peculiar form was selected which gave indications of being sufficiently distinct to have a value for horticultural purposes. This form does not develop a typical central trunk but has a low, wide-spreading habit, sending up many ascending branches which may become depressed or horizontal as they elongate with age; many of the branches forming supplementary roots where they rest upon the ground.

Taxus cuspidata Thayerae appears likely to develop stems six to eight feet or more in height and to spread indefinitely, so that if individual specimens are wanted plenty of space must be allotted to them.

Many plants were sent to the Arboretum from the Thayer estate in October, 1924, and these were reported to have all been raised from seed, not cuttings, collected from the original peculiar selected plant. The fact that these seedlings do not in any case seem to revert to the arborescent form but remain low and spreading like the selected mother plant, is very interesting. The plants show a vigorous growth and give promise of being a decided acquisition to the forms of *Taxus cuspidata* already in cultivation. Plants received October 1, 1924, were two or three feet high and measured about three feet in diameter through the branches. They are now from three to five feet in height and from tip to tip some of the plants spread across fifteen feet of ground. Specimens recently transplanted have been spaced about twenty-five feet apart, with the understanding that if the space allotted is found to be insufficient as the plants develop, intervening plants may be removed. If the central part of the plants continues to maintain a green state as the branches grow outward, it is easily conceivable that they will cover a surprisingly large area if unobstructed by other vegetation, and if they are not affected by unforeseen diseases.

Looking forward for fifty or a hundred years growth, so as to show possible development, is the reason for the recent transplanting of some of the plants in the Arboretum.

J. G. JACK.

Juniperus virginiana Growing on a Rock. About twelve years ago, children at play in a New England pasture carried to the summit of a large granite rock a small plant of *Juniperus virginiana* and without giving attention to a single one of the rules that are usually observed in transplanting Conifers, crowded its roots into a crevice. A little earth was laboriously supplied. The Juniper grew on year after year. It withstood



JUNIPERUS VIRGINIANA

Photographed at North Easton, Massachusetts, August, 1931,
by Professor Oakes Ames

the severe drought of 1930 and in the summer of 1931 was apparently in perfect health. It is now about ten feet high.

In July and August 1930 there were very few days when rain fell in sufficient quantity to penetrate the soil. The summit of the rock, seventeen feet above the ground, fully exposed to the scorching heat of the sun, would seem to have presented conditions of extraordinary aridity, yet the Juniper was able to obtain the moisture necessary for its need.

It is well known that plants transpire, that is, they give off water taken in by the roots, the process of transpiration taking place at the surface of the leaves. It is a relentless process in the life of a plant and the means of modifying it are severely circumscribed. The quantity of moisture giving off varies, of course, some species of plants giving off more or less than others. The higher the temperature the greater is the rate of transpiration. It has been ascertained that a plant of Indian corn, if kept moist at the roots, will transpire during the season of growth fully forty gallons of water, and a Birch tree with two hundred and fifty thousand leaves is said to have given off ninety gallons of water in a day. Perhaps a very clear conception of what transpiration signifies may be had if it is borne in mind that in the summer season an average leaf gives off an amount of water equal to its area and two-fifths of an inch (1 cm.) deep.

But how, we may ask, did the Juniper, seventeen feet above the ground on the top of a rock, exposed to the full heat of the sun in a time of excessive and abnormal drought, obtain the moisture needed for its survival? Henry Correvon in "Rock Garden and Alpine Plants" refers to rocks as being comparable to saturated sponges which soaked with water are reservoirs of coolness and moisture that Nature uses with due circumspection for watering and irrigation. A rock mass absorbs moisture and gives it off to the atmosphere and to the roots of plants. It would seem that this is the simplest explanation to satisfy curiosity regarding the capacity of a Juniper to survive on the summit of a rock under conditions of exceptional dryness.

OAKES AMES.

Plants of Current Interest. Because of the late frosts and fine weather, fall coloring has been at its best this year in the Arboretum. The early flame of Red Maple and *Cercidiphyllum* around the north meadow has come and gone and the finest coloring is now to be found in the neighborhood of Hemlock Hill. The color in that part of the Arboretum, heightened by the dark green background of the Hemlocks, is just approaching its best and should remain fine for another two weeks. The American Beeches are a brilliant yellow brown. Their English cousins, slower to color, are just turning from green to yellow. The small groups of Sorrel-trees or Sour-woods (*Oxydendrum arboreum*) are making a fine showing with their bright reds, yellows, and browns.

