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ILLUSTRATIONS

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ARNOLDIA



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

VOLUME 6

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SPRING IN 1946

THERE is every indication that spring will be early this year, but just how early it is difficult to say as yet. *Magnolia stellata* growing in front of the Administration Building in the Arnold Arboretum usually is in full bloom on April 15. On March 28 of this year their flowers were fully open, only to be frozen on the night of March 30. One other definite indication of an early spring is the early appearance of the small green leaves on a weeping willow opposite the Administration Building. This tree has the peculiar faculty of turning green almost overnight in the early spring. Dates on which the green leaves have appeared during the past few years are as follows:

- 1940 — May 1
- 1941 — April 15
- 1942 — April 6
- 1943 — April 28
- 1944 — May 1
- 1945 — March 27
- 1946 — March 27

The trouble with an early season in New England is the fact that usually warm weather in March and April is followed by a cold spell, frequently including disastrous frosts. Last year the New England fruit crop was ruined, and there were less fruits on many kinds of trees and shrubs growing in the Arnold Arboretum than there have been for many years past. This year, even though the spring was off to an early start, heavy frosts followed record-breaking high temperatures. On the night of April 1, an inch of snow and sleet with thunder and lightning, all came at once as if to prove to anxious gardeners that Mother Nature herself was undecided what to do about the weather. Unfortunately, there is no way we can circumvent an early spring, but all of us interested in growing ornamental plants for display purposes (and commercial fruits for best production) certainly

hope that the spring will not be too early and that later frosts will not be too severe.

There are a few changes on the Arboretum grounds this spring, and these need to be explained so that the visitor who knows the area well will understand what is taking place. It must be realized that during the war years it was impossible to obtain all the labor necessary to keep the collections in good condition, much badly needed maintenance work having had to be deferred. Because of this, broken branches and poorly maintained shrubs are evident on every side. We have now been fortunate in adding four new men to our maintenance force, one of them an experienced tree pruner. The Assistant Horticulturist, Mr. Heman Howard, and the Assistant Propagator, Mr. Alfred Fordham, recently released from the Army, are back to lend us their vigorous assistance as well. Under the competent direction of Mr. Robert G. Williams, the Superintendent, the maintenance force has become a more energetic one than before the war, and this is well, for much of the plantings need vigorous treatment. It will not be possible to bring the collection back into perfect shape overnight, and visitors who are accustomed to seeing perfectly grown specimens in the Arboretum should realize this. However, with an invigorated force (and plenty of work piled up ahead) we hope to be able to improve the collections greatly in the months ahead.

Vines

The vine collection has been renovated and we hope will soon be in a much better condition than it has ever been. It was always sadly crowded. The only apparent method of overcoming this was to eliminate most of the grape species and varieties and give the truly ornamental vines more room for proper growth and display. The *Vitis* collection has been repropagated, and when the plants have grown to suitable size, a place will be found for them on some of the walls or fences bordering the Arboretum property.

The entire vine trellis has been rewired and vigorous growing species and varieties have been transplanted so that one vine will now occupy the entire space between two posts, making the maintenance of these vines much more simple, and giving each vine sufficient room so that it will be able to grow better and flower and fruit normally. It is admitted that the honeysuckle vines are not well represented in this collection. We have been accumulating these during the past few years and have a representative group growing well in the nursery. The logical place for them is along the Arborway wall, where they will have some winter protection and plenty of support. It is hoped that, within the next year or two, we can eventually plant a good collection along this wall, but this will not be done until we can care for it properly.

The Shrub Collection

The entire shrub collection consisting of nearly one thousand different plants is responding markedly to the "rejuvenating program" adopted for it a few years

ago. With the elimination of every other grass path between the long lines of shrubs, machine cultivation is greatly reducing the amount of hand labor necessary to care properly for these plants. Lime and fertilizer have been generously applied to the soil, vigorous pruning has greatly reduced their general overgrown appearance, and some, of necessity, have had to be severely cut back. Nevertheless, the plants are now in a much better condition than at any time since the beginning of the war. The reduced number of grass paths does not in any way hinder close inspection of each and every plant, and, what is most important, the reduction of hand hoeing in this large collection allows more time for proper care of the plants.

Pruning

It was impossible to obtain the services of an experienced tree pruner during the war years, and many stubs and broken branches remain as mute evidence that we were unable to care for the trees properly because of this situation. Now we have a well-trained man who is able to climb trees and who knows how to prune them properly without constant supervision. The amount of work ahead of him is tremendous, but it is highly probable that, within a month or two, the casual observer may not notice too much amiss with the more conspicuous trees. There will be many long months of work ahead of this pruner; painstaking work, a great deal of which will not be seen nor appreciated by the majority of Arboretum visitors. For the first time in many years it is now possible to provide once more for the proper and intelligent pruning of trees. Once the trees are in good condition, it will be much easier to keep them so by providing the consistent attention they had in earlier years. It must be pointed out, however, that pruning neglected in the war years cannot be accomplished in a few short months. Visitors who see the plantings off the main walks will become aware of the tremendous amount of work ahead in this field. We realize the situation, but with the excellent progress already made since March 1 of this year, we can foresee the time in the not too distant future when the pruning neglect of the war years will be just another memory of that unsettled period.

Trees are not the only plants in need of attention. The lilac collection, consisting of *over 600 plants* (with five hundred more in the nurseries) has not been properly pruned for the past six years. Anyone who grows lilacs will understand what this means, for the numerous suckers and dead branches which will appear in that length of time in such a large collection constitute a real maintenance item. Time for doing some of this may be available before these plants bloom this spring, but the apparent earliness of the season seems to indicate that some of this will have to be done later. At least we may expect to be able to take care of the more conspicuous cases.

Half-hardy Plants

For many years it was the policy of the Arboretum to grow every species and

variety of woody plant which will live out of doors in New England's fickle climate. This, up to the last year, included a considerable group of half hardy shrubs which would exist for a few years, only to be killed by a severe winter. Such plants are usually in very poor condition at all times. They necessitate considerable care and repeated propagating and even then are not what one might call "good specimens."

Consequently, last year it was decided that, after a thorough test, if a plant proved itself to be consistently in this half hardy group, it would not be maintained in the collections. Ample notes are recorded regarding each species, the number of times it has been tried, propagated, and the number of times it had failed, and the various situations where it had been grown. If it failed to be "dependably hardy"—hardy except in the unusually severe winters—then it was marked for elimination. In each case a serious attempt will be made to see that it becomes thoroughly established in an area with a milder climate, so that the species involved will not be lost to cultivation.

DONALD WYMAN

NOTE

Dr. E. D. Merrill, Director of the Arnold Arboretum, has received an expression of appreciation from the War Department for services rendered as Consultant to the Secretary of War in the Army Medical School, in connection with its specialized training program in tropical medicine. He has also received the following recognition from abroad: he has been elected a foreign member of the Royal Swedish Academy of Sciences, Stockholm, to fill the vacancy caused by the death of Dr. L. Diels; and, he has also been elected as an honorary member of the Botanical Society of Edinburgh.

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TREE PEONY

"The tree peony is yet rare in our gardens. It is too slow for us Americans, we must have something like a verbena, which can be had in full bloom and sells cheap." Thus wrote that great New England gardener, Hovey, in 1864. He had been writing about these same plants in the American Gardeners' Magazine and Register for 28 years with the hope of popularizing them; apparently he was getting discouraged.

Mr. B. M. Watson, who taught horticultural classes in the old Bussey Institute, used to tell his pupils that the tree peony was the most beautiful flower in the world. Yet he knew only a few of the older kinds. What could he have said had he lived to see the magnificent varieties of today!

The tree peony has been in cultivation in this country for nearly a century and a half. Collections of 25 or more named varieties were exhibited at flower shows at both Boston and Philadelphia 120 years ago, yet what Hovey wrote so long ago still remains true. Our gardening public flocks to the cheaper, quicker things.

The oldest and largest of the public collections in this country is at Highland Park in Rochester. John Dunbar brought named varieties from Japan in the early 90's. The plants were grafted on wild *Paeonia suffruticosa* stock and did not long survive, but Dunbar saved the seeds and there are now some 5000 seedlings to be seen in the Rochester Parks. They have a fairly good color range, but most of them are not equal to the finest named varieties of the day.

The collection at Swarthmore College has fewer plants but has over 200 of the finest varieties. These plants are now 10 and 15 years old and give spectacular bloom each year.

The name "Tree" peony is unfortunate for the plants are quite dwarf shrubs. They grow ordinarily not more than 4 or 5 feet in height though occasional plants are to be seen up to 6 or even 7 feet. The term "Tree" has long been

used to distinguish them from the herbaceous peonies which die to the ground each winter. Commercial propagation nowadays is by grafting on herbaceous peony roots, which do not sucker to any extent, and which seem to support the new plant well, although not every one of the plants will eventually have the desirable trait of growing on their own roots.

Planting should be done in the autumn, preferably about the middle of October. They must be given a well-drained position; soil should be dug deep and have plenty of plant food. Occasional applications of ground limestone are beneficial in acid soil regions. Little pruning is necessary except to cut out old or weak stems. In some places the plants ought to be covered in winter with straw or burlap to prevent rabbits from eating the young shoots.

The color range of tree peonies is from pure white through pink, scarlet, crimson, purple, magenta and lilac pink. It is one of the most remarkable color ranges of any garden plant.

When the expression "tree peony" is used it ordinarily refers to varieties of *Paeonia suffruticosa*, the wild home of which was only discovered in western China quite recently although the tree peony had been an inhabitant of China's gardens for over 15 centuries. The wild plant is a single magenta purple and it has a white form with some purple flecks in it. The old Chinese gardeners loved heavy double forms and propagated these and it was varieties of this group which first came to western Europe in 1787 and to this country about 1800.

Many American gardeners do not care much for these heavy double forms which hang their flower heads down in the foliage. The color selections in this group also are not particularly pleasing to American tastes and of the more than 100 varieties of these that I have grown I have retained only very few, the best of them being "Reine Elizabeth," "Carolina d'Italie," "Souvenir de Ducher" and a few others.

The tree peony was taken from China to Japan by Buddhist monks in the 17th century. Japanese gardeners have developed single and semi-double varieties, which I very much prefer to the Chinese ones. They seem to be a little more finicky in their requirements than the Chinese kinds and perhaps for that reason are not so well known. I recommend them to all American gardeners, who are not in the class described by Mr. Hovey, and who are willing to pay a fair price for a plant that is expensive to produce and are willing to wait for it to develop properly.

Plants of named varieties of Japanese types are now available in a few American nurseries, the prices range anywhere from \$3 to \$10 apiece, depending on size, and this price, I believe, is a very reasonable one as the plant is increased slowly and with considerable difficulty.

It would seem to me best for most American gardeners to buy Japanese tree peonies from specialty growers and to give the order by color desired rather than by name, as the quantities of some of the named varieties are so small that

it is not always possible to get just the variety one wants. A list of all varieties in American commerce with cross reference to the nurseries which have them was published by the American Peony Society in September 1944.

All the peonies I have mentioned are commonly called moutan peonies, the name being derived from the old Chinese word for peony. There are coming into commerce now, however, hybrids between these moutan peonies and the more recently discovered species from southern China, *Paeonia lutea* and *Paeonia Delaveyi*. These peonies, discovered by French missionaries in the 1880's were sent to Paris where they attracted the attention of Professsr Louis Henry of the Paris Museum of Natural History. He made crosses which resulted in a variety now quite well known among peony experts, "Souvenir de Maxine Cornu." It is a heavy double yellow with red and magenta markings and to me it looks much more like a dahlia than a peony and I do not care much for it. It has sold in this country in the past few years for as much as \$65 for a small plant just because it is so unique. The Lemoines took up this cross and produced quite a number of varieties both single and double, the best known of which are probably "La Lorraine," "Flambeau," "Surprise" and "Alice Harding." Now we are getting magnificent new hybrids in this group from Professor A. P. Saunders of Clinton, New York. His first introduction, "Argosy," is beginning to be quite well known in gardens. Among his newer varieties which are not yet widely distributed and which can be had in only very small quantities, there may be mentioned "Banquet," "Black Pirate," "Festival," "Roman Gold," "Siver Sails."

These hybrid peonies are very vigorous in our climate but may not be quite so hardy in the extreme North. They bloom in the Philadelphia region in the last of May which is about two weeks later than the moutan peonies which usually come in mid-May.

Tree peonies have been so little grown that relatively little is known either about their cultural requirements or their climatic adaptability. There are fine ones in Boston and other parts of New England, splendid ones in central and western New York and in New Jersey, eastern Pennsylvania, Delaware, Maryland down to Washington, D.C. They are probably not so hardy in the middle west although I have seen them in Chicago and there is quite a collection of them in the park in Milwaukee and an occasional report comes in of plants in Minnesota. They are thoroughly hardy to 20 degrees or so below zero and beyond that we do not know exactly what they will or will not stand.

I do not know how well they will do in the regions south of Washington, D.C. In general they seem to be more subject to spring frost injury in mild climates because it is their habit to start growth extremely early. In some of these milder climates they might begin their growth in January and then be ruined by February frosts. Each year when the buds come out in the spring I wonder if they will be nipped by frost but I have had good flowers from plants with quite large buds when the thermometer dropped as low as 28 in mid-April. Only once since

I have been growing tree peonies has the entire crop been ruined and that year practically all spring flowers including lilacs were caught.

The Japanese, who have developed so many beautiful varieties, evidently feed their plants quite heavily. I have been rather afraid to do that here on the theory that the quick growth would be soft and more subject to disease. The only serious trouble I have had with my plants has been botrytis. It seems to be worst in seasons with alternating hot and cold weather when whole branches will suddenly wilt and die overnight. These branches should be pruned off well below the affected part and burned to prevent the spread of the fungus. It is said that the regular spraying with Bordeaux mixture will prevent this trouble but my experience is too limited from which to draw conclusions.

I allow the seed to ripen each year so that I can plant seed as this is a fascinating experiment to see if superior new forms can be obtained. I find that many of my seedlings have poor colors and hence they are discarded but occasional good whites and pinks and reds turn up and they are much appreciated. Commercial propagation is by grafting on the roots of the herbaceous *Paeonia albiflora* in August. Experiments are under way in suggesting new methods. One of these is storage of grafts in warm vapor to hasten the callous. The Boyce Thompson Institute has done some work on tree peony seeds in reference to temperature for after-ripening and work has been done at Cornell on embryo culture. All these are still in the experimental stage but may make propagation methods more certain in the future. As far as I have record no one has been able to root cuttings to any great extent. Occasional reports come in of successful layering.

For more detailed accounts of the tree peony I would refer the reader to the manual of the American Peony Society published in 1928 and to the bulletins of the American Peony Society, particularly the September 1944 number.

JOHN C. WISTER*

Secretary, Pennsylvania Horticultural Society

* Editor's Note: We are greatly pleased that Mr. Wister wrote this article for *Arnoldia*. He has been growing tree peonies for many years and so is well qualified to give us information about them.



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THE GARDEN CLUB OF AMERICA TOURS THE
ARNOLD ARBORETUM MAY 15, 1946

THE Arnold Arboretum of Harvard University is fast approaching its best today. Azaleas, crab apples, lilacs and hundreds of other plants are vying with each other to attract attention. The spring, a most peculiar one, at first, abnormally advanced blooming dates, but later, because of several weeks of cold weather, the blooming of many species was retarded so that today the season is just about "on time."

