

Arboretum BULLETIN

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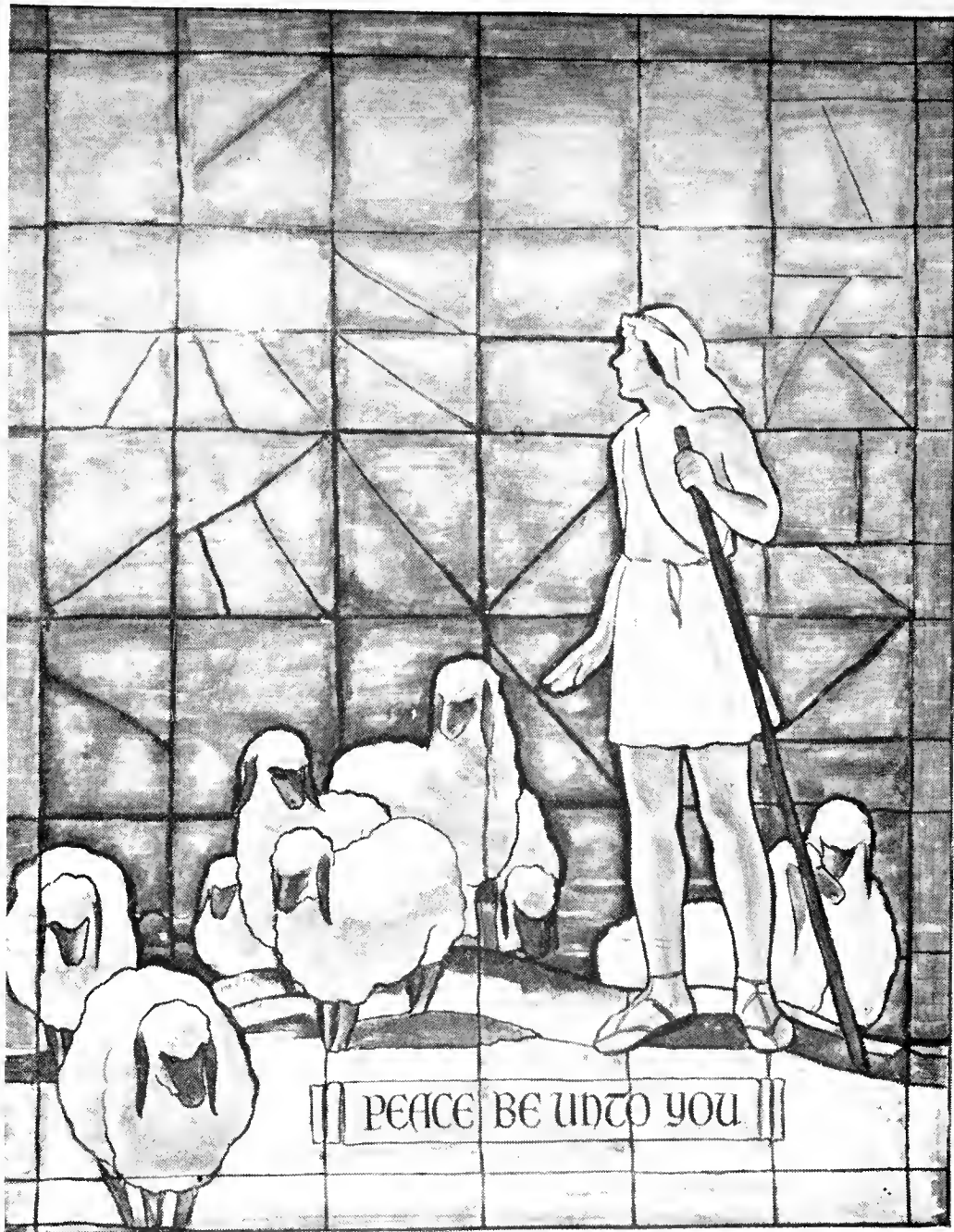
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The
Season's Best Wishes