The current number of the English "Gardeners' Chronicle" (October 17) carries as a supplement a picture of *Fothergilla monticola* from a photograph taken in the Arboretum. It is interesting that just at the moment when their picture is being featured in a London journal, these same shrubs should be showing the very height of their fall color.

ARNOLD ARBORETUM
HARVARD UNIVERSITY
BULLETIN
OF
POPULAR INFORMATION

SERIES 3. VOL. V NOVEMBER 16, 1931 NO. 17

Hybrid Trees. There died last year in Ireland an old friend of Professor Sargent's and of the Arboretum, Augustine Henry, a man of whom it could well be said that he lived two lives. Going out to China as a young medical officer in 1880, he turned his spare moments to the study of plants and became foremost among those plant collectors who have made available the botanical and horticultural treasures of western China. Returning to Europe, he took up the study of forestry and at the age of fifty boldly pioneered into an entirely new field and became the world's first tree breeder.

At the University of Cambridge and later at Dublin he carried on the first comprehensive series of experiments in creating and studying hybrid trees. He travelled back and forth across England studying the peculiar Elms which had from time to time appeared in English gardens and which had puzzled botanists. He grew over five thousand seedlings from these quick-growing garden varieties of Elm and succeeded in showing that they were actually species hybrids and that their progeny behaved as the progeny of such hybrids are known to do. Having demonstrated that trees could hybridize and that the hybrids were vigorous and quick-growing, he was at once interested in the possibility of producing hybrid forest trees.

He made crosses between different species of Larches, Poplars, Oaks, Beeches, Walnuts, Ashes, and Alders, and created many new hybrids. The actual technique of crossing trees is far from simple. A cross cannot be made unless the tree is of flowering age, and even then many species do not flower at all regularly in cultivation. The female flower must be protected from contamination until it is ready to be fertilized. Then pollen collected from the male parent must be applied. Often the two species it is desired to cross do not flower at the same time and so for many of his crosses Henry had to send to more southern gardens for pollen of the later-flower-

ing species. Henry solved all these technical difficulties. Working from gigantic step ladders he (or his assistants) covered the female flowers of one species with paper bags to protect them from natural pollination. When they were mature, pollen was brought from other species and carefully applied to the stigmas of the female flowers. Then began long watchful care, first of the developing fruit, then of the seed, then of the helpless young seedlings, until they were well under way and could be set out in nurseries.

He not only made many such experiments himself but interested others in collaborating with him in the work. His previous experience as a plant collector and as junior author of the monumental "Trees of Great Britain" had put him in touch with tree experts all over the world. He used these contacts to help him in his new work. So we find him writing to Professor Sargent for pollen of the American Beech and sending to Portugal and to the gardens of the Trianon for pollen of species of American Ash which he wished to cross with the earlier-flowering English ones. Whenever a fruiting specimen of an exotic tree grew in close proximity to an allied native species he was quick to realize the opportunity for natural crossing between them and was instrumental in having seedlings raised in large numbers and carefully inspected for possible hybrids.

The importance of his work lies not so much in the actual hybrid trees which he created as that he made a good beginning in an unknown and difficult field. If the world was ever to learn to what extent trees might be hybridized and how profitable such hybrids were likely to be, it was important that a start should be made. Even the quickest trees are slow-growing and tree breeding experiments must extend over centuries. With his vast knowledge of the trees of the world and his detailed information as to what trees of fruiting age were available in public and private parks for actual experiment he was able to accomplish much during the last twenty-five years of his life.

It is even yet too early to appraise the actual hybrids for which he was responsible. One of them, the "Dunkeld" Larch (*Larix eurolepis* = *L. Kaempferi* × *L. decidua*) has already interested foresters in a number of countries and is the subject of extensive experimentation. It is not one of the hybrids which he actually made himself but is rather the result of his ability to enlist the interest and cooperation of others. On the estates of the Duke of Atholl at Dunkeld, Perthshire, Scotland, was a large fruiting specimen of the Japanese Larch (*Larix Kaempferi*) with many European Larches (*L. decidua*) also of fruiting age, growing nearby. At Henry's suggestion, seedlings of the "mother Larch" as it has since been called, were planted in large numbers. Many of the seedlings fulfilled his expectations and were unlike the mother tree but were hybrids, the result of natural cross-pollination between these two species of Larch.