The Arnold Arboretum, established in 1872, has long been outstanding in the introduction of new plants from all parts of the world. Many of its introductions are now common in nurseries throughout the land. At present there are approximately 6,000 different species and varieties of woody plants growing within its borders. The famous garden of woody plants is not the only important feature of the Arboretum. It also maintains a library of more than 46,000 volumes dealing chiefly with woody plants, and an herbarium of 640,000 mounted specimens, limited to woody plants. The garden, the library and the herbarium, each one of which has earned world renown in its own field, all constitute the Arnold Arboretum; and these are supplemented by the greenhouse laboratories.

Time does not permit a thorough examination of each one of these parts of the Arboretum. The garden of plants, made so famous by the painstaking effort of its first director, Charles Sprague Sargent, and also because of the many new plants it introduced through the efforts of Ernest H. Wilson, is now at its prime, and the Garden Club of America tour will be entirely taken up with the observation of these many wonderful trees and shrubs.

The first color to be noted as one enters through the Jamaica Plain gate and passes the Administration Building, is a planting of the pinkshell azalea (*Rhododendron Vaseyi*) beside the road a little beyond the linden collection. A native of the southeastern United States, this azalea does very well in the Arboretum, and is especially valued because its leaves turn red in the fall. A walk through the woods at this point is most invigorating for here are planted hundreds of the torch azalea (*Rhododendron obtusum Kaempferi*) one of the many outstanding orna-

mental plants the Arnold Arboretum has introduced to this country. Walking through the famous collection of 137 different kinds of maples, the sentry maple (*Acer saccharum monumentale*) and the columnar form of the red maple are prominent. To the average visitor the maples are merely a group of common trees, but on close examination one is surprised at the large number which have been collected from other parts of the world and which can be grown in this climate. The maple collection merely exemplifies what is true of many other groups of plants, namely that many species and varieties are growing in the Arnold Arboretum, not all with outstanding ornamental value but with some of considerable merit that have never been grown and offered for sale by commercial nurseries.

Leaving the maples, one comes into the shrub collection, containing nearly one thousand different kinds of shrubs, growing in long lines where they can be readily cared for and where each group of plants is kept growing fairly close together. This affords an excellent opportunity for comparing the different species and varieties in a genus. A majority of the honeysuckles, quinces, spireas, currants and rose species will be found growing here. Special attention might be given the yellow roses shortly to be in bloom. *Rosa primula* is first to bloom, closely followed by *R. Hugonis*. Many of the quinces are still in flower and it is interesting to note the wide diversity of flower sizes and colors among these old-fashioned favorites. Some of the currants (*Ribes sp.*) spireas and pearlbushes (*Eurochorda sp.*) are also in full bloom.

Driving past the bank of sprawling forsythias (containing eighteen different kinds) it is hard to realize that included in the collection of lilacs beyond are over 450 different varieties and species. These will be seen at first hand later. The beautybush on the left of the road beyond the lilacs is one of the many plants the Arnold Arboretum has introduced into cultivation. It is just now coming into flower. Before 1922 it was indeed rare in nurseries although it had been growing continuously in the Arboretum since 1907. Now it is available from almost every nursery in the country.

On the right of the road where it winds up Bussey Hill, is the viburnum collection some of which are now in flower. These serviceable plants cannot be recommended too often for they are of value when in flower as well as when their bright colored fruits and brilliant autumn foliage is on display in the fall.

Ascending Bussey Hill, past the *Euonymus* collection on the left, there are some *Prunus* species and varieties, some beach plums (*Prunus maritima*); and on the right the magnificent oak collection. At the top of Bussey Hill one can look across to Hemlock Hill, now showing material damage from the results of two hurricanes. In 1938, winds of over 125 miles per hour velocity felled more than 300 mighty hemlocks, many of which were growing sturdily when George Washington was President of the United States. Many young hemlocks have since been planted, but the blowing over of so many trees on this rocky hill has seriously effected the water-holding capacity of the soil and hence the growth of the remaining mature trees is materially retarded.

Coming down from the top of Bussey Hill, one can walk across an open area and under the large old pines at the end of the path. Many plants have been growing on Bussey Hill, mostly the Asiatic introductions of E. H. Wilson. Some were so over-

grown that this year it has been imperative to replant or replace many of them, an operation which is going on at the present moment. Before leaving this area, one should pause a moment under the cedars of Lebanon, forty-year-old trees originally coming to the Arboretum as seeds in 1902 from their northernmost limits in the Anti-Taurus Mountains of Turkey, just north of Syria. Many times this species had been tried, only to succumb in New England's climate, but this strain has proved hardy for more than four decades, withstanding temperatures of twenty degrees below zero. Close examination will show some of the peculiar cones still remaining on the trees. It takes two years for them to mature.

The native pinxterflower (*Rhododendron nudiflorum*) as well as its close relative *R. roseum* with darker pink flowers, is on the left of the path as one walks back to the road. The brilliant scarlet azalea seen throughout the woods and so gorgeous at the end of this walk under the century old pines is the torch azalea from Japan (*R. obtusum Kaempferi*) often referred to by Professor Sargent as the most brilliantly colored of all the Arnold Arboretum introductions. The mauve colored azalea is the Korean azalea (*R. yedonese poukhanense*) another Arboretum introduction. Note how well it goes with the pale lemon yellow flowers of the Warminster broom close by.

Stopping for a few moments at Azalea Path on the way down Bussey Hill, hundreds of azaleas can be seen in full bloom. The first along the path is the royal azalea from Japan (*Rhododendron Schlippenbachii*) which is one of those rare azaleas the foliage of which is blessed with autumn color in the fall. Across from this is the hardy form of the silk tree (*Albissia julibrissin rosea*) which the Arboretum introduced from Korea in 1918, and this specimen was grown from the original importation of seeds. The trees that are so common in the southern United States are not so hardy in New England, but this form is. The foliage is very delicate and the interesting, thread-like flowers, begin to appear the middle of July and continue until September. A really unusual tree for this part of the country.

Walking back to the Bussey Hill road and down the hill, one passes the oaks, the mountain ashes, the rockery with several interesting small plants, the hornbeams, and beyond them but mostly unseen from the road, the junipers and yews. Dogwoods (*Cornus florida*) and redbud (*Cercis canadensis*) are evident everywhere and are loaded with flowers this year. Only one or two of the rhododendrons are in flower now, yet the Arboretum has 285 representatives of the genus *Rhododendron* growing within its borders. The famous bank of mountain laurel will not bloom for at least another two or three weeks.

The hill to the right of the road harbors most of the pinetum where hundreds of evergreens from many parts of the world display their dependable green foliage year in and year out. Pines alone are represented by 68 different species and varieties. The graceful Sargent weeping hemlock to the left of the road has been growing there since 1881. Plants were originally found growing on an estate along the Hudson River of upper New York. This is a splendid specimen and is another living example of what peculiar forms Mother Nature sometimes creates.

Continuing through the gates and across Bussey Street to the Peters Hill area, one comes to the oldest collection of ornamental crab apples in the country. Here 189 species and varieties of the genus *Malus* are being grown side by side. The

trees range in height from the low Sargent crab apple (7' to 8') to the tall Mandshurian crab which is a standard tree of over 50 feet in height. The peak of the flowering of these interesting and usefully ornamental trees is in the first two weeks of May, but some are still in flower. To appreciate them fully, one should return to see their myriads of small brilliant fruits during the late summer and fall.

Time being at a premium, one rushes on past the pinetum once more, being certain to gain a view down Bussey Brook of the splendid native stand of American beeches, and on to the gorgeous planting of a thousand of the torch azaleas on South Street bank, through the propagating units of the Arboretum, glancing at a few of the experimental beds where many interesting experiments are being carried out by Arboretum staff members. There may be only a minute to pause at the unique collection of dwarf evergreen trees, originally imported from Japan many years ago by Larz Anderson and presented to the Arboretum by Mrs. Anderson. Some of these are well over 150 years old. The hedge collection of over 100 different kinds of clipped hedges is always open to close inspection for those who want to choose just the right hedge material for the right place.

Before finally leaving the Arboretum, one should enter the Forest Hills gate where the majority of visitors first come, walk among the oriental cherry trees (now past bloom for several weeks) and pause a moment to admire the magnificent specimen of the Sargent cherry which is one of the oldest in this country grown from the first packet of seeds here introduced by the Arnold Arboretum in 1890. It is a standard tree, perfectly hardy under New England conditions. Graced with deep pink flowers in the early spring at about the same time the bronze leaves start to unfurl, it is of marked ornamental interest a second time in the fall when its foliage turns a brilliant scarlet.

Leaving this specimen and continuing to the top of the famous lilac collection, one cannot help but gain inspiration from walking among these beautiful plants. Plant breeders and home owners for nearly two centuries have been contributing new varieties, and here in the collection, a studied attempt has been made during the past years to grow at least one specimen of every variety which can be obtained. At present there are 450 species and varieties. They commence to bloom about the first week in May with some varieties coming into bloom for a six-week period thereafter. At this time, by far the most numerous are the varieties of the common lilac (*S. vulgaris*) of which there are over 300 varieties being grown here. An interesting experiment would be for several individuals to stroll through this collection and each list the ten "best" lilacs. Comparisons of such lists after a thirty-minute or a five-hour visit are sometimes most educational.

The early lilac, the late lilac, the littleleaf lilac that blooms a second time in the fall, the tree lilac and the Preston lilac—all are here and growing well. If lilacs are one's chief interest, this collection is the place to study them. Even the amateur is enthusiastic, for this large collection is living proof of the great efforts which have gone into the breeding and selection of these plants by hundreds of people throughout the north temperate zone.

There is no better way to finish one's May visit to the Arboretum than to linger among the lilacs, and absorb to the full their fragrance and beauty.

DONALD WYMAN

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ON THE HISTORY OF THE INTRODUCTION OF WOODY PLANTS
INTO NORTH AMERICA¹

THE introduction of North American woody plants into Europe has been treated frequently, and especially more recently by K. Wein,² while of the introduction of woody plants from other countries into North America almost nothing has as yet been written. It will, therefore, be appropriate to give here a brief sketch as to when and how foreign and also western American woody plants reached the gardens of eastern North America, as well as to mention the earliest and the more important gardens and arboreta.

The history of the introduction of ligneous plants into North America may be divided into three periods, the first of which embraces the time from the arrival of the first European settlers up to the middle of the 18th century. This period

¹ Professor Rehder has rarely been prevailed upon to write for the Bulletin of Popular Information or Arnoldia, hence this paper is doubly valued. It is reproduced from the National Horticultural Magazine of October, 1936, because it is deemed of sufficient value to be of interest to all Arnoldia readers. Several years prior to 1932 it was written by Professor Rehder in English. No American publication would then accept it. The horticultural magazines rejected it as being too botanical, and the botanical journals did not care for it, because it was primarily of horticultural interest. Then it was translated into German and published in *Mitteilungen der Deutschen dendrologischen Gesellschaft*, pp. 114-129, 1932. Later, Miss Ethelyn M. Tucker, Librarian of the Arboretum at that time, translated it back into English, and it was published in the National Horticultural Magazine. Because of the great part the Arnold Arboretum has played in the introduction of plants to America, this article still has much merit, and is here reproduced in the hope that someone, with the interest, the time, and the means, will take up this study of plant introduction. There is much about it not yet known nor recorded.

² *Mitteilungen der Deutschen dendrologischen Gesellschaft*, 1930, pp. 137-163; 1931, pp. 95-154; 1932, pp. 123-129.

is characterized by the fact that the introduction of European woody plants is restricted chiefly to fruit trees and other useful plants with the addition of but a few ornamental shrubs. This is not to be wondered at since pioneers in a strange land have a hard struggle for existence and are forced to seek first to assure for themselves the necessities of life, and only with increasing wealth and security of possession do they find leisure to think of beautifying their surroundings.

The first fruit tree introduced into the New World was the peach, which as early as the 16th century was brought into Florida by the Spaniards; from there it spread west and north and was planted by the white settlers as well as by the Indians. The introduction of woody plants in the North began in the first half of the 17th century. The first account of this we find in Josselyn (*New England Rarities*, 1672, and *Account of Two Voyages to New England* in 1638 and 1663, 1674) where he mentions the apple, pear, quince, cherry, plum and barberry as thriving in New England; he mentions also *Salvia officinalis* and remarks that *Artemisia abrotanum*, rosemary and lavender were not suited to the climate of New England, which shows that their introduction was attempted, but was successful only in the southern states. Of ornamental shrubs he mentions only the rose. We can, however, be almost certain that some other ornamental shrubs, such as the lilac, snowball (*Viburnum Opulus* f. *roseum*) and box had already in the second half of the 17th century been found here and there, as in the garden of Van Cortlandt in Croton on Hudson established shortly after 1681, and in that of Peter Stuyvesant in New Amsterdam (New York) which was established somewhat earlier; but as to what other plants these gardens may have contained we have no knowledge. The sources of information concerning the garden plants of this period are very few and unreliable; it is, however, to be assumed that some native ligneous plants also were cultivated, especially shade trees such as sugar maple, elm (*Ulmus americana*), red oak, and farther south *Catalpa*. Here, too, it may be mentioned that in the year 1645 Endecott, Governor of Massachusetts, introduced *Genista tinctoria* as a dye plant, which soon escaped from cultivation and is now thoroughly naturalized in eastern Massachusetts.

The second period is characterized by the introduction of an ever-increasing number of ornamental trees and shrubs, exclusively, however, from European gardens, and may be considered as extending from the middle of the 18th to the middle of the 19th century. In this period two men are outstanding figures, pioneers in garden-craft. One is John Bartram, who in 1728 established a botanic garden at Kinsessing near Philadelphia, where he planted and cultivated American trees and shrubs, which he had collected in his travels extending from Lake Ontario to Florida. He was in active communication with England and introduced many American plants there; in exchange he received plants from European gardens and propagated them in America. Among these may be mentioned the horse chestnut, which probably came to America in the year 1746. His work was continued by his sons, John and William. Bartram's house and garden stand to-

day, preserved in their original form. The second man is Robert Prince, who in the year 1730 founded a nursery in Flushing, Long Island, which has been managed continuously through five generations of the same family. Although in the beginning intended only for the raising of fruit trees, the management gradually broadened to include ornamental trees and shrubs, and since 1793 the nursery has been continued under the name Linnean Botanic Garden. From the catalogues which were issued it is evident what foreign trees and shrubs were in commerce at that time; from the catalogue of 1790 the following plants may be mentioned, though only the English names are given: *Cotinus coggygria*, *Koeleruteria paniculata*, *Colutea arborescens*, *Laburnum anagyroides*, *Populus nigra* var. *italica*, *Viburnum Opulus* f. *sterile*, *Hibiscus syriacus*. In the earlier Prince estate still stand the oldest specimens in America of the cedar of Lebanon and Atlas cedar, *Paulownia*, the copper beech, Asiatic magnolias and others.