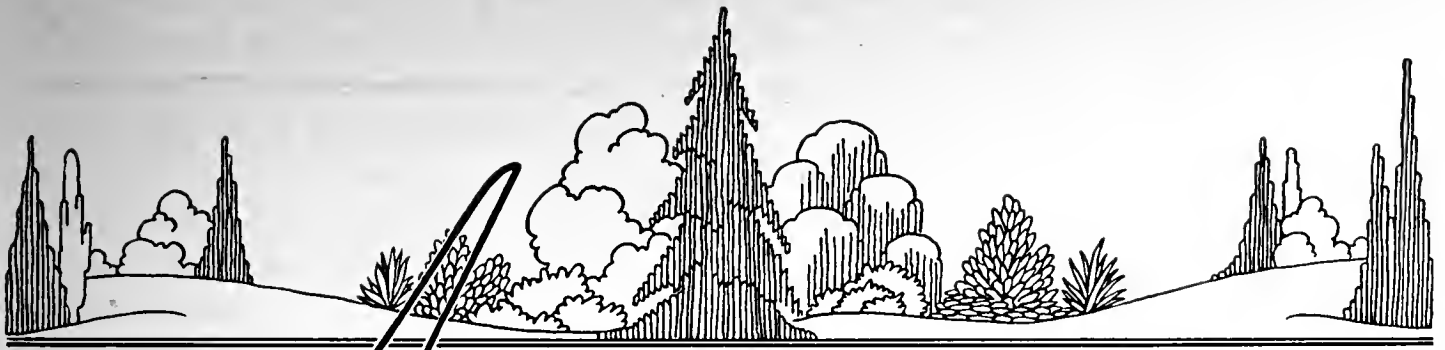
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The Arboretum Bulletin

VOLUME XII

WINTER, 1949

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The Arboretum in Summer and Fall

B. O. MULLIGAN

PROBABLY the greatest change in the appearance of the Arboretum since the war took place in June, when contractors employed by the Park Board relaid with asphalt the whole length of Lake Washington Boulevard through the Arboretum south of Miller Street, at the same time improving the drainage system and forming a concrete curb on both sides, with convenient service or parking pull-outs where needed. The same work, excepting the curbing, also extended along the Upper Road, previously only gravelled, and to those who work in the Arboretum this elimination of the annual summer dust clouds has been perhaps the most satisfying result of the whole operation. Great approval of it has since been frequently voiced by those who use either road regularly, and the Park Board is to be thanked for this major improvement to our road system.

A second large-scale though less obvious task has been the dredging of the lagoons at the northern end of the Arboretum by a crew and equipment from the Buildings and Grounds Department of the University, working for several months in the summer. This not only resulted in partial clearance of the banks for dumping the dredged material, but also brought up many tons of excellent humus which will be useful in preparing land for sowing grass seed, for planting, or merely in raising low places along the lagoon banks.

During July several vacant sections of the nursery were ploughed, as well as the east bank of Azalea Way below the look-out from which all Azalea plants had earlier been removed, and have since been well cultivated. To the former we are now adding quantities of sawdust, in an endeavor to improve its condition and eventually eliminate the quack-grass; the plan for the latter, which has been badly infested with horsetail and other perennial weeds, is to sow grass over the whole bank next spring and then prepare new Azalea beds with convenient paths through them, both up and across the bank.

A great deal of time and labor has, as usual during this season of the year, been spent in methodical weeding of all the cultivated beds—along Azalea Way, in Rhododendron Glen, the new plantings by the Upper Road, the northern end of the Boulevard, and elsewhere as needed. One man, with occasional part-time help, spent most of the summer in the nursery, weeding, cultivating and mulching, so that this important section, and the young plants growing therein, is in better condition than it has previously been. The use of sawdust as a mulch, both in permanent beds and in the nursery, has been of great assistance in retaining moisture, in reducing annual weeds and making it easier to extract those with a vigorous perennial root-system.