As is usual in such cases they proved to be intermediate in appearance between the parental species from which they came but were much more vigorous and quicker growing than either. In other words they had that curious quality known technically as "hybrid vigor", which makes the mule, for instance, a valuable hybrid, even though it is perfectly sterile and cannot be used for breeding purposes. The hybrid Larches would have interested foresters if only for their extra vigor and speed of growth but in this particular hybrid there was even a more useful combination of characteristics than there is in either of the pure species from which it came. Ostenfeld and Larsen, in their recent monograph of the Larches, describe the hybrid as follows: "It is an easily recognizable form, intermediate between the two widely different parent trees. The cone is more cylindrical than that of *L. Kaempferi*, the cone scales being at the same time less recurved. The one-year shoots are something between the reddish-brown stout shoots of the Japanese Larch, and the light-coloured slender shoots of the European species. In the seed bed, one-year plants of *L. Kaempferi* are distinguishable by being considerably smaller than those of *L. decidua* and in this particular too the one-year hybrid plants occupy an intermediate position. From the forestry point of view, the European Larch has a better shape, but it is on the other hand, extremely susceptible to the attacks of canker (*Dasyctypha Wilkommii*), which the Japanese Larch is not. The hybrid combines the good shape of the one and powers of resistance against canker of the other, and is therefore now the subject for larger experiments in forests. The second and third hybrid generation has also been raised, and is now being experimented with".

The Arboretum has a fine specimen of this hybrid, *L. eurolepis*, which came as a small plant from the Duke of Atholl (then the Marquess of Tullibardine) in 1910. In the 20 years since that time it has made a remarkable growth and is now a sizable young tree. It has fruited heavily for several years. The accompanying plate shows a typical cone, compared with the cones of the two parental species. As can be seen from the illustration it is almost exactly intermediate between the cones of the two parents. The scales are neither strongly reflexed as in the Japanese Larch, nor straight as are those of the European species.

Like many other hybrids, *L. eurolepis* matures its fruit earlier in the year than does either parent. When the cones for the illustration were gathered in early October neither those of the Japanese Larch nor of the European Larch were fully ripe, while the slightest touch of a branch on the hybrid tree brought down showers of larch seeds. It will be seen from the illustration that the scales on the hybrid cone have opened out a little more fully than have those on the other two cones.

Most of the hybrids created by Augustine Henry did not fruit during his life time. And so it must inevitably be if one is to hybrid-

ize organisms which are slower to mature than is man himself. Such work must become the aim of institutions rather than of a single individual, and so the Arboretum is very properly interesting itself in hybridizing hardy woody plants. Experiments with forest trees and flowering shrubs are already under way here. It is by no means the only center in the country where such work is being done. Here and there a number of people (many of them unaware of what is being done elsewhere) have undertaken to hybridize trees. Unfortunately for those who are studying the subject, there is little published information in regard to what crosses were made and what measure of success attended them. Publication was usually deferred until the hybrid trees should have reached maturity and by that time their originator had usually gone elsewhere.

Sometimes the information does exist but in unsuspected places. Dr. A. F. Blakeslee, for instance, did some very interesting pioneer work in hybridizing Pines when he was at the Storrs Experiment Station. Apparently, however, the only printed account of the experiment is in the report of a speech made many years later when he returned to dedicate a new laboratory.

Here and there throughout the country there must be a number of hybrid trees which were brought into being some time ago and were then more or less forgotten. Some of them would be very useful in experimental work and might make possible the study of second generation hybrids. Most of them would yield valuable data. The Arboretum will be grateful for any information about such artificial hybrids and will be glad to keep in touch with gardeners, scientists, and amateurs who have made (or are making) experiments in hybridizing trees.

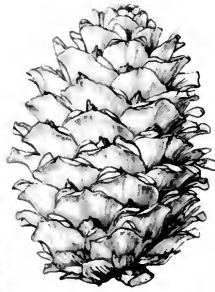
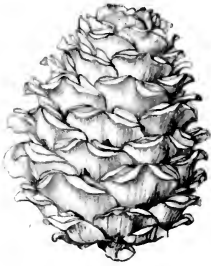
EDGAR ANDERSON.