Toward the middle of the 18th century wealthy landowners, especially in Pennsylvania and Virginia, began to lay out large gardens in which among other things one finds box, lilac, *Taxus baccata*, and *Salix babylonica*. Washington's garden at Mount Vernon, begun about 1760, was one of the most important and contained many American and foreign trees and shrubs. One other very rich garden was laid out some years later by William Hamilton on his estate, "The Woodlands," near Philadelphia. This estate was later converted into a cemetery, "Woodlands Cemetery," in which today many of the trees planted by Hamilton still stand, among them the first *Ginkgo* in America which was planted in 1784. Humphry Marshall, inspired by his cousin, John Bartram, began in 1773 the foundation of an arboretum in Bradford, now Marshallton, in Pennsylvania. In 1785 he published his "Arbustrum americanum," the first work written by an American on American trees and shrubs. Many of the trees which Marshall planted stand today. The first actual botanic garden in America was founded in 1801 by David Hosack in New York under the name "Elgin Botanic Garden." In the year 1810 it was taken over by the state of New York and later transferred to Columbia University, but was finally discontinued for want of funds. The second edition of the catalogue of this garden in 1811 contained many European and a number of Asiatic trees and shrubs, among which are *Gleditsia sinensis*, *Malus spectabilis*, *Rosa multiflora*, *Magnolia liliflora*, *Hydrangea macrophylla* (*H. opuloides*), *Sophora japonica* and *Aucuba japonica*, the last two grown as greenhouse plants. A second botanic garden was established at the beginning of the 19th century in Cambridge, Massachusetts and still exists as the Botanic Garden of Harvard University. In the year 1818 a catalogue of the garden by W. D. Peck was issued listing the following Asiatic trees and shrubs not mentioned in the catalogue of the Elgin Botanic Garden: *Vitex Negundo* var. *incisa*, *Eriobotrya japonica* and *Thuja orientalis*. Other eastern Asiatic trees and shrubs listed in Prince's catalogue for 1828 are *Ulmus parvifolia* and *Wisteria sinensis*. In the year 1806 an expedition under command of Lewis and Clark, sent to the west coast by the United

States government, brought back to the East the first west American plants, which were distributed by Macmahon and Philip Landreth, two gardeners in Philadelphia; by far the most important woody plants so brought were *Mahonia Aquifolium*, *Ribes aureum*, and *Ribes sanguineum*. At the beginning of the 19th century a greatly increased interest in gardening and plant culture and especially in the cultivation of trees and shrubs was evidenced through the collection of ligneous plants begun in 1800 by the brothers Samuel and Joshua Pierce in Longwood, Pennsylvania, and through more than 50 years carried on by the family. The garden which still contains many of the trees planted by the Pierce brothers is now the property of Pierre S. Du Pont. Another well-known collection is the Painter Arboretum, near Lima, in Pennsylvania, founded in 1825 by the brothers Minshall and Jacob Painter, who extended and maintained the arboretum up to the time of their death in the 70's. The garden exists today and contains among other plants the oldest specimen of =*Sequoiadendron gigantea* in eastern North America.

In the year 1828 John Evans founded a garden on the Ithan Creek near Philadelphia and brought together a remarkable collection of trees, shrubs and herbaceous plants. He corresponded with both Hookers, father and son, and exchanged seeds, and also received seeds of Himalayan plants which Joseph Hooker had collected. In the year 1841 Henry Winthrop Sargent bought the estate Wodenethe above Fishkill Landing in the state of New York and planted and attempted to raise all the conifers which he was able to obtain; from here was distributed *Pinus ponderosa* f. *pendula*. Another pinetum was established by Horatio Hollis Hunnewell, of Wellesley, Mass., in the year 1852, and is still maintained by the family. No garden in the eastern United States can boast a better collection of fine large specimens of various conifers.

Here also mention should be made of some famous nurseries such as that of Ellwanger and Barry in Rochester, New York, established in 1840, the nursery of Samuel B. Parsons and his brother Robert established at the same time in Flushing, Long Island, and later that of Thomas Meehan, in Germantown, near Philadelphia, in 1853. All these firms carried a large number of trees and shrubs and thereby made many of the plant treasures of European gardens available to American garden lovers.

A third period may be marked from the year 1861 in which the first Japanese plants were sent to America and thereby direct communication with Japan and later also with China was initiated, countries which were destined to enrich American and European gardens through a large number of beautiful and valuable trees and shrubs. Up to this time America had received eastern Asiatic woody plants entirely by way of Europe, with the possible exception of a few important trees and shrubs such as *Rosa laevigata* Michx., which had previously come direct to America and by the end of the 18th century was already growing wild in the southern states. How it may have come there remains unknown.

In the year 1861 Dr. George R. Hall, who spent nearly fifteen years in China and had also visited Japan sent a number of plants from Japan to America: in the following year he brought still more Japanese plants, some of which he sent to Parsons' Nursery, in Flushing, some to Francis Parkman, in Boston, and some he planted on his own estate in Bristol, Rhode Island, where many of them are growing today. Among the plants which he introduced may be mentioned some then not even known in Europe, as his *Malus Halliana*, *Magnolia stellata* and *M. kobus*, *Hydrangea paniculata* f. *grandiflora*, *Hypericum patulum*, *Taxus cuspidata* f. *nana*, *Sciadopitys verticillata*, *Phellodendron Lavalleyi*, *Eryonymus patens* and *Lilium auratum*. Other Japanese plants were introduced by Thomas Hogg, the American consul in Japan in the years 1865 and 1875, and propagated in Parsons' nursery: among these *Cercidiphyllum japonicum*, *Hydrangea petiolaris*, *Symplocos paniculata*, *Magnolia parviflora* and *M. obovata* (*M. hypoleuca*) deserve special mention.

In the year 1872 the Arnold Arboretum was founded as a department of Harvard University with Professor C. S. Sargent as Director, an institution whose purpose was to grow all the woody plants which would be hardy in the climate of Boston. All plants already cultivated in European and American gardens were collected and planted. As to those not yet found in cultivation the director made it his aim to introduce from eastern Asia the rich ligneous flora up to that time only slightly known in western gardens. The first shipment of seeds from eastern Asia was sent to the Arnold Arboretum in the 80's by Dr. E. Bretschneider, who was physician to the Russian embassy in Peking. It consisted chiefly of trees and shrubs from the mountains west of Peking, among which may be mentioned *Syringa pubescens* and *S. villosa*, *Sorbus pohuashanensis* and *S. discolor* (*S. pekinensis*), *Deutzia parviflora*, *Rhododendron dauricum* var. *mucronulatum*, *Pyrus Bretschneideri*, *P. betulifolia* and *P. phaeocarpa*.

From Japan the Arboretum received in 1890, through Dr. William S. Bigelow, seeds of *Prunus Sargentii*. Two years later, the director, Professor Sargent, visited Japan and brought back seeds of many trees and shrubs chief among which were *Rhododendron obtusum* var. *Kaempferi*, one of the most valuable introductions of the Arboretum, *Malus Sargentii*, *Acer capillipes* and *Sorbus alnifolia*. In the year 1905 J. G. Jack made a trip to eastern Asia and brought back, among other plants from Korea, *Rhododendron yedoense* var. *poukhanense*, *Tripterygium Regelii* and *Evodia Daniellii*, and from northern China *Quercus aliena* and *Salix Matsudana*. A year earlier the Japanese botanist Uchiyama had sent seeds of Korean woody plants to the Arnold Arboretum, among them *Abies holophylla* and *Neillia Uekii*. In the years 1907 and 1908 E. H. Wilson, who had formerly collected very successfully in China for the English nursery firm of Veitch, traveled for the Arnold Arboretum. Two years later he undertook a second journey to China, chiefly to western China, to collect seeds of conifers which in 1908 had borne no cones. During these three years Wilson sent more than 1,200 numbers of seeds to the Arnold Arboretum as well as a number of cuttings and young plants of *Populus*

and *Salix* and some other woody plants. Many of the plants collected by him proved to be new not only to cultivation, but also to science. Wilson's new introductions and even those of horticultural merit are too numerous to mention here and only the following selection may be noted, among which are found some previously collected by him for Veitch; *Abies Fargesii*, *Actinidia chinensis*, *Aesculus Wilsonii*, *Berberis Sargentiana* and *B. triacanthophora*, *Cercis racemosa*, *Corylopsis Veitchiana*, *Cotoneaster divaricata* and '*C. hupehensis*, *Dipteronia sinensis*, *Fagus lucida*, *Hydrangea Sargentiana*, *Ilex Pernyi*, *Jasminum Mesnyi* (*J. primulinum*), *Kolkwitzia amabilis*, *Malus hupehensis*, *Populus lasiocarpa*, *Picea asperata*, *Rosa Moysesii*, *Salix magnifica*, *Sargentodoxa cuneata*, *Sinoxylsonia Henryi*, *Sorbaria arborea*, *Spiraea Veitchii*, *Styrax Wilsonii*, *Syringa reflexa*, *Viburnum rhytidiphyllum*. Also a part of the seeds of woody plants collected in western China by C. Schneider for the Austrian Dendrological Society in 1914 came to America owing to the interruption of communication with Europe by the World War. In the year 1914 Wilson went again to eastern Asia and this time to Korea and Japan. Of the Korean ligneous plants which he introduced those deserving special mention are *Forsythia ovata*, *Pentactina rupicola*, *Stewartia koreana*, *Buxus microphylla* var. *koreana*, *Thuja koraiensis* and *Syringa velutina*; of the Japanese ligneous plants may be named the numerous garden forms of Japanese cherries and the Kurume azaleas. From Formosa, which he visited in 1918, he introduced the only recently discovered *Taiwanian cryptomerioides*, the tallest conifer of eastern Asia, a counterpart of the *Sequoiadendron gigantea* of California. In the year 1910 and 1911 William Purdom visited the northern provinces of China and sent back a large number of valuable seeds of ligneous plants, such as *Malus transitoria*, *Prinsepia uniflora*, *Berberis circumserata* and *B. Purdomii*, *Sorbus Koehneana*, *Deutzia grandiflora* and *D. hypoglauca*, and *Picea Meyer*. The last collector for the Arnold Arboretum in eastern Asia was J. F. Rock, who in the years 1925 and 1926 collected in northwestern China, after he had previously traveled for the United States Department of Agriculture in southwest China, Burma and Siam. Among the woody plants collected by him that were new to cultivation may be mentioned the following: *Juniperus libetica*, *J. distans*, *J. glaucescens*, *Betula japonica* var. *Rockii*, *Quercus laotungensis*, *Spiraea uratensis*, *Caragana brevifolia* and *C. densa*, *Evonymus nanooides* and *E. Przewalskii*, *Rhododendron rufum* and *R. capitatum*. During the sixty years of its existence the Arnold Arboretum has introduced into American gardens some 2,500 species and varieties besides the garden forms of *Syringa*, *Rhododendron*, *Rosa*, *Diervilla* and others; of these some 1,400, including 600 species of *Crataegus*, were for the first time introduced into cultivation and over 1,000 were introductions from European gardens into America. Also to the Department of Agriculture with its experiment gardens in different parts of the country, America is indebted for many new introductions of trees and shrubs through collectors sent to all parts of the world. One of the most successful of these collectors was Frank N. Meyer, who in the years 1907-1914 traveled in central and eastern Asia, where by accident he lost

his life in the Yangtze River. Among his new introductions may be mentioned *Juniperus squamata* var. *Meyeri*, *Syringa Meyeri*, *Albizzia kalkora*, *Betula chinensis*, *Buxus microphylla* var. *sinica*, *Daphne Giraldii*, *Wisteria villosa*. The botanic gardens with arboreta connected such as the Missouri Botanical Garden in St. Louis, founded by Henry Shaw as a private garden and opened to the public about 1860, the New York Botanical Garden founded in 1894 and the Brooklyn Botanic Garden established in 1910, have contributed but little to the introduction of foreign trees and shrubs. The same is true of other arboreta founded in more recent times, as the Knox Arboretum in Warren, Maine, the Sanford Arboretum in Knoxville, Tennessee, and the Morton Arboretum, in Lisle, near Chicago. The last named is, next to the Arnold Arboretum, the most important arboretum in the United States; in it are special plantations, largely of trees of value for forestry purposes, but it is also very rich in its collection of ornamental trees and shrubs.

From the preceding statements it is evident that the introduction to American gardens of most of the trees and shrubs was not direct from their native country but through the medium of European gardens. Not until the second half of the present century did introductions begin to be made direct. Even many American plants, especially those from the Rocky Mountains and from the western states, came by way of Europe into eastern American gardens.

Since most of the plants reached America by way of Europe, it may not be amiss here to give a short sketch of the history of the introduction of woody plants into Europe. If we disregard the gardens of Babylon, Egypt, India, Persia, Greece and Rome, since we are chiefly concerned with the woody plants of the cooler temperate zone, we find the first written proof of cultivated trees and shrubs in middle Europe in connection with cloister gardens, as in the plan of the cloister garden of St. Gallen published in the year 830, and in the "Capitulare de villis" promulgated by Charlemagne in the year 812, in which many fruit-bearing trees such as apple, pear, plum, cherry, quince, walnut, mulberry, peach, almond, chestnut, hazel-nut, medlar and grape, also salvia, rosemary, and *Artemisia abrotanum* are mentioned. Of ornamental shrubs only the rose appears, probably *Rosa centifolia*. A fairly complete list of woody plants cultivated in middle Europe in the middle of the 16th century we find in Conrad Gesner's "Horti Germaniae" under the date of 1560. He names nearly all the known woody plants growing wild in Germany and also some in south Europe such as *Cercis*, *Colutea*, *Laburnum*, *Staphylea*, *Vitex* and *Colinus*, while some eastern trees and shrubs, as the horsechestnut, lilac, and mock-orange are still lacking, but in John Gerard's Catalogue of the plants in his garden, published in 1596, which is the first catalogue of plants cultivated in English gardens, the last named plants are found together with others from eastern and southern Europe. About the same time Jean Robin published a catalogue of cultivated plants in the Royal Garden at Paris, and Richier de Belleval a catalogue of the botanic garden in Montpellier.

These are the first catalogues of garden plants for France. The first North American woody plant reached Europe through France. It was the arbor-vitae (*Thuja occidentalis*) which probably was brought to France in the year 1536 through Cartier's expedition. In the first quarter of the 17th century a large number of American trees and shrubs were introduced into France as shown by J. Robin's "Enchiridion Isagogicum" of 1623, and Cornut's "Canadensium Plantarum Historia" of 1635, in which among others were listed *Robinia Pseudoacacia*, *Parthenocissus quinquefolia*, *Rhus Toxicodendron* and *R. typhina*, *Campsis radicans* and *Prunus serotina*. From the middle of the 17th century, however, most of the new introductions came first to England and by the end of the 18th century nearly all the more important trees and shrubs of eastern North America, partly through the agency of John and William Bartram, had reached Europe. The first plants of western North America, through the expedition of Lewis and Clark, came in 1806 to the East and from there to Europe; however, most of the woody plants of the west coast of North America and of the Rocky Mountains were introduced into England through W. Lobb, R. Douglas, and Th. Hartweg between 1825 and 1850. For later introductions we are indebted chiefly to American gardens and various American and European collectors. Among the latter we may here mention the two German collectors, C. A. Purpus and A. Purpus.

Siberian plants reached Europe scarcely before 1750, when such species as *Lonicera tatarica*, *Caragana arborescens*, *C. frutex* and *C. pygmaea*, *Cornus alba*, *Sorbaria sorbifolia*, *Malus baccata* and *Malus prunifolia* were received. From the middle to the end of our present century we owe our introductions of north and central Asiatic woody plants in large part to the St. Petersburg Botanic Garden and its collectors.