Broad-leaved weeds in the larger grass areas

have been considerably reduced by several sprayings between late May and early August with 2-4-D; another form of this substance has been used to kill individual shoots of horsetail both in nursery rows and amongst small Azaleas and Rhododendrons. Some young plants, however, are adversely affected by it, so that more knowledge as well as great care is required to use it in this way.

That part of the former city dump facing the Boulevard between Miller and Roanoke Street, after having been thoroughly cultivated several times during the summer, and more stones, cans and bottles removed, has now been sown with grass over about two acres. Later, beds will be formed for the combined rose species and crab apple collection, of which we expect to make the initial plantings during this winter. This will be the first step towards the formation of the Winkenwerder memorial area in this previously uncultivated area and also towards its permanent improvement and incorporation as a useful and attractive part of the Arboretum.

Other areas sown with grass this fall include an acre or so at the northernmost tip of this same section, where it descends to Lake Washington; part of the ground in the Oak collection close to the Lynn Street bridge over the Boulevard, and the small triangle at the junctions of Interlaken and Lake Washington Boulevards.

On the south bank of Rhododendron Glen it has been evident for some time that the drainage system was inadequate and faulty. During October, existing drains as well as wet patches were opened up and cleared; before next spring we expect to lay new drain tiles where needed and generally to renovate the whole system, which should improve both the adjacent grass and cultivated areas. It is quite clear, however, that much more work of the same kind is going to be required in future years before we can make any use of the wide grass area sloping down from the Glen to Azalea Way.

A considerable amount of clearance and preparatory work has been accomplished in Woodland Garden, prior to starting fresh

planting based on a new plan for this area drawn up by Mr. Hansen at the request of the sponsoring West Seattle Garden Club, who have supplied further funds this summer to advance the project.

New beds have been formed for (a) Azaleas, on the west side of Azalea Way facing Boyer Avenue, towards the north end on the east side, as well as a third facing the nursery across the Upper Road; (b) for Ceanothus, on the east side of Azalea Way; (c) in the Hamamelis section east of the Upper Road, and (d) in the Montlake area near Hamlin Street. All of these, with the exception of the last, have been wholly or partially planted.

Plantings

These were begun again at an early date (September 20) in order to try and overtake some of the arrears of last season, especially of Azaleas and Rhododendrons. About 250 plants of *A. Kaempferi* or its hybrids have been placed in a new bed under shade of Maple, Fir and Hemlock trees between Woodland Garden and the picnic tables, with a group of some 100 plants of dwarf types of Japanese Azaleas ("Gyokushin," "Gunrei," "Myogi," etc.) on the north side. Amongst them, to extend the season of interest, are young trees of *Sorbus*, *Styrax*, *Halesia* and *Prunus subhirtella* var. *rosea*. To a bed close by, where last season we planted an extensive group of the rosy-red hybrid Rhododendron "Azma," we have added as a foreground 75 plants of *R. (Azalea) arnoldianum*, underplanted along the front with *Pachysandra terminalis*. Another bed of low-growing Azaleas now crowns the bank north of Woodland Garden, close to the Upper Road, and contains a young plant of the famous *Franklinia* bush. Near these newly planted areas we have commenced a garden of winter-flowering plants, sponsored by the Mercer Island Garden Club, set in a bay facing west surrounded by Maple, Fir and Dogwood (*Cornus Nuttallii*) trees. Up to the present, fourteen distinct species are represented, but others have been ordered and this number will be considerably increased by next spring. In the

background is a collection of *Camellia Sasanqua* varieties, whilst the west side will have a wide irregular margin of the forms of *Erica carnea*, backed by *Pieris*, *Mahonia Bealei* and *Helleborus corsicus*.

On the west side of Azalea Way a long bed has been partially filled with *Azalea Daviesii* and hybrids of *A. calendulacea*, *Kaempferi*, and *occidentalis*. Three young Sassafras trees stand amongst them.

The Holly collection has been considerably augmented. In October we added approximately 75 plants, representing 14 species or hybrids plus a number of varieties of *Ilex Aquifolium*, *I. crenata* and *I. opaca*. Many of these were young plants donated by the State Conservation Society in March, 1948.