SUPPLEMENT PLATE.

Cones of the Dunkeld Hybrid Larch and of its parent species seen in side view, natural size.

(*Drawing by Blanche Ames Ames.*)

LARIX
Kaempferi



LARIX
eurolepis

LARIX
decidua



ARNOLD ARBORETUM

HARVARD UNIVERSITY

BULLETIN

OF

POPULAR INFORMATION

SERIES 3. VOL. V DECEMBER 10, 1931 NO. 18

The Cambridge Washington Elm. During the past year the mail and telephone have brought to the Arboretum many inquiries regarding the so-called "Washington Elm", a specimen of the American or White Elm (*Ulmus americana*), which grew in Cambridge, Massachusetts, and has been regarded as having close historic association with the movements of General Washington when he visited Cambridge in July, 1775. The last appearance of life in the tree does not appear to be definitely recorded, but we know that it finally fell to the ground October 26, 1923, after being for a long time a menace to the public because of its decaying condition. Its demise must be attributed simply to old age and disease hastened, no doubt, by modern street construction.

Most of the inquiries, referred to above, have been with regard to the plants now offered by several nurserymen who have used the word "patriotism" freely in their seductive advertisements. These dealers insist that the plants they offer have been propagated directly from the original tree which stood on Garden Street, bordering Cambridge Common, or were propagated from trees a generation once removed, in all cases the propagation having been effected by division and not by seeds.

The inquiries have mainly taken the form of questions regarding the genuineness of the plants offered as progeny of the tree which has been popularly associated with General Washington. Unfortunately there is no absolute proof that Washington either "assumed command" of the "American Army" under the shade of this tree, or that he noticed it or cared for it; and there is certainly very much doubt with regard to the authenticity of the origin of some of the offerings made by professional nurserymen. These men work on the credulity or ignorance of their clients whose patriotic feelings they capitalize by charges of high prices for plants which practically cost little, if any, more than ordinary propagated material.

That the stories regarding the tree are largely founded on sentiment and tradition, rather than on facts, appears to be borne out by historical

data. These accounts are widely scattered and, of course, are often apparently contradictory. It would be too much of an undertaking to attempt to reproduce the most important of these records in this Bulletin. Anyone interested in the facts or traditions will find a very good résumé of the evidence in a letter compiled by Samuel F. Batchelder, printed in the Cambridge (Mass.) *Tribune*, in December, 1923, and afterwards reprinted as a pamphlet, in 1925, under the title "The Washington Elm Tradition—Is It True?" The available records are here well analyzed and give us a partial picture of how history is made. In the latter case a quotation from the pamphlet is especially interesting in its connection with the Elm.

"A typical account of the fully developed (traditionists') vision is in the 'Diary of Dorothy Dudley' under date of July 3, 1775:— 'Today he (Washington) formally took command under one of the grand old elms on the Common. It was a magnificent sight. The majestic figure of the General mounted upon his horse, beneath the wide spreading branches of the patriarch tree; the multitude thronging the plain around, and the houses filled with interested spectators of the scene, while the air rang with shouts of enthusiastic welcome as he drew his sword and thus declared himself the Commander-in-Chief of the Continental Army ' As for 'Dorothy Dudley's Diary' almost everyone knows by this time that it is a literary forgery—and not a very clever one at that—written for the centennial anniversary volume entitled '*The Cambridge of 1776*'. Its whole phraseology is obviously modern, and it is full of small inaccuracies. In this passage, for example, the only house nearby was the Moore house, built about 1750, where the Shepard Church now stands: as Cambridge had been virtually deserted by its inhabitants there could have been no thronging multitude of spectators: and the army was not then the Continental Army but the Army of the United Colonies. All the same the passage is worth repeating to show the traditionists' state of mind. It is just the sort of thing which our school-children have been fed up with for generations Moreover, to clinch the effect of the printed word, the most outrageous pictures have been published in the history books, especially the school histories issued during the middle of the last century. In these pictures the artists have allowed their historical imaginations to run amuck. Prancing steeds, dipping colors, dear little drummer boys, long rows of troops aligned to a hair's breadth, gorgeously uniformed, and presenting glittering arms with fixed bayonets, thrill every youthful heart, while smack in the middle of the front rank stands the Elm, with just room for Washington, flourishing his sword, to ride between it and his immaculate warriors What child after devouring such a scene could doubt the tradition for the rest of his life?"