The very first Chinese plants reached Europe before or about the beginning of the Christian era by way of the old trade route from North China through Tibet and Turkestan to Persia. The most important among these are the peach, apricot, *Morus alba*, *Hibiscus syriacus*, *Salix babylonica*, and *Syringa persica*, which for a long time was thought to be a native of Persia. Some few east Asian plants came to Europe through India, such as *Rosa chinensis*, which therefore was called Bengal rose. The first direct introduction we owe to the Jesuit father d'Incarville, who in 1750 among other plants brought to Paris *Ailanthus altissima* (*A. glandulosa*) and *Sophora japonica*. Toward the end of the 18th century and at the beginning of the 19th century Chinese plants began to be introduced into England through the English East India Company, among them *Paeonia suffruticosa* (*P. moutan*) and magnolias. Between 1810 and 1830 John Reeves sent many valuable trees and shrubs to England, such as *Wisteria sinensis*, *Spiraea cantoniensis* and various azaleas. Very important introductions we owe to Robert Fortune, who in the years 1840 to 1860 collected in China from whence he sent to England among other plants *Prunus triloba*, *Exochorda grandiflora*, *Spiraea prunifolia*, *Viburnum tomentosum*, *Jasminum nudiflorum*, *Forsythia viridissima* and *F. suspensa* var. *Fortunei*,

Chionanthus retusa, *Syringa oblata*, and *Pseudolarix amabilis* (*P. Kaempferi*). Another English collector who in the year 1880 was sent out to China by the nursery firm of Veitch was Charles Maries, to whom we owe the introduction of *Hamamelis mollis*. In the years 1870 to 1880, through the French missionary, A. David, many important northern Chinese plants were brought into France and at about the same time a Russian, Dr. Bretschneider, in Peking, sent woody plants from northern China to Europe and also to America. Between the years 1890 and 1900 various French missionaries as J. M. Delavey, P. Farges and J. A. Soulié sent seeds of central and western Chinese woody plants to France and the Italian missionaries G. Giraldi and C. Silvestri sent seeds of northern and central Chinese trees and shrubs to Italy. From 1900 to 1904 E. H. Wilson collected very successfully for the English firm of Veitch and from 1907 to 1910 for the Arnold Arboretum in central and western China, as already related above more in detail, where also the explorers F. N. Meyer, W. Purdom and J. F. Rock are mentioned. In more recent times F. Kingdon Ward, Reginald Farrer and G. Forrest sent many woody plants from western China to England, especially rhododendrons. During the last decade with the creation of Chinese universities and scientific institutions Europe as well as America is beginning to receive seeds and plants directly from Chinese botanists and collectors.

As in the case of the Chinese plants so also the first Japanese plants came to Europe by way of other countries, as *Rhododendron indicum*, which was brought from Java to Europe in the year 1680. Others as the *Hydrangea macrophylla* (*H. opuloides*) and *Deutzia scabra*, which were cultivated in China, were introduced into Europe from the last named country. Not until the second quarter of the 19th century were the treasures of the Japanese gardens made available for Europe, first through Philipp von Siebold, who traveled in Japan in 1823 to 1829 and returned again in the year 1856. Of the numerous valuable trees and shrubs which he introduced we may here mention *Malus floribunda* and *M. Sieboldii*, *Cornus kousa*, *Cercis sinensis*, *Hydrangea paniculata*, *Callicarpa japonica*, *Spiraea Thunbergii*, many forms of *Acer palmatum* and of *Diervilla*. Other Japanese plants were brought to St. Petersburg by the Russian botanist Maximowicz about the year 1850, and cultivated there. In the year 1860 John Gould Veitch journeyed to Japan and brought many plants, especially conifers, to England. Of the introduction of trees and shrubs to America through Hall, Hogg, Sargent and Wilson we have already spoken. In more recent times new woody plants have been sent to Europe and America by Japanese botanists and nurseries. The introduction of woody plants from the Himalayan Mountains began chiefly about the year 1820; particularly were the English gardens enriched through the collections of Joseph Hooker, who in the years 1848 to 1851, traveled in India and especially in the Himalayan Mountains. The influence, however, of the Himalayan introductions of woody plants on the gardens of the cooler temperate zone has remained comparatively slight, since most of the plants have proved more or less tender, es-

pecially the rhododendrons, among which are many of great ornamental value.

That portion of eastern Asia which was the latest to disclose to us its ligneous treasures is Korea. Some woody plants such as *Pinus koraiensis*, *Cornus officinalis*, *Poncirus (Citrus) trifoliata* and *Rhododendron Schlippenbachii* had already reached us by way of Japan before the end of the 19th century and *Viburnum Carlesii* in the year 1902, but the first direct introductions to America came about through J. G. Jack, T. Uchiyama and E. H. Wilson, as has already been reported above.

The southern hemisphere has contributed little to the ligneous flora of our northern gardens. Of the Australian and New Zealand flora the New Zealand *Cassinia fulvida* is the only hardy shrub, and from Antarctic South America there are but a few species of *Berberis*, especially *B. buxifolia*, some species of *Pernettya*, as *P. mucronata*, and *Escallonia virgata (E. Philippiana)*, which have proved to some extent hardy.

Of the woody plants introduced into North America from Europe and Asia may be found so favorable conditions for their growth that they, especially in the eastern states, have to a large degree escaped from cultivation, and many are so well established that they actually form a part of the native flora. Among such woody plants that have become naturalized in many places may be mentioned the following: *Picea Abies (P. excelsa)*, *Salix fragilis*, *Populus alba*, *P. nigra*, *Alnus glutinosa*, *Berberis vulgaris*, *B. Thunbergii*, *Ribes sativum*, *Philadelphus coronarius*, *Sorbaria sorbifolia*, *Malus pumila*, *Sorbus Aucuparia*, *Crataegus Oxyacantha*, *Pyracantha coccinea*, *Rubus laciniatus*, *Rosa canina*, *R. Eglanteria (R. rubiginosa)*, *Prunus Persica*, *P. avium*, *P. Cerasus*, *P. spinosa*, *Genista tinctoria*, *Cytisus scoparius*, *Ailanthus altissima (A. glandulosa)*, *Evonymus europaea*, *Rhamnus cathartica* and *R. Frangula*, *Daphne Mezereum*, *Solanum Dulcamara*, *Ligustrum vulgare*, *Paulownia tomentosa*, *Lonicera Caprifolium*, *L. japonica*, *L. tatarica*, *L. Xylosteum*, *L. Morroccii* and many others. Their number increases from year to year so that in time the flora of the wooded areas, at least in the more densely populated regions, takes on a mixed character. For the most part, however, the foreign trees and shrubs will probably never become so predominant as is the case with herbaceous plants on cultivated and uncultivated ground in proximity to settled communities. Here the native plants are often almost crowded out by the European aliens, and when a European who has a knowledge of plants comes to northeastern America he will scarcely be reminded by the surrounding vegetation, so long as he stays in and near the cities and does not go out into the country, that he is in another part of the world.

In Europe this is far less the case; American plants have not become naturalized to such a degree as to change the character of the vegetation; in contrast to the European plants the American plants appear to possess less vitality, which possibly may be explained by the fact that the European plants represent a geologically younger flora. The American plants belong in the main to the tertiary flora, while the European flora has developed and spread since the ice age. But the European and Asiatic flora will also change with time. As a consequence of

the intercourse between the different countries ever becoming closer one may expect that an increasing mixture of floras of each of the climatic zones will take place and that finally each climatic zone around the world will have more or less the same or similar vegetation, as this is already the case today to a higher degree in the Tropics than in the Temperate zone.

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Translated from the German

by

ETHELYN M. TUCKER

(Revised by the author)

Translator's Note

In the foregoing article Professor Rehder has made an important contribution to our knowledge of the dates of introduction into America of many of our well known trees and shrubs. There is a constantly increasing interest in the history of our favorite or familiar plants, where they came from, how and when, who named them, and why they bear the names they do. It is hoped that someone will carry forward the fascinating study which Professor Rehder has so ably begun and thus give to garden lovers a better acquaintance with their plant friends.

Note

The many friends of the Arnold Arboretum will welcome the announcement that Mrs. Beatrix Farrand has been appointed Consulting Landscape Gardener to the Arnold Arboretum during the next year. Mrs. Farrand, once a student of Professor Charles Sprague Sargent, has been Consulting Landscape Gardener to Princeton University, Yale University, the University of Chicago and Dumbarton Oaks in Washington, D.C. Mrs. Farrand's aim will be to initiate plans that will bring the living collections of the Arboretum into the best possible degree of usefulness to the general public.

William H. Judd passes away

It is with the deepest regret that the Arnold Arboretum announces the sudden death of William H. Judd, propagator, on its staff for thirty three years. Mr. Judd died of a heart attack on May 23. More information concerning him will appear in a later issue of *Arnoldia*.

ARNOLDIA



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

VOLUME 6

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WILLIAM H. JUDD, PROPAGATOR

FOR thirty-three years William H. Judd has been propagating plants at the Arnold Arboretum. This long period of usefulness was cut short in the early hours of May 23 when he died unexpectedly of heart disease. He had just returned from the last meeting of the season of the Horticultural Club of Boston, reaching his home at eleven P.M. when his attention was attracted by a large fire not far distant. He apparently hurried to the fire, and it was while he was mingling with the spectators that he suffered the fatal heart attack. He had not complained of any serious illness and was up to the very end as keenly interested in his daily tasks at the Arboretum as he always had been.

Born on July 14, 1888, at Preston Brook, Cheshire, England, he was the son of the superintendent of a large private estate known as "The Oaklands." Naturally, in such an environment he developed an interest in gardening, and his earlier training undoubtedly included many a chore which one would expect to find on an estate of the time. At the age of fifteen, he commenced his own gardening career in earnest, taking a position at Steventon Manor, Hampshire, England, where he worked from 6 A.M. until 6 P.M., his salary being four shillings a week.

He changed positions several times during the next few years, as was apparently the custom among the gardening apprentices in order to gain a rounded experience. He was always interested in the Royal Gardens at Kew and many a holiday would find him off on some excuse to visit these famous plantings. Finally, in 1910, when he was twenty-one years old, he accepted a position there. The training he received during the next three years was of the utmost importance to him in later life. It was here that he learned the system of records which he was responsible for initiating at the Arnold Arboretum. It was here that he learned many of the gardeners' "tricks" which better prepared him to propagate the new and strange plants which came to him later at the Arnold Arboretum. Kew meant a great deal to Mr. Judd, and many of the things which he learned and practiced there he strictly followed through the years. New processes might be explained

to him, new methods demonstrated, but he would always gauge them by the old "reliable" methods he had learned at Kew. The associations he made there lasted throughout his life. He was always intensely loyal to the United States and the Arnold Arboretum, but if anyone, even in jest, would so much as say a word against Kew and its trainees he was quick to take up the argument in behalf of what was his Alma Mater.

In June, 1913, he left Kew coming to the United States to accept employment at the Arnold Arboretum in a position offered to him by Charles Sprague Sargent. He was immediately placed under the general supervision of that remarkable propagator Jackson Dawson. I wish I could have listened in on some of the conversations these two strong-willed characters must have had. Jackson Dawson had much to teach to the new lad from England, and without a doubt it was absorbed quickly, until I think that student and teacher must have been on par. When Dawson died in 1916, Mr. Judd was given complete charge of all the propagating work at the Arnold Arboretum, an important responsibility which he assumed with eminent success until his death thirty years later.

This is yet too early fully to gauge just how valuable his efforts have been to the Arboretum and to horticulture in general. We undoubtedly owe him a very great deal, for when a packet of seeds reached the Arnold Arboretum greenhouses from some remote Chinese source, it was the propagator's responsibility to exert all his skill in order to coax at least a few of them to germinate. He was propagator during a period when the Arboretum was introducing tremendous numbers of plants from eastern Asia as well as from Europe. All of the seeds collected by Wilson on his 1917 and 1920 trips to eastern Asia were handled by Mr. Judd, this being his sole responsibility. Thus the success of some of the Wilson introductions were to a certain degree due to the skill of Mr. Judd as a propagator. It is one thing to introduce the seeds of a plant new to horticulture; it is another matter to grow the plants and to test them under varying climatic conditions. Because of his painstaking nature, his excellent gardening training, and a highly developed experimental inquisitiveness, he was able to propagate many things where others would undoubtedly have failed.

He not only had "green fingers" but he knew the language of plants, and was always willing to talk about plants to anyone at any time. With amateurs he was courteous but often abrupt. With so-called "experts" he took delight in pointing out the mistakes they made in discussing certain plants. He was always in demand by those writing on horticultural subjects for he could easily and quickly point out errors that had escaped others. His advice was continually being sought by all types of individuals because of his phenomenal knowledge of plants. He would not hesitate an instant to tell a Director of the Royal Horticultural Society that he was wrong as to a certain point, while on the other hand he would be the first to commend some youngster who might have brought in some new or interesting specimen. His dry humor and quick wit have made him famous in this country as well as abroad.

One of his most prized positions was that of secretary in the Kew Gardeners of America, an organization made up of men who took their early training at Kew and have since occupied responsible positions in various horticultural and botani-



William Henry Judd

1888-1946

Propagator at the Arnold Arboretum 1916-1946

cal establishments in the United States and Canada. He was a life member of the Massachusetts Horticultural Society, and since 1921 has been in great demand as a judge at its more important flower shows. In 1931 he was awarded the Jackson Dawson Gold Medal of the Massachusetts Horticultural Society for his skill in the propagation of hardy woody plants. He was a past president of the Boston Gardeners and Florists Club, one of the most important groups of its kind in this country.

In 1945 he was awarded the Veitch Memorial Gold Medal by the Royal Horticultural Society, London, a high award made each year to a person who has distinguished himself for achievement in horticulture. Mr. Judd was very properly proud of this award, for it could not have been given to a more deserving person in the United States.

Mr. Judd was also a prominent member of the Masons, the Horticultural Club of Boston, the New England Botanical Club, and many other organizations, taking an active part in their deliberations. In any group where horticultural problems were under discussion he would express himself cogently regarding his Arnold Arboretum experiences with a great variety of species, and when Judd spoke, his humor was always awaited with anticipation by those in the group who knew him.

He was easily one of the country's foremost authorities on ornamental woody plants. He liked to travel and always made it a point to keep extensive notes of his trips, the people he met, his experiences, and particularly the individual plants noted on such trips, especially those that he had propagated and distributed. He made frequent trips to Europe where he was distinctly a *persona grata* with the outstanding propagators in England, France, Holland and Germany, as well as with administrative heads of botanical and horticultural establishments, proprietors of private estates, wealthy amateurs and professional horticulturists. When traveling became more restricted, he journeyed to the west coast of the United States. It is evident that he travelled largely to learn more about plants, and no matter where he turned up, he would make it a point to visit the prominent plantsmen in that particular locality. He was continually making new friends for himself and the Arboretum, for he had to a remarkable degree that capacity of meeting people in all walks of life, impressing his personality on them, and of retaining their respect, esteem, and personal friendship.

His death is a very great loss to horticulture and especially to the Arnold Arboretum for he is the last of the practical plantsmen on the staff of the Arboretum trained under the administration of Professor Sargent. His good nature, his dry wit, and his phenomenal knowledge of plants will be sincerely missed by his host of friends in this country and abroad.

DONALD WYMAN

As positive evidence of the esteem that others had for Mr. Judd, it is here recorded that on the day of his funeral there was received from one of his Boston friends a check for \$1000.00 payable to the Arnold Arboretum. The donor requested that the amount be added to the capital funds of the institution under the designation "The William Henry Judd Memorial Fund." Others among his very numerous friends may be inspired to increase their amount.

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BAMBOOS FOR NORTHERN GARDENS

LEST the title of this paper be misunderstood, it must be explained at the start that although nearly all the hardier bamboos retain their leaves in fresh, green condition through the winter in regions having a suitably mild winter climate, the leaves of even the hardiest species are injured or killed at temperatures around zero. At lower temperatures the branches and, finally, the culms (main stems) are killed. Since the culms and branches normally live for several to many years where injurious winter temperatures do not occur, and the wood of the culm does not reach its full hardness and durability until the end of the third season in the life of the culm, it will be evident that with killing back every year or two no culms can ever fully mature their wood. Nor can the development of culms of full size take place, except possibly in some of the very small, grasslike species of bamboo. These circumstances preclude the production of culms suitable for industrial purposes in these colder localities.

Even when the branches and culms are killed to the ground in winter, however, the hardier bamboos often can be grown as ornamentals with a measure of satisfaction, provided the ground be well mulched to prevent cold injury to the more shallow-growing rhizomes (underground stems) and roots. Rhizomes in soil only moderately mulched have survived when the minimum air temperatures were somewhat lower than -20° F., though the rhizomes at the surface of the ground were largely killed. The degrees of temperature at which cold injury to the leaves and to the woody parts of a given bamboo occurs cannot be stated with any exactness, since they are determined in part by the exposure of the plants to sunlight at the time of low temperature and to cold winds. It occasionally happens that the degree of cold that kills the leaves of a bamboo is not quite sufficient to damage the culms or kill the branches. The killing of the leaves alone is not too serious a matter, for new leaves always appear in the spring; they are borne on new twigs arising from the older ones just below the leaves of the preceding year, and the old leaves gradually fall.

The bamboos constitute a fairly large and very diverse group—of the grass family. They are woody perennials and range in their maximum heights from 6 or 8 inches to 120 feet, with basal diameters of from 1/16 inch to about 1 foot. The largest are tropical species, though two or three giants of the temperate zone reach heights of 70 to 80 feet. The leaves of all the species may easily be distinguished from those of almost all other members of the grass family by the narrowing of the blade into a short but definite petiole at the base; the petiole is joined to the sheath that encircles the culm, branch, or twig (branchlet) on which the leaf may be borne. Except in the very dwarf bamboos and at the tips of the culms in others, the true leaves are always borne on branches or twigs rather than directly on the culm as in the ordinary grasses. Below the leaves gathered at or near the tip of the culm, the “leaves” on the culm itself become “culm sheaths,” modified in character until they cease to function even temporarily as true leaves. In many bamboos, including those of the genus *Phyllostachys* among the hardier kinds, the culm sheaths are early deciduous; in *Semiarundinaria* they are tardily deciduous while in *Arundinaria*, *Sasa* and some other genera they are more or less persistent. Flowering is exceedingly variable among bamboos. In a few species it may occur at intervals of only a few years and without resulting death of the plants—unless seed production is profuse, which often it is not.

The Hardy Running Bamboos

The hardy bamboos are of running habit as contrasted with most of those adapted to warmer climates, which usually grow in close clumps. The rhizomes in general run horizontally underground for a greater or less distance and only rarely turn upward at the tip to form a culm. They are all jointed, consisting of nodes and internodes, much like the culms, but with internodes shorter and much thicker walled—sometimes solid. From lateral buds at certain nodes arise the culms, which form gradually—sometimes rather rapidly—an extended thicket. The true roots, woody in character, develop in a whorl from each node of a rhizome and from the underground nodes of the culm base.

To summarize what has already been said in more detail, the distinctly hardy bamboos, with a number of which we shall be concerned here, are mostly evergreen at temperatures down to about 5° F., but at about zero the leaves of all but the hardiest are killed, and at a few degrees lower the stems are partially or completely killed. Notwithstanding this, as was stated in the beginning, it is often possible by maintaining a good winter mulch among the culms to grow many of the hardy bamboos rather satisfactorily as ornamentals even where the tops ordinarily are killed in winter. The culms normally live for several years and when all are killed, by cold or other means, the size of those produced in the succeeding season will be much smaller. The hardy bamboos send up their new shoots in the early weeks of really warm weather in spring, provided the ground is reasonably moist. A shoot develops into a culm of full size in 5 to 8 weeks.



PLATE II

The wood is at first very soft, however, and in all except perhaps the smallest species, only attains its maximum density and strength gradually during the first three years of its life. These hardier bamboos are mostly native to China and Japan. At least two species, however, of the very wide-spread and diverse genus *Arundinaria* are endemic in our southern states. They are not very ornamental and will not be mentioned further.

Other genera of hardy bamboos besides *Arundinaria* of which representative species are now in cultivation in the United States are *Phyllostachys*, *Pseudosasa*, *Sasa*, *Semiarundinaria* and *Shibataea*. However, with the exception of *Phyllostachys* and *Shibataea*, generic lines in this large group are not too clearly drawn, and for this and other reasons there has been and doubtless will be further considerable transfer of species by botanists from one genus to another. The genus *Pleioblastus*, erected in 1925, is at present considered by some authorities to be of doubtful validity and in this paper it is recognized only in synonymy. Attention will be given here to a number of species of the hardy bamboos, mostly small or medium sized, of the genera previously mentioned. They will be treated, as far as practicable, in order of size, the smaller being considered first.

The photograph on page 31 shows a small part of a collection of hardy oriental bamboos, grown in circular "tanks" 5 feet in diameter—filled with soil and without bottoms—at the United States Plant Introduction Garden, Glenn Dale, Maryland. The tanks are for the purpose of keeping the running rhizomes from spreading into adjacent areas. They are formed from galvanized iron sheets 26 inches wide and are sunk that distance into the ground. Running bamboos with their rhizomes thus confined grow in an artificial clump form and should be clearly distinguished from those that grow naturally in compact clumps. These plantings were about five years old when the photograph was taken. Incidentally, the temperature at Glenn Dale in some winters falls to between -10° and -15° F., and rarely as low as -23° . In light soils the rhizomes of some of these bamboos may grow under such a barrier and come up on the outside, and there is always the probability that those of all the running species will come to the surface and go "over the top" into the soil outside and continue to spread, unless watched and cut off when they start to go over.

1. *Arundinaria graminea* (Plate II) $3\frac{1}{2}$ feet high here is reported to reach 9 to 16 feet in localities with a less rigorous winter climate. The leaves of *A. graminea* are distinctly grasslike—4 to 10 inches long and from less than a quarter to scarcely a half inch wide. Botanical synonyms for this species are *A. hindsii* var. *graminea* and *Pleioblastus gramineus*. The plant is a native of Japan but was introduced into this country from a European source, as have been most of our other oriental bamboos of small and medium size.

2. *Sasa chrysantha* (*Arundinaria chrysantha*) (Plate II), a larger-leaved species



PLATE III

has grown to nearly 5 feet in height. Its maximum is probably a little taller. Branches arise from the upper nodes of the culm, bearing 5-7 oblong-lanceolate leaves, 3-7 inches long and up to $\frac{3}{4}$ inch wide.

3. *Sasa pumila* (Plate II, III) is dwarf, growing about 2 feet in cool climates or in partial shade in warmer ones. It branches rather freely from the upper nodes of the culm and each branch bears 4-7 oblong-lanceolate leaves $1\frac{1}{2}$ - $3\frac{1}{2}$ inches long and $\frac{1}{4}$ to nearly $\frac{5}{8}$ inch wide, gathered near the tips of culms and branches. The leaves tend to curl, or roll up, in dry and sunny situations in summer. Because of its small size and rampant rhizomes, *S. pumila* may easily become a weed; it is very difficult to eradicate when it escapes into a garden and especially when it invades a lawn.

4. *Shibataea kumasaca* (Plate II, IV) is a broad-leaved bamboo 3 to 6 feet high. Other names, but without botanical standing, that have been used in the literature for this species are: *Shibataea kumasasa* (variant of *kumasaca*), *S. ruscifolia*, and *Bambusa viminialis*. This bamboo is a native of Japan. There are usually 3 to 5 dark-green, ovate-lanceolate leaves at each of the upper 8 or 10 nodes of the slender culm; they are $1\frac{1}{2}$ -3 inches long and are usually terminal on very short branches—which commonly range from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length but rarely considerably longer. The leaves suffer more or less injury at temperatures below 10° F.

5. *Sasa variegata* (Plate IV) a handsome Japanese bamboo has leaves conspicuously striped with white or creamy white. *S. variegata* has been reported to grow only $1\frac{1}{2}$ to 2 feet high, but the culms of the plant grown at Glenn Dale have attained slightly over 3 feet in height. The white-striped, oblong-lanceolate leaves, well rounded at the base, are finely pubescent beneath; they are 5 to 10 in number, usually gathered near the culm tip and the tips of the branches and are from 2 to 6 inches long. The plant is a little more cold-resistant than the preceding. Although the identity of our present plant has not been questioned until recently, it now seems to me possible that an apparently similar species described under the name *S. argenteo-striata* may be involved. Since the true identity of the plant is in some doubt, synonyms for the name *S. variegata* cannot well be given.

6. *Sasa veitchii* (Plate V) is a dwarf broad-leaved bamboo from Japan, with leaves roughly resembling those of *S. palmata* but much smaller and quite distinct in detailed characters. The little culm sheaths are at first densely white-hairy, which serve to help in identification. The leaves, dark green above and glaucous beneath, are usually oblong, 2 to 7 inches long and $\frac{5}{8}$ to $1\frac{1}{2}$ inches wide, broadly tapering or rounded at the base. There is a tendency for the leaves to decay on the margins and turn brown to whitish in the late autumn or winter. This is very striking and characteristic in some situations, and when the first description was

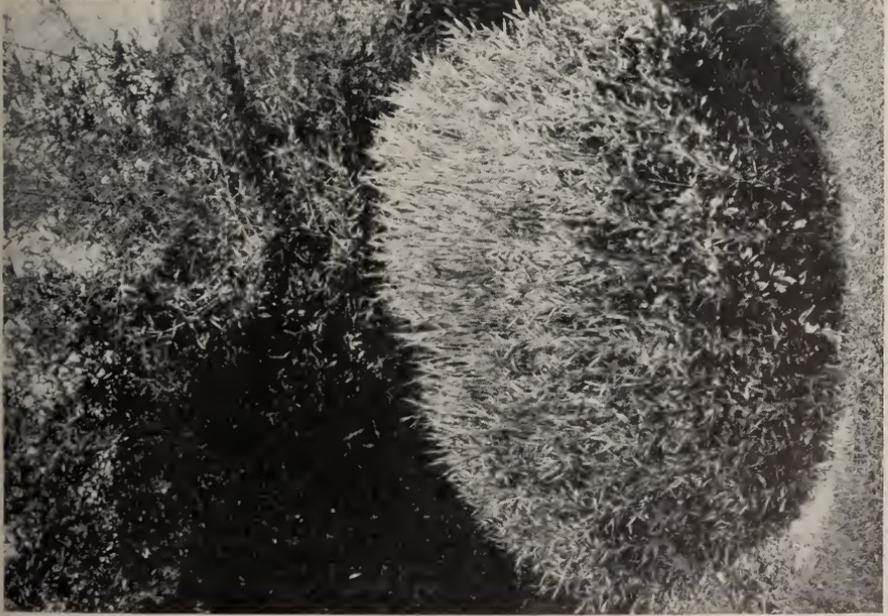
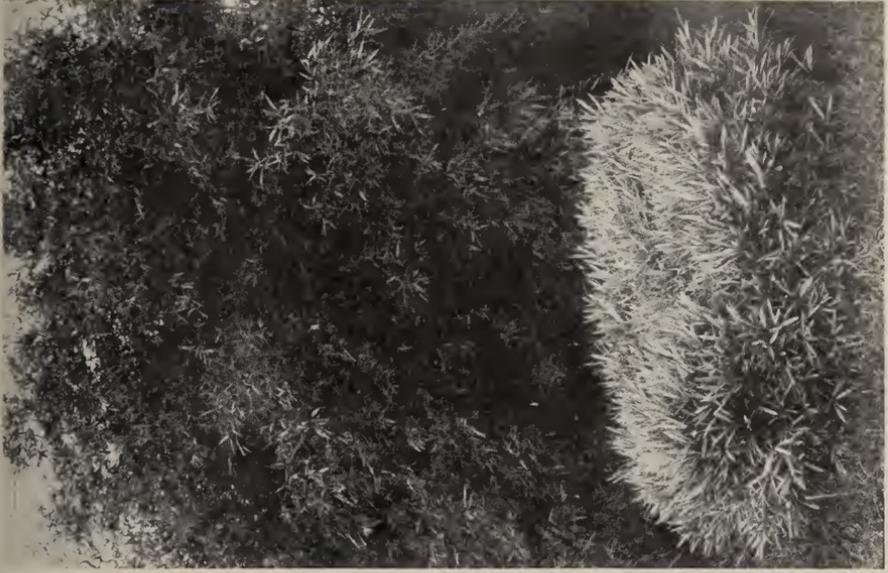


PLATE IV

published the plant was given the varietal name *albo-marginata*, under a different genus and species. The plants in the photograph are 15 inches high and represent average growth, though it is reported in England culms have sometimes attained heights of 3 to 4 feet. *S. veitchii* was first described as *Bambusa veitchii* and later was for some time known as *Arundinaria veitchii*. Still later it was called *Sasa albo-marginata*, a name shown by Mr. Alfred Rehder to be invalid. A small variety of *S. veitchii* was described from Japan many years ago as forma *minor* and it is possible that our present plant represents this rather than the larger, typical form.

7. *Sasa tessellata* (Plate III) a large-leaved, low-growing, species from China, has the distinction of bearing probably the largest leaves of all known bamboos. Its height is only $2\frac{1}{2}$ to 3 feet, but the leaves have measured from about 10 to as much as 23 inches in length and from $1\frac{3}{4}$ to $3\frac{1}{2}$ inches wide, at Glenn Dale, Md. In shape the leaves are oblong, tapering broadly at the base and rather narrowly to a sharp point at the apex. They are medium green above, glaucous beneath, and are regularly 2 in number at tip of the culm the first year, there being no branches developed that year; the midrib is conspicuously yellowish. The culm is rather short-jointed. The plant is interesting in a collection of bamboos but cannot be rated as very ornamental under ordinary conditions. It was introduced into Europe before 1845. Synonyms of *S. tessellata* are *Bambusa tessellata*, *Arundinaria tessellata* and *A. ragamowskii*.