Much more might be quoted but enough is given to show that there is a serious element of doubt about the connection of the tree with this stirring event on July 3, 1775. It will be noted that the discredited "Diary of Dorothy Dudley", quoted above, states that Washington "formally took command under one of the grand old elms on the Common" and describes the tree as a "patriarch" with wide spreading

branches. No specific tree is here mentioned among a number of good sized elm trees which then existed on the area known as the Cambridge Common. While the sentimentalists and traditionists have referred to the Washington Elm as a venerable or patriarchal tree, and would have us think of it as a hoary wide branched monarch of its kind, it is worth while to consider the actual facts as to its age. After the tree fell, on October 26th, 1923, Irving W. Bailey, Professor of Plant Anatomy in Harvard University, an expert in plant growth and wood structure, carefully examined the trunk and sections of the wood and arrived at the conclusion that when it fell it was between 204 and 210 years old. (See Cambridge Park Department Report for the year ending in March, 1924.) Granting that the age was the higher figure it would appear that this tree was about 62 years old when Washington assumed command of the Colonial troops, or, if we accept the lower figure we have a tree 53 years old. This certainly is no great age for a White Elm (*Ulmus americana*). Professor Bailey found that in 1775 the trunk of the tree was at least 24 inches in diameter at 30 inches above the ground. Two inches more may be allowed for thickness of bark, so that the total circumference at that time was less than 8 feet.

As already stated the sentiment and tradition built up about this tree have recently been capitalized in a commercial way by a number of nurserymen or dealers in plants. One of the most glaring cases, which deserves to be classed as extremely misleading, or meriting a stronger term of condemnation, is exhibited by a circular of four pages, issued by an enterprising dealer in Chicago. In this illustrated advertisement we are told again "Here, under that old Elm, on July 3, 1775, Washington assumed command of the 'rebels and farmers' that made up the American Army. Under that old Elm nine thousand militiamen renewed their allegiance to the Colonies and to the new Commander-in-Chief". It is further described as a "stately Elm" for "close to two centuries", as though it never had had a vigorous juvenile period of growth.

In this circular we are told that the propagator and salesman, who describes himself as an "Elm tree specialist", "secured cuttings from the famous and historical Washington Elm", and that from these he "was able to propagate a limited number of trees that are now from 6 to 8 feet high. The fact that they are direct descendants of America's most famous tree removes entirely the thought that they are mere Elm trees." The term "direct descendant" as used here, and by another nurseryman referred to below, is misleading, as the implication conveyed to the average mind is that the propagated material came directly from the Washington Elm, whereas, in both enterprises, the living buds used by the propagators were *not* taken from the historic tree itself but were from a generation once or twice removed, with no proof that these generations were authentic or true relatives of the original. In the case of the Chicago dealer the actual or admitted facts are that the young trees offered were grown from scions or twigs sent to him early in October, 1927, four years after the fall of the original tree, through the friendly offices of a Boston journalist who secured them

from a plant in Wellesley reputed to have been propagated from the original tree before it died. The method of propagation was by budding according to a statement by the nurseryman offering these trees. The price asked is twenty-five dollars per tree, including a small bronze tablet or marker.

It is adroitly suggested by the vendor that the trees are suitable for planting on school and public grounds, parks and similar places, as well as by patriotic societies. In an advertisement in one of our horticultural magazines he also makes a "special offer" to D. A. R. Chapters, and we are told also how to make the planting of such trees a "civic event" with appropriate "planting ceremonies" and how to "finance the project".

Another nursery concern, with headquarters in Massachusetts, is offering Washington Elms, grown by grafts from trees which are said to have been propagated from a tree which we are told was started as a scion from the old tree and was grafted at the Arnold Arboretum, and later sent to Wellesley, Massachusetts, where it was planted with other White Elms. It was not permanently labeled at the time of planting and it was some years later that a resident, now dead, of the town hesitatingly pointed it out as the particular tree. It was then given a fixed, distinctive label. There is no *proof*, however, of the correctness of the identification of the tree at Wellesley or of the validity of the origin of the second or the third generation.

The scion from the old tree was undoubtedly grafted upon White Elm stock. If the scion died or was broken off, which all plant propagators know is something which occasionally happens, it would probably be supplanted by a healthy sprout from the stock which might easily be more vigorous than a scion from the decadent old tree.