8. *Sasa palmata* (Plate VI) is the accepted name for this handsome large-leaved bamboo. For some time we had supposed it to be *S. senanensis* (Fr. & Sav.) Rehder, but the misidentification has recently been discovered. The latter species has not yet been introduced into this country so far as known. *S. palmata* is one of the most striking of the medium-low bamboos. The culms, curving upward from the base, often grow 5 to 6 feet tall and in very favorable situations will reach 7 or 8 feet. Branches arise singly from some of the middle and upper nodes of the culm. The leaves, bright green above and glaucous beneath, are borne in palmate clusters of 3 to 9 at the apex of the culm and the tips of the branches. They are among the largest in bamboos, measuring up to 15 inches long by $3\frac{1}{2}$ inches wide and being exceeded in length, I believe, only by the leaves of *S. tessellata*. This bamboo is generally neat in habit and makes an exceedingly attractive appearance where mass effect is desired and where the winter climate is not too severe; it is but little injured at temperatures of 5° F. Besides the misidentification of our plant as *S. senanensis*, it has been known at various times, in Europe or in Japan, under the synonyms *Bambusa palmata*, *Arundinaria palmata*, *A. paniculata* forma *chimaki-zasa*, *Sasa paniculata*, and *S. australis*.

9. *Pseudosasa japonica* (Plate II) still widely known as *Arundinaria japonica*, is



PLATE V

believed to be the earliest of the hardy oriental bamboos to be introduced into the United States. It came, of course, by way of Europe, sometime after 1850, and it probably is still the best known and most widely grown species in decorative plantings, especially in the more northern areas in which bamboos thrive. An attractive group of plants that grew in the old U.S. Botanical Garden shortly before it was moved to its present site is shown on page 31. Besides the rather handsome leaves, evergreen down to about 7° F., and the ease of growing the plant, the comparatively slow spreading of the rhizomes is a characteristic by which this bamboo doubtless has largely earned its popularity. It more nearly "stays put" than almost any other hardy bamboo that might otherwise have competed with it. The erect culms commonly grow from 6 to 10 feet high, even where they are killed by cold every few years, and in warmer localities they sometimes reach 16 feet or more. Semi-erect branches grow singly from some of the upper nodes, and these, with the apical section of the culm, bear clusters of 4 to 11 narrow-oblong leaves 5 to 13 inches long, wedge-shaped at the base; they are glossy dark green above and somewhat glaucous beneath. Other synonyms of *Pseudosasa japonica* are *Bambusa metake*, *Arundinaria metake*, and *Sasa japonica*. The accepted Japanese common name for our present plant is Yadake, though it presumably at one time also was called Metake, by which name we recognize it in this country.

10. *Arundinaria simoni* a variable bamboo from Japan, represents one of the several forms the species assumes, supposedly by way of its seedlings. This one, being grown at the U. S. Barbour Lathrop Plant Introduction Garden, near Savannah, Georgia, came originally from a European source. It is a form of medium stature, the tallest culms being about 8 feet. Although *A. simoni* is not a spectacular bamboo, the absence of any strong tendency to run and the consequent forming of a fairly dense clump are points in its favor. The leaves of *A. simoni* are narrow-oblong, sometimes almost linear, from 3 to 12 inches long and from $\frac{1}{3}$ to about $1\frac{1}{4}$ inches wide at most. Occasionally a white stripe appears. The Japanese name for *A. simoni* is Medake (which should never be confused with Madake, *Phyllostachys bambusoides*, or with Metake, *Pseudosasa japonica*).

11. *Semiarundinaria fastuosa* is the stateliest, if not the handsomest, of the hardy bamboos. Narihira-dake, the Japanese name for it, has allusion to the general appearance of the plant, as does also the Latin specific name, *fastuosa*. Narihira is said to have been a sort of legendary Beau Brummel. We may call the plant the Narihira bamboo. The culms grow ultimately to heights up to 25 feet or more in a mild climate. The rhizomes are less active than those of most running bamboos, which results in slow spreading. The smaller culms are generally densely clothed for almost their entire length by the rich dark-green, oblong to oblong-lanceolate leaves, which are from 4 to 7 inches long and are borne on

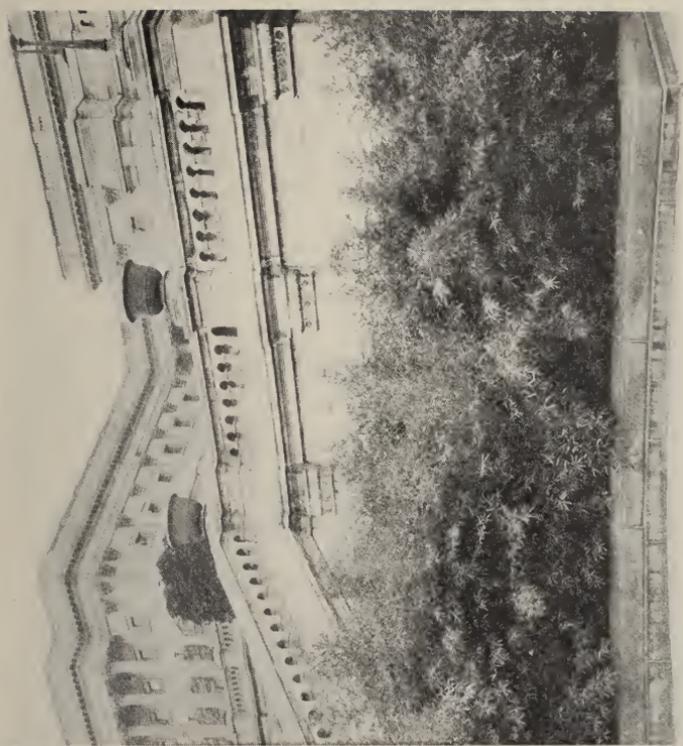
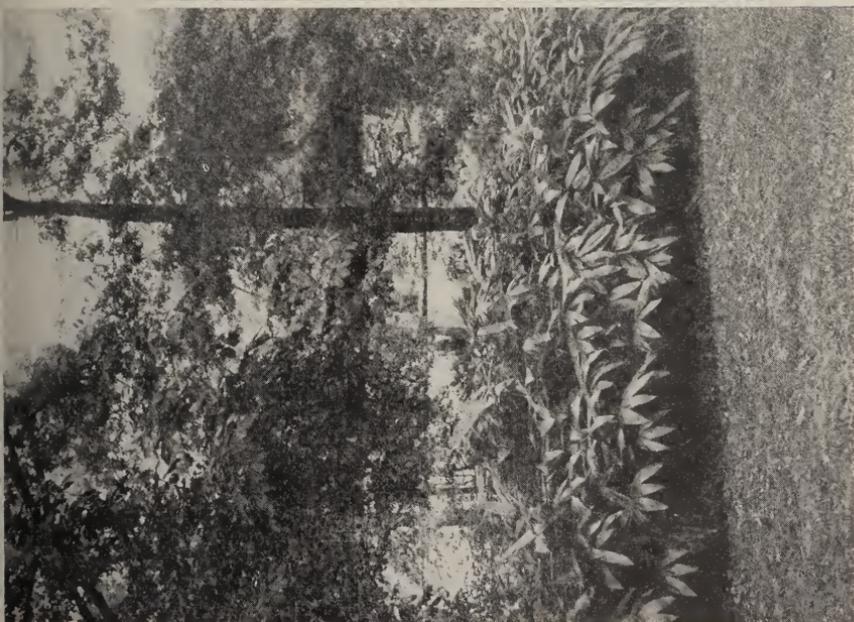


PLATE VI

short, rather upright, branches. The smooth straw-colored culm sheaths often hang on in a semi-detached state for a number of weeks after the new culms have completed their growth and are quite characteristic during that period. The species fortunately is one of the hardiest and withstands temperatures down to zero F. with little injury. There are many other things that might be said concerning this splendid bamboo but space does not permit. The synonyms are *Bambusa fastuosa*, *Arundinaria fastuosa*, *A. narihira*.

Hardy Bamboos of the Genus *Phyllostachys*

The species of *Phyllostachys* have an open branching habit, quite different from that of any of the members of *Arundinaria*, *Sasa*, or other genera previously mentioned. The internodes of the culms of *Phyllostachys* are grooved or flattened on one side, above the branches, and the branches themselves are similarly somewhat flattened. The grooved strip is called the "sulcus." The branches are paired and are unequal in size, the smaller one arising, in fact, from an almost suppressed basal internode of the larger. The nodes of the culms and branches are much more prominent than in any of the other genera of bamboos that we have considered. The leaves of none of the species of *Phyllostachys* are large, and all those on adult culms are small as compared with the size of the plants. This is easily apparent in *P. nigra* var. *henonis*. In other general habits of growth, such as running rhizomes and the spring growth of the new culms, these bamboos are much like those of the other genera discussed. Each species has its own time for sprouting in any given environment—usually in May in the north—but the exact time is always dependent upon heat and the moisture supply. However, this is also true of all types of bamboo.

Besides *Phyllostachys nigra* var. *henonis*, another variety of *P. nigra* and three other species of the genus will be discussed briefly. A number of other species and varieties, probably not less well adapted for growing in the North for their decorative effects, could have been included but their characteristics are much the same in general and space does not permit.*

12. *Phyllostachys viridi-glaucescens* is a native of China and is one of the smaller of the species of the genus so far introduced into the United States. It was first brought to this country from Europe by the Biltmore Nurseries, about 1895. At Glenn Dale, Maryland, because of being frequently frozen back it has not exceeded about 12 feet in height but at the U. S. Barbour Lathrop Plant Introduction Garden, near Savannah, Ga., it has grown to twice that height. From its

*For any reader who may be interested in a somewhat more detailed treatment of the foregoing and other species of the hardy bamboos, there is a series of three articles by the author in the National Horticultural Magazine in the issues for July and October, 1945, and January, 1946.

specific name one might expect it to be strikingly distinctive in its greenness or in the glaucous character of the under surface of the leaves as compared with other species of *Phyllostachys*. The foliage does not, however, differ greatly in either of these respects from that of most others. The leaves, 2 or 3 to 5 on a twig are $2\frac{1}{2}$ – $6\frac{1}{2}$ inches long. The dry culm sheaths are dull straw color, lightly spotted and blotched with brown, and have a characteristic roughness on the upper part of the outer surface due to scattered minute projections from some of the veins. The maximum height recorded at Savannah for *P. viridi-glaucescens* is about 24 feet—a third taller than that attained at Biltmore, where minimum winter temperatures sometimes are injurious.

13. *Phyllostachys nigra* f. *muchisasa* is one of several black-stemmed variants of *P. nigra* and is grown somewhat widely in Japan and in Formosa (Taiwan). The country of origin is said by Dr. T. Nakai to be in doubt. It was introduced into Europe many years ago from a source not now known and was imported into the United States by the Department of Agriculture in 1928. Culms up to 24 feet in height have been produced near Savannah, Georgia.

14. *Phyllostachys aureosulcata* (Plate VI) is a medium-sized Chinese bamboo, known to reach heights of at least 30 feet in favorable environments in the South. The plant was originally collected as an unidentified species in Chekiang Province, China. The specific name alludes to the pale-golden or yellowish color of the sulcus (the flattened or grooved area of the internodes of the culm and branches) that is present during the first year. In the second year, as the green of the rounded part of the culm or branch becomes paler, the yellowish color of the sulcus becomes gradually less apparent and by the third year is practically indistinguishable from the faded green of the rounded part. During the first season at least, the pale-golden sulcus constitutes an infallible means of identification of this bamboo. Another useful character is a faint roughness of the culm and branches that can be felt when the fingers are moved gently upward over the surface of a new culm. This roughness also becomes less perceptible with time. The light-green culm sheaths, with their whitish threadlike stripes and the prominent, bristled auricles at the apex, are likewise very characteristic during the period of development of the new culms. The leaves, 2–5 inches long, are borne 3–5 on a twig. The new shoots, when of sufficiently large diameter to be useful for food, are reported to be of very good quality.

Phyllostachys aureosulcata was for a time placed under *P. nevini* and was sent out widely under that name. After discovery of the error (1933) plants were sent out by the Department of Agriculture simply as “*Phyllostachys* sp., P. I. No. 55713” until the species was described under the new name in 1945. The fact of the extensive distribution of this bamboo made by the Department of Agriculture, in the North as well as in the South, is one of the reasons for including it

in this paper, though its attractiveness and vigor of growth well justify mention of it.

15. *Phyllostachys aurea* (Plate III, V) may be the first species of this genus successfully introduced into the United States. Culms up to 30 feet in height have been produced near Savannah, Georgia, and there are unverified reports from other localities of greater heights. Although the species has the creeping rhizomes of all its relatives, it spreads much less rapidly than many. It is not difficult to confine it to a satisfactory clump form, for a number of years at least, by cutting any culms that may come up beyond the limits desired. The leaves of *P. aurea* are mostly small but they range up to 5 inches long; there are usually only 2 or 3 on a twig. The species has flowered oftener than any other of the introduced bamboos but little seed has been produced. An outstanding characteristic of this bamboo is a type of distortion of many of the culms by which a varying number of the lower internodes are shortened, in a very irregular manner; the nodes occasionally are inclined at an oblique angle, and there appears to be a form in which this pattern is commonly carried out in such a way as to give a tortoise-shell effect. This crowding of the nodes makes such culms very attractive for distinctive fishing poles and walking sticks, especially in view of the fact that the wood of this species is generally rated high in strength. The mature culms of this species may be considered as of high quality generally for all purposes to which bamboo of its size range may be adapted. The specific name *aurea*, which would seem to imply a distinctly golden or yellow coloration, is to that extent a misnomer. The culm is green at first and becomes no more golden with age than do the culms of numerous related species when grown under similar light conditions; and it does not at any time compare with the brilliant yellow culms of two other members of the genus, *P. bambusoides* var. *castilloni* and *P. sulphurea*.

16. *Phyllostachys nigra* var. *henonis* (Plate II) has produced culms more than 50 feet in height in the Gulf region but, although it is considered one of the most cold-resistant bamboos, it is so often killed back in winter at Glenn Dale that no culm has exceeded 15 feet. It is a handsome bamboo and is well worthy of trial, especially where subzero temperatures are not an annual occurrence. Synonyms are *P. henonis*, *P. puberla*.

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EXPLANATION OF THE ILLUSTRATIONS

Plate II. (*Left*). A group of six species of running bamboos grown in "clumps," with roots confined, at U.S. Plant Introduction Garden, Glenn Dale, Maryland. Foreground: *Arundinaria graminea*. Center: *Sasa chrysantha* (left); *S. pumila* (right). Background: *Pseudosasa japonica* (left); *Phyllostachys nigra* var. *henonis* (center); *Shibataea kumasaca* (right).

(*Right*). *Pseudosasa japonica*, the well-known Metake, at the old U. S. Botanical Garden, Washington, D.C. Plants up to 7 feet tall.

Plate III. (*Top, left*). *Sasa pumila*, a dwarf running bamboo, with roots confined.

(*Bottom, left*). *Sasa tessellata*, one of the largest-leaved of all bamboos but of low stature, rarely taller than 3 feet. (Roots confined.)

(*Right*). Basal sections of selected culms of *Phyllostachys aurea*, showing the characteristic distortion of nodes and internodes of some of the culms that makes them attractive for walking sticks, etc.; no two culms are exactly alike but some are very similar. The base of nearly one-half of the culms may exhibit these irregularities of structure. Photograph by Robert L. Taylor.

Plate IV. (*Left*). *Shibataea kumasaca*, a unique broad-leaved bamboo—roots confined—with ovate-lanceolate leaves. The new culms, with leaves not yet fully expanded, dominate the center and right side of the clump.

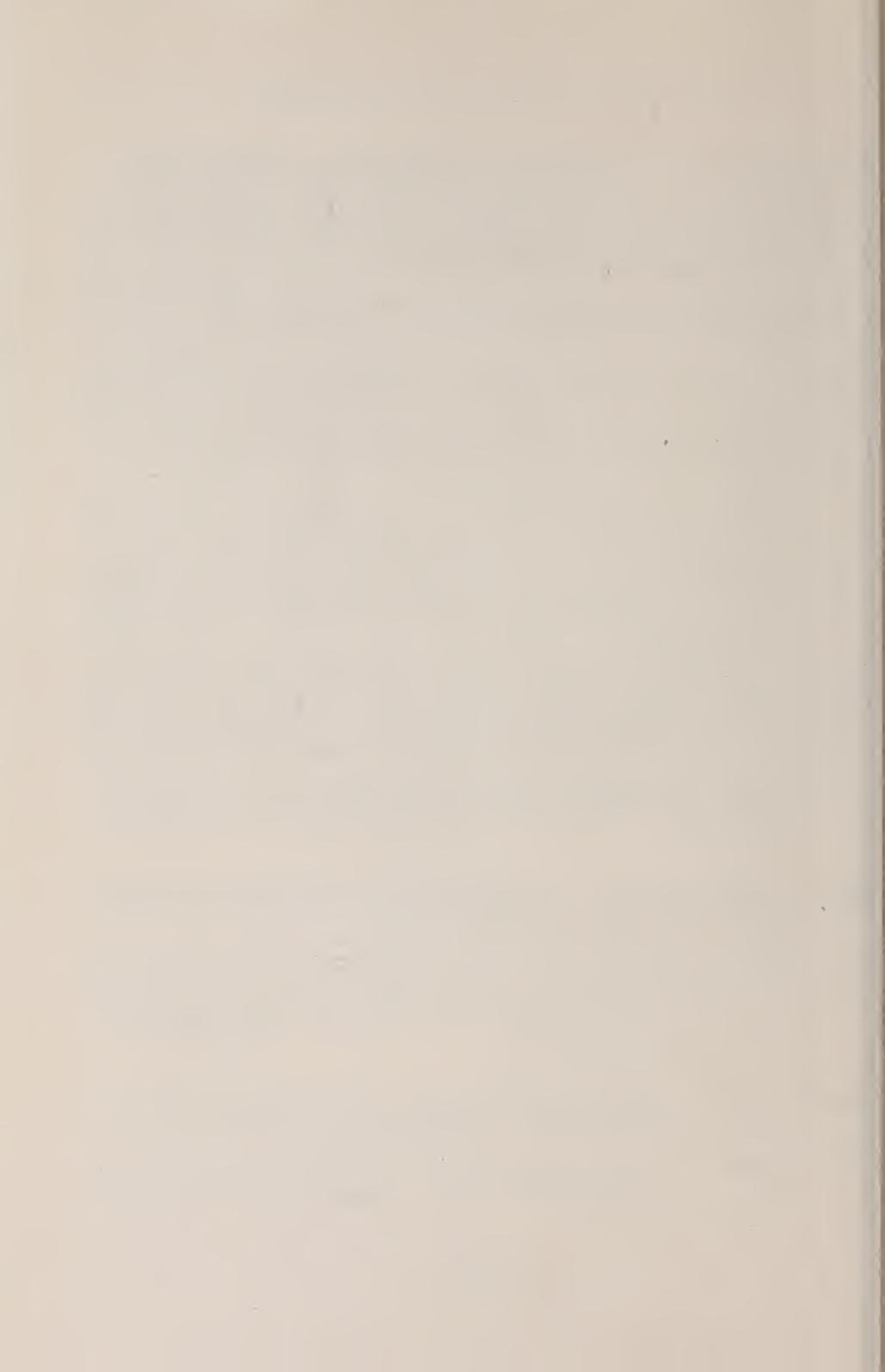
(*Right*). *Sasa variegata*, a dwarf bamboo—roots confined—with white-striped leaves. (Plants 2 feet high. *Phyllostachys viridi-glaucescens* in background.)

Plate V. (*Left*). *Sasa veitchii*, a dwarf broad-leaved running bamboo, growing usually to only 15 inches or less in height.

(*Right*). *Phyllostachys aurea*, kept in artificial clump form by cutting all culms that come up on the outside. This clump, growing in 1933 at the U. S. Plant Introduction Garden, Glenn Dale, Md., had a diameter of 6 feet at the base.

Plate VI. (*Left*). *Sasa palmata*, one of the larger-leaved bamboos, growing here to about 5 feet high. Old U. S. Botanical Garden, Washington, D.C.

(*Right*). *Phyllostachys aureosulcata*, a Chinese hardy bamboo, in early stage of growth on West Front of U. S. Capitol, Washington, D. C., as it appeared in 1933.



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CONTEMPLATED LANDSCAPE CHANGES AT THE ARNOLD ARBORETUM

MORE than seventy years ago the Arnold Arboretum was started as a collection of trees and shrubs of the temperate regions of the world grouped in a landscape design by Frederick Law Olmsted. Mr. Olmsted's unrivalled skill and his perception of the possibilities latent in the varied topography of the acreage used the natural modeling of the land to full advantage. The first director was Professor Charles Sprague Sargent. Perhaps his greatest contribution to the design was his appreciation of the value of the various plant groups considered as an integral part of a harmonious picture. Years of close observation and study of landscape composition convinced him that plant material could not only be displayed correctly from the botanist's point of view but also as part of a design. In placing each plantation, advantage was taken of pleasant incidents of topography, either an outcropping of rock; a steep hill slope or a quiet stretch of open meadow-land. The setting of the groups was considered quite as important as the number of different specimens they contained. Under his leadership plants were placed so that they might be studied either as free-standing individuals or as parts of a larger whole. Different sorts were variously treated in an effort to solve the double problem of showing a botanical collection and yet displaying the qualities of plants as they might be used in outdoor design. Emphasis was frequently repeated on the need for space between groups and complication and crowding of planting was deprecated.

In the years which have passed since the early plantations were started, hundreds of introductions have been made, many of great merit, but others have proved either of no permanent adult value or so like other hybrids and varieties that they are of little interest except to a student of the particular genus they represent. Since the early years many new introductions have been carefully tried but should now be ruthlessly discarded since they show no special merit.

Long before the so-called "habitat" groups of animals began to appear in Natural History Museums Professor Sargent anticipated them in the plant world

as the living collection under his direction became more than an outdoor herbarium. Inevitable changes made by passing years have altered many of the conditions. Hurricanes have swept through the groups and have destroyed or maimed many plants. New problems are awaiting solution, among others the re-forestation of Hemlock Hill. The ageing conifers need special study, since the hurricane of 1938 did irreparable damage to this grove of century old trees.

Overcrowded plantations should be gradually remodelled and Peters Hill and its experimental collection of thorns and apples should also be carefully reviewed. The problems are many and the need is great for a re-study of existing conditions in order to restore the general composition as much as possible to its early grace and easy spaciousness. A hasty review of present conditions makes certain needs apparent. It is evident that the studies started several years ago regarding elimination of duplicate and over-age plants should be broadened and continued. Thinning of groups should be carefully done rather than additional plantations started.

Among many questions to be considered is whether the comparatively small acreage of the Arboretum can wisely accommodate all the species and varieties of woody plants of the temperate regions. If the acreage is thought too small for this full collection, a further decision should be made whether to limit the Arboretum collections or to provide a space for planting the material of comparatively limited interest which would overcrowd the present available area.

The physical aspects of the care of the Arboretum have altered with passing years. Policing has become a considerable difficulty and protection of plants and visitors are an essential part of administration. Costs of upkeep are very different and labor conditions must be frankly faced if the institution is to endure on the lines originally conceived.

Old friends of the Arboretum may feel aggrieved in seeing some of the plantations altered, but they will be less distressed when they realize that these very alterations are absolutely essential. They are undertaken in order to restore the design to essentials in the plant groups and also to display to advantage the best and most ornamental of the plants now growing within the Arboretum.

A start must be made in every undertaking and in order not to attempt a larger campaign than budget funds and labor conditions permit, a few areas of various types have been chosen to begin the long and slow process of rehabilitation. Greater demands are made today on normal upkeep of grounds due to shortage of labor and materials during the war years.

Hurricanes have dealt harshly with the plants in the neighborhood of the Administration Building as the pines and other conifers on the hillside were almost completely destroyed. Much of the hill was replanted with red and white pines immediately after the 1938 hurricane but it now needs additional attention. Below the pine border plantation, a few of the best introductions of small trees and shrubs might be planted between the building and the entrance gate walls. On the opposite side of the road where some of the groups have left their best years behind them, new groups of Arnold Arboretum introductions might be placed, chosen from sorts appropriate to the place and growing conditions. At the Forest Hills entrance the *Pyrus* collection has already been removed making room for a



PLATE VII

Courtesy of J. Horace McFarland & Co.

Rhododendron obtusum Kaempferi — One of the many Arnold Arboretum introductions

collection of the best crabapples started there several years ago. These two entrances will exhibit some of the many plants given to horticulture by the Arnold Arboretum during its seventy-four years of plant introduction.

The planting at Bussey Hill has also deteriorated and been gashed by the elements so that this neighborhood must also be partly replanted and considerably thinned as some of the older plants are now almost unsightly.

One of the major undertakings should be the start of the rehabilitation of Hemlock Hill. The opinion of forestry experts has been sought and the Harvard Forest has recommended a far-sighted course of treatment. Soil must be rebuilt and reconditioned, nurse trees encouraged, and the young hemlocks planted after the 1938 hurricane should be protected, so that in time to come, many years hence, the hill will again be covered with hemlocks interspersed with a few hardwoods, as it used to be at the time of its greatest beauty.

It is evident that where so much should be done, only a few areas can be attempted at the start. Everyone must agree that the places which cry loudest for help should be those first attended to, so the conifer and shrub collections and Peters Hill will have to wait their turn. Professor Sargent often commented on the Massachusetts climate as unfavorable to many cone-bearers, many of which come from moister and cooler regions where there are foggy nights and tempered sunshine. He foresaw the progressive deterioration of many species after they had passed their attractive adolescence, and often said the old Norway spruces of the neighborhood proved more emphatically than warning words how difficult it was to foresee the appearance of an aged alien tree when studied in its promising youth.

Certain present defects of upkeep must be corrected as funds become available. There is great need for a proper watering system. Ample nursery space must be provided where valuable sick plants may be coaxed back to health, and new plants tried and sorts grown which are needed to complete the collections, but for which there is no room in the Arboretum itself. It is hoped that the Case estates in Weston, recently given the Arboretum, will provide ample ground for this purpose.

Patience and understanding interest will be needed both from the casual visitor and the technically interested horticulturist or botanist, but before long vistas will reappear which will add material beauty to the landscape and plants will have wider frames and more spacious surroundings. The spirit and teaching of the first Director will be studied as clearly as memory can dictate and the contributions of succeeding Directors followed as carefully as present-day situations permit.

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HEMLOCK — THE QUEEN OF CONIFERS

FROM the beginning of the Hemlock Arboretum, founded at "Far Country," Germantown, Philadelphia, in 1931, the Arnold Arboretum and its officers from the "Keeper" down have been most helpful. New plants, generous advice and sound suggestions have all contributed to what success, so far, has come this way. Especially helpful has been the cooperation of William H. Judd, propagator at Jamaica Plain. His frequent visits, his generous contributions of new varieties, the eagle eye kept open for errors of statement and printer's mistakes in the little quarterly Hemlock Bulletin, all were deeply appreciated. We called him, familiarly and affectionately, "Juddy." His death on May 29th, after thirty-three years at the Arnold Arboretum, was a shock, giving us a deep sense of personal loss. So it was, when it was suggested by Arnoldia's editor that hemlock copy for a bulletin would be welcomed, there was nothing to do but to comply promptly. A bulletin for popular reading was requested; for a scientific treatise the editor would have had to look elsewhere.

Among the first of our American landscape architects was Andrew Jackson Downing, who in his "Rural Essays" published in 1854, described the hemlock, *Tsuga canadensis*, from a horticultural viewpoint. In this important book, one of the milestones in aesthetic appreciation of rural life, he wrote: "We place the hemlock first, as we consider it beyond all question the most graceful tree grown in this country. There are few who have the least idea of its striking beauty when grown alone on a smooth lawn, its branches extending freely on all sides and sweeping the ground, its loose spray and full feather foliage floating freely in the air and its proportions full of the first symmetry and beauty." This sketch could be filled entirely with similar quotations from horticulturists, botanists, poets and artists. Dr. Charles S. Sargent, long the head of the Arnold Arboretum, summed it up in a few words in his monumental "Silva of North America" — "No other conifer surpasses the hemlocks in grace and beauty."

An old lumberman, who ran rafts of timber down the Susquehanna River in Pennsylvania, once said the early Scotch-Irish settlers regarded the white pines as "noble" trees and called a forest of them the House of Lords, whereas they thought the hemlocks lacked "quality" and he likened them to the House of Commons. But this opinion may have been from a practical, the lumber, standpoint. I hold no brief for the hemlock against the pine, except for gracefulness and it may be pointed out that in the English form of government, the House of Commons is the far more important body. Let me express the thought a little differently :

The pine is called the "kingly" tree,
It well deserves full royalty ;
The hemlock's called the "princely" tree,
This lower rank is not for me.
Right here and now, Oh Hemlock tree,
A royal crown is given thee ;
Not prince, but equal,—"queenly" tree
In beauty, grace and symmetry ;
Great honor his, full honor hers,
The KING and QUEEN of conifers.

From the first settlement of the American Colonies, hemlock was a valuable source of lumber supply, and later its bark was important as an agent in tanning leather. In 1887, one million two hundred thousand tons of hemlock bark were cut and used for this purpose and in many cases the logs were allowed to rot on the ground. In modern times other barks have been extensively used and synthetic chemicals have largely replaced hemlock for tanning.

When introduced to the English settlers hemlock was considered and called "spruce" or a "fir." Because its leaves and branches resembled that of the European poison hemlock, *Conium maculatum*, a weed of the carrot family well-known in Europe, it was commonly called "hemlock spruce," that is, the spruce with hemlock-like leaves. When years later the botanists determined it was not a spruce, the name hemlock continued as the common name. Visitors to the Hemlock Arboretum at "Far Country," knowing their classics better than their botany, often asked which part of the hemlock is poisonous, the roots or the leaves, remembering that the philosopher Socrates was put to death by the "hemlock cup." In his day this was the Athenian's method of putting criminals to death, and Plato's description of the symptoms caused by Hemlock poisoning is one of the masterpieces of the literary world as he tells of the last hours of his beloved friend. No part of our hemlock tree is poisonous.

The botanical name of the genus hemlock, *Tsuga*, comes from Japan, meaning in that language "the mother tree." When first introduced to the botanists of Europe, the hemlock was included in the genus *Pinus*. Later the French botanist, Michaux grouped it with the firs. Finally, another French botanist, Carrière,



PLATE VIII

Tsuga caroliniana, the Carolina hemlock, just as beautiful an ornamental specimen as its northern relative *Tsuga canadensis*.

classified all hemlocks into a separate group under the generic name *Tsuga*.