In this Massachusetts nurseryman's circular we are told that the famous elm "was a large tree when Cambridge was first settled", and that it is described in the "Harvard Book" as having a trunk "over 18 feet in circumference".

If the famous Elm was "a large tree when Cambridge was first settled" (in 1630) and when measured, presumably in its best condition, was "over 18 feet in circumference", is it not a curious circumstance that its own record shows that it was less than 8 feet in circumference in 1775, over 140 years later? And if the Washington Elm was 210 years old when it died and fell on October 26, 1923, there would appear to be a remarkable discrepancy between the human accounts and the natural records kept by the tree, which would seem to show that, as a matter of fact, *the seed of the Washington Elm had not been produced or the seedling started into life for nearly a hundred years after Cambridge was first settled!*

The plant said to have been propagated from it and growing in Wellesley is described in this Massachusetts nurseryman's circular as "now a beautiful, large tree growing on the grounds of the Public Library". As a matter of fact, if anyone should go to see the labeled tree at Wellesley he

would find a rather unkempt specimen between 30 and 35 feet in height and 26 inches in circumference (between 8 and 9 inches in diameter), breast high, apparently about 28 to 30 years old. Other White Elms of about the same age, in the same vicinity, are twice as large, but they all appear as if of the same parentage.

Grafted plants of the next generation of this Wellesley tree, one foot high, are offered to the patriotic public at five dollars each! And with each is given a label and a numbered certificate signed by the President of the company, which assures the purchaser and his or her heirs that the tree is a "direct descendant of the Washington Elm", although earlier in the advertisement we are told it came indirectly, or two generations removed. There is no known record of seedlings ever having been grown from this tree.

If a Washington Elm is budded or grafted upon the stock and root of another Elm, upon which it depends for its life, should it not be classed as a dual organism rather than a fundamentally pure successor of the original organism?

The anniversary of the 200th birthday of George Washington, in 1932, could be much more fittingly, permanently and usefully marked by the establishment of community forests rather than by high priced trees of doubtful history.

J. G. JACK.

Plants of Current Interest. Among the trees or shrubs noted in the Arboretum as showing flowers on November 26th (Thanksgiving Day), after an autumn remarkable for very light and very few frosts, the following may be mentioned: *Prunus subhirtella autumnalis* had many of its small, pretty, semi-double, pink flowers scattered among the nearly leafless twigs. It has been producing such flowers for several weeks. Unless the winter is very severe it will continue to bloom in the spring, for there are innumerable firmly closed flower buds which will withstand ordinary winter conditions.

Some Forsythias, such as *F. suspensa* and *F. intermedia* have many of their bright yellow flowers scattered over the branches.

Some forms of Japanese Quince (*Chaenomeles lagenaria*), were bearing many blooms.

Lonicera fragrantissima and *L. Standishii* bore occasional samples of their sweetly scented whitish flowers, as they usually do every mild time in late autumn.

Some plants of the common native Witchhazel (*Hamamelis virginiana*) in the woods still carry some of their golden yellow flowers; two open flowers were found on the winter or spring flowering Chinese Witchhazel (*H. mollis*), and some plants of *H. vernalis* from Missouri and adjoining southwestern regions showed many of their delicately fragrant honey yellow blossoms while other plants of the same species appeared closely dormant.

Erica carnea is well known as a little rock garden or border Heath which, in sheltered places, may be found producing its spikes of small rosy-red flowers in late autumn, in mild weather in winter and in early spring. At this time it shows many of its pretty little flowers. *Erica darleyensis*, a hybrid between *E. carnea* and *E. mediterranea*, and which appears to be a more vigorous plant than *E. carnea* is also blooming freely, on some plants. If not injured in winter its spikes of little rosy-red flowers should be among the first to brighten the rockery or shrubbery plantation.

J. G. J.

ERRATA

- Page 56, line 9 from bottom *for* Riverside Park *read* Forest Park.
 Page 58, line 7 from bottom *for* C. C. Laney, Commissioner *read* P. Slavin, Director.
 Page 62, line 12, *for* the typical arborescent form of *Taxus cuspidata*, with central trunk and broadly conical form, *read*, *Taxus cuspidata nana*.
 Page 64, line 7, *for* need *read* needs.
 Page 64, line 12, *for* giving *read* given.

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