In 1931, the writer started making a collection of hemlocks at his home in Germantown, Pennsylvania, on a hillside overlooking the Wissahickon Valley, which is part of Fairmount Park. There were seven and a half acres available, and gradually a Hemlock Arboretum was evolved. Arboreta, nurserymen, collectors and horticulturists throughout the country have generously cooperated and the number of accessions on the card catalogue is now 211. Some of these have died, many have been shared with other arboreta or growers, so that the number actually growing in the Arboretum is about 140, with many duplicates.

Hemlocks are indigenous to North America and eastern Asia. They are not found native in Europe, western Asia, Africa or in the southern hemisphere. There is some difference of opinion as to just how many species of hemlock should be recognized. We have two species in the eastern United States, two on the Pacific coast, two in Japan, two in China and one each in the Himalayas and the Island of Formosa. Some other species have been listed, but they are not generally recognized by botanists.

Of the foreign species, *Tsuga dumosa*, coming from the Himalaya Mountains in Sikkim and Nepal, a most distinctive hemlock, is not hardy in the neighborhood of Philadelphia. It comes from high in the mountains where the rainfall is 120 inches in the year. Likewise neither *Tsuga yunnanensis*, from the Chinese province of Yunnan, which is also called "the land below the clouds," nor *Tsuga formosana* will stand our climate and more severe winters. These three species are removed shortly after the first frost comes to the sheltering care of a cool green house at the nearby hospitable Morris Arboretum, where they stay until danger of frost is over in the spring. The remaining foreigners from China and Japan are perfectly hardy in the latitude of Philadelphia. *Tsuga chinensis*, from the province of Sezuan in western China, is growing successfully in the Arnold Arboretum and last year the specimen at "Far Country" made a growth of twenty inches. We have two trees growing side by side—a seedling which the late W. H. Judd of the Arnold Arboretum grew from seed obtained from the Sun Yetsen Park, in Nanking, China, and a grafted plant on *Tsuga canadensis* stock. They are of the same age but the seedling is now outstripping the grafted plant in growth.

The two species from Japan are also hardy. *Tsuga diversifolia* is one of the best of the hemlocks for ornamental purposes. It is slow growing and of unusual beauty and distinction. Its leaves, when a branch is turned up, are grayish white underneath and on this account the Japanese call it the "rice tree." It was introduced in 1861. *Tsuga Sieboldii* is a more rapidly growing tree. It was introduced in the United States in 1850 and both it and *T. diversifolia* are grown and sold by nurserymen specializing in the rarer plants. No variations of these foreign species have so far been obtainable, but some have been listed in Japanese catalogues. It is an interesting fact that *Tsuga diversifolia* is the first, of all the hemlock varieties, to put out leaves in the spring, and *Tsuga Sieboldii* is the last.



PLATE IX

Tsuga diversifolia, a splendid hemlock native in Japan.

Of the two hemlocks from the Pacific coast, *Tsuga heterophylla* and *Tsuga Mertensiana*, the former is an important lumber tree. The forestry authorities of British Columbia stated on a recent visit that they were growing it "by the millions" for reforestation purposes. But on the western coast its use as an ornamental was very restricted. A visit to one of the larger nurseries near Seattle some years ago disclosed but a bare dozen specimens in stock. Josiah Hoopes, whom I remember well as a boy, wrote the first book in America on conifers in 1868. While extolling the beauty of our eastern hemlock, he said that the only tree which could compare with it for beauty was the Deodar—*Cedrus Deodara*. In lower California we found the latter used for ornamental purposes exclusively, as against the western hemlock, which compares most favorably in beauty and symmetry with our eastern hemlock. *Tsuga heterophylla* is a native of the Pacific Northwest where it gets plenty of moisture; for this reason it does not do well in the East. On the other hand, the mountain hemlock, *Tsuga Mertensiana*, coming from the high Sierras, is a contented, although slow-growing, inhabitant of the Hemlock Arboretum. It is this tree growing amid the snows and ice and rocks of the western mountains, its natural habitat, which has aroused the enthusiasm of western poets and naturalists. Readers who are familiar with the writings of John Muir, will come across many allusions to its grace and beauty.

It is our eastern hemlock, *Tsuga canadensis*, which is a native of the Atlantic Seaboard from Canada to northern Georgia, that we turn to for most of these variations which have added interest and zest to the collector's task. John C. Swartley, a young man who had graduated from the University of Pennsylvania and went from there to do practical work at the nearby Morris Arboretum, took the Hemlock Arboretum as a laboratory for advanced study. Starting in the spring of 1938, he has devoted a large part of his time to studying the mutations of *Tsuga canadensis*. The result of his labors appeared in a thesis at Cornell University, where he had been taking an advanced course in ornamental horticulture. In the preparation of this work, Mr. Swartley visited many of the nurseries, arboreta and private estates on the Atlantic Seaboard. He found sixty-two variants of *Tsuga canadensis*, all of which had been named, many of which were similar to plants bearing other names. It was confusion and duplication. A nurseryman or botanist or plant lover might find an unusual hemlock growing in a nursery row or in the wild, proceed to propagate it and give it or have it given a name, without knowing that an identical plant bore some other name. And having quoted Dr. Charles S. Sargent as to the beauty of the hemlock, it is only fair to repeat what he has to say about these variations: "The abnormal cultivated forms of *Tsuga canadensis* are distinguished in some cases, by a dwarf and compact habit, in others by fastigate branches, and by unusually broad or narrow leaves or by foliage slightly marked with white. About eighteen of these forms are cultivated but none of them have any particular beauty or value." (The italics are mine, *De gustibus non disputandum*.)



PLATE X

Photograph by Bert Huntton

Tsuga Mertensiana, mountain hemlock as it grows in Mt. Baker National Forest in the Rocky Mountains.

Using the Hemlock Arboretum as a laboratory, Mr. Swartley proceeded to try to bring order out of chaos. Cooperating with the committee which was at work on the new edition of "Standardized Plant Names" published in 1942, the natural seed variations of *Tsuga canadensis* were reduced to twenty-one classes as follows:

Broadleaf	Golden	Slender
Bushy Globe	Largeleaf	Sparseleaf
Cinnamon	Littleleaf	Spreading
Dense	Prostrate	Twiggy
Denseleaf	Pygmy	Weeping
Fastigiata	Pyramidal	Whitetip
Globe	Dwarf Pyramidal	Yewlike

In the above classification it will be noted that some are differentiated by their form or manner of growth, as bushy, fastigiata, pyramidal, weeping, spreading, prostrate, etc. Others are specialized by their color, golden, whitetip and cinnamon, while the third class are those whose description relates to their leaves or to size and shape. Then follows, in this authoritative book, a list of sixty named variations of our eastern hemlock. Mr. Swartley is still at work observing and classifying this bewildering list.

Perhaps the best-known and the most popular of these mutations of *Tsuga canadensis* are the weeping pendulous trees, and heading this list is Sargent's weeping hemlock. This variety was important in the prominence of its distinguished discoverer, the manner of its original propagation and its dissemination. General Joseph Howland sometime before 1870 found four seedlings growing in the mountains back of Beacon, N.Y. He gave one to his good neighbor, Henry W. Sargent, another to the famous Hunnewell Arboretum at Wellesley, Massachusetts, another to Dr. Charles S. Sargent of the Arnold Arboretum and kept one for himself. Of these, the latter two are still growing and flourishing, one at Beacon, N.Y. and the other not far from the Arnold Arboretum. From some of these original plants grafts were made and plants were shown in the horticultural display at the Centennial Exposition in Philadelphia, in 1876. They created a great sensation among horticulturists and nature lovers, and as a result there are still growing today around Philadelphia many of these early specimens. They were all grafted on *Tsuga canadensis* stock, and in most cases this has influenced the plant so that the clones are never quite as low growing as their ancestor.

If you have room for only one hemlock, plant a Sargent, picking one from the nursery row that is most pendulous. The plant at the Hemlock Arboretum is now thirty years old and we call it our "vernal fountain of perpetual joy." Of twelve specimens of Sargent's weeping hemlock planted in the Centennial gardens, four still survive and form a most striking and beautiful group on the lawn near Horticultural Hall in Fairmount Park, Philadelphia. At Inver House, a country es-



PLATE XI

The Sargent weeping hemlock (*Tsuga canadensis pendula*) is one of the most graceful forms of all the Canada hemlock varieties.

tate some twelve miles from Philadelphia, are a dozen of these graceful and unusual trees which must be at least sixty years old. Just before the financial crash in 1929, ten of them had been sold to a gentleman on Long Island for \$1600 apiece, delivered and planted. It took a little time to arrange for their transportation. They were too large to go through the Holland Tunnel or on the ferry boats in New York harbor, so a barge was secured to float them down the Delaware River and around by sea. But the stock market collapsed, the purchaser cancelled his order, and the trees are still growing, in all their glory, in their old home.

One of the latest additions to the Hemlock Arboretum is a prostrate variety which crawls over the ground. Another miniature one is *Tsuga canadensis minuta*, a little plant which grows about one-half-inch a year and is now six inches in height and twenty years old.

The white tip variety, *Tsuga canadensis* "alba spicata," comes from a plant some ten feet high growing at the Morris Arboretum, which is thought to be nearly one hundred years old. *Tsuga canadensis Jenkinsii* (Bailey) is a quick growing, small-leaved variety with rather sparse, pendant branches. Of particular interest is a globose bushy form with at least a score of stems, its only drawback being its inability to stand up under a heavy weight of snow. But it would be impossible to describe all the many variations of form, size, growth and color. Mr. Swartley's monumental book on the mutations of *Tsuga canadensis* contains 382 pages of typewritten material, with 245 illustrations. Cornell University is now at work on an edition which, when issued, will undoubtedly increase interest in *Tsuga canadensis* and its variations, and will be a distinct contribution to horticulture.

Of the second species, indigenous to the eastern United States, *Tsuga caroliniana* is represented in the Hemlock Arboretum by four varieties, with one more spoken for and expected in the spring. This species has a romantic history remaining unknown to the scientific world until 1850. For nearly a hundred years a long list of experienced botanists had combed the southern Alleghenies, beginning with William Bartram, Michaux, the Frasers, and in 1842, Asa Gray himself. None of them had noticed any difference in the hemlocks which grew so profusely on crag and mountain and in glen and gorge. "*Pinus canadensis*," as it was then called, was the only genus that had been identified. It was in 1858 that Professor Lewis R. Gibbs reported to the Elliott Society of Charleston, South Carolina a body formed for the serious study of natural history, as follows: "Professor Gibbs mentioned his recent verification of a suspicion he had entertained respecting the existence of a new species of fir in the Saluda Mountains resembling *Pinus canadensis* but clearly distinct by well-marked characteristics." Thus to the distinguished scientist of Charleston belongs the honor of discovering and identifying the charming *Tsuga caroliniana*. It was a gratification that the correspondence between Dr. Gibbs and Dr. Asa Gray which is now reposing in the

Gray Herbarium at Cambridge, was first published in the Hemlock Bulletin of October, 1934. The four varieties of *Tsuga caroliniana* so far established in the Arboretum are: 1, the type plant; 2, a dense compact variety, *Tsuga caroliniana compacta*; 3, *T. caroliniana fastigiata* and 4, *pendula*. Let me conclude the reference to *Tsuga caroliniana* by quoting from Ernest H. Wilson, the "Keeper" of the Arnold Arboretum, who says: "Both the Hemlocks (*Tsuga canadensis* and *Tsuga caroliniana*) are excellent trees, but the Carolina species with its dense and tufted branches is the most lovely."

If you ask how many variations of *Tsuga* are growing in the Hemlock Arboretum, the answer is we do not know, but probably fifty. It will take some years to have them all classified. Some of them which were distinctive in their juvenile form, as they have grown older, have lost their early character and it is hard to place them.

The Arboretum at "Far Country" is open to the public and horticulturally-minded visitors are always welcome. More than half the specimens have been presented by nurserymen to augment the collection. Growers will find among their rows of seedlings some "ugly duckling," that is, one that differs from the type and which they cannot sell, not being true to type. They lay it aside thinking they will propagate and disseminate it, but nurserymen are busy, there may not be a market, and they finally send it along to the Hemlock Arboretum orphanage.

Last fall John C. Swartley made a "swing around the hemlock circle" visiting many nurseries throughout the east to encourage them to propagate their distinctive varieties, list them in the catalogues and make a market for them. Many of the dwarf varieties are more suited for foundation planting, for rock gardens and for hedges, than the varietal type. The Hemlock Arboretum receives inquiries, from time to time, as to where some rare form may be obtained. Several nurseries are now at work increasing their stock of varieties. The Arboretum issues a quarterly bulletin of hemlock news and will be glad to send it to anyone, without charge, who would be interested. It is not a commercial enterprise, there is no stock for sale, but cuttings and assistance with information will be gladly furnished.

How old and large do hemlocks grow? In 1932, observing the two hundred and fiftieth anniversary of the coming of William Penn to Pennsylvania, a census was made of the trees in Pennsylvania, New Jersey and Delaware, which in all probability were growing when Penn sailed up the Delaware in 1682. The list of trees, which numbered 250, included nine hemlocks. The smaller of the group of nine was nine feet, eight inches, in circumference. As to age, a stump is or was standing in the Tionesta National Forest in Warren County, Pennsylvania, that was fifty inches in diameter and had five hundred and sixty annual rings of growth. From Sullivan County, New York, a reliable observer years ago counted eight hundred rings on a fallen hemlock, a monarch of the forest. The log had been stripped of its bark and allowed to rot.

Hemlocks, like other conifers, should not be planted along city streets, or in parks in large cities, where their leaves, which continue for three years or more, become coated with dirt and smoke. They will not thrive and are no credit to the race. They do best growing in full sun and in any good garden soil. We give them a mulch annually of rotted oak leaves and peat moss but have never used commercial fertilizer. The dwarf or unusual forms should not be grafted but grown from cuttings, as the stock, usually the varietal form of *Tsuga canadensis*, has a marked effect on the new plant.

While Sargent's weeping hemlock was named by Dr. Charles S. Sargent for his cousin Henry W. Sargent, the tree in ninety-nine times out of a hundred is associated with the distinguished scientist, arborist, and for 55 years head of the Arnold Arboretum. While not strictly horticulture, I would like to conclude this account of the tree he loved so well, by a sonnet to his memory :

I do not know where Sargent's body lies,
If shaft or urn may mark that sylvan spot,
We do not know that he builded to the skies,
With "Sylva" he will never be forgot.
Twice fortunate was he, whose ardent task
Added each day new luster to his fame,
And greater monument no one need ask,
Than the low-sweeping hemlock with his name.

In green cascades around its lowly girth
Its branches graceful as green waterfalls;
With soft caress they stroke old mother earth,
It Sargent's calm and dignity recalls.
A monument, which time will not destroy,
A vernal fountain of perpetual joy.

CHARLES F. JENKINS
The Hemlock Arboretum

Note

Dr. E. D. Merrill resigned as Director of the Arnold Arboretum in June, his resignation being accepted as effective at the end of July, 1946. He retains his academic position as Arnold Professor of Botany and is to become Professor Emeritus in June, 1948.

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These bulletins will be discontinued until Spring of next year. Subscription renewals for 1947 are now due, price \$1.00 per year. Checks should be made payable to Harvard University, Arnold Arboretum, Jamaica Plain 30, Mass.

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