A new bed of *Cytisus* (Broom) species has been formed and planted just north of Rhododendron Glen, on the east side of the Upper Road. A small bed was planted with Hamamelis (*H. virginiana* and *H. vernalis*) and additions made to the Hypericums, Eucryphias and Clematis. On Foster's Island some replacements of weak or damaged young pines were necessary, and a few more, together with some Birches and Alders, have been set out.

Acquisitions

(a) In equipment, a new G.M.C. 1½-ton truck fitted with a steel dump body and hoist is the principal item. This, received in October, replaces the old pre-war International truck, which has now been turned over to the nursery department for moving loads of young trees or shrubs. In passing, it may be appropriate here to state that the 76-inch Toro "Professional" mower and the Howard Rotary Hoe, both purchased last spring, have done excellent work through the season in their respective spheres and are both valuable additions to our mechanical equipment.

(b) Of seeds and plants, three further shipments of Glenn Dale hybrid Azaleas have been received from the U.S.D.A. Plant Introduction Station, representing 24 new varieties. Another unusually interesting gift from the same source included plants of *Camellia*, *Gordonia* and *Metrosideros* species, for trial in the Seattle climate.

Bonnell Nurseries, of Renton, Washington, presented us with 18 Azalea plants in six varieties; a small collection of ten Rhododendron species was purchased from a Vancouver Island nursery. Mr. H. J. Hohman, of Kingsville, Maryland, generously gave us 15 young plants of six Japanese cherry varieties not represented here, and Mr. A. Schnellhardt sent us about 20 plants each of Black Spruce and Tamarack by air from Alaska. A particularly welcome donation was two cases of the Olympic Hybrids of *Lilium centifolium* from the raiser, Mr. Jan de Graaff, of Gresham, Oregon. These have been planted amongst the young Camellias and *Arctostaphylos* by the Upper Road facing Rhododendron Glen.

During last winter's low temperatures we lost our stock of the beautiful Chilean Bellflower (*Lapageria rosea*). This has now been more than replaced by the kindness of Dr. T. H. Goodspeed, Director of the University of California Botanic Garden at Berkeley. Cuttings of a number of rare shrubs have been freely given to us from the gardens of Mr. D. G. Graham and Mr. D. Eggerman in or near Seattle, and the former has also supplied seeds of Magnolias and other plants for our exchange list.

Amongst the more unusual or interesting seeds received from various sources have been those, in great variety, collected by Capt. Kingdon Ward in Manipur, and sent through the New York Botanical Garden. Mr. John Duffield, of the Institute of Forest Genetics, Placerville, California, sent seeds of four species of Pines from their unique collection, as well as the native *Fremontia* and two prostrate *Ceanothus* species. Mr. Leo Isaac, of the U. S. D. A. Forest Service at Portland, Oregon, forwarded seedlings of the handsome Corkbark fir (*Abies arizonica*), and from the National Botanical Gardens of South Africa came seeds of four species of their native conifers, *Widdringtonia*, amongst other welcome items.

(c) The Library continues its steady growth. Some 25 works have been added since July 1st, but as some of these items represent

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The Hemlock Arboretum*

CHARLES F. JENKINS†

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."

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 the 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 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, Carriere, 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

*Extracted from "Arnoldia" vol. 6, Nos. 11-12 (Dec. 1946) by permission of the author.

†Mr. Charles F. Jenkins, owner and director of the Hemlock Arboretum at "Far Country," Germantown, Pennsylvania, has clearly demonstrated what important contributions can be made to horticulture in the selection and study of one group of plants—in this case the genus *Tsuga*.

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 greenhouse 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 Szechuan 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 Yatsen 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.

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.*)

Perhaps the best-known and the most popular of these mutations of *Tsuga canadensis* are the weeping pendulous trees, and heading the 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."

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*

(Continued on Page Forty-three)

The Conifers of California

PHILIP G. HADDOCK*

TO the lowlanders of the central and southern regions of California, who constitute the great majority of the state's population, forests are closely associated with mountains and cool, fragrant air. In most of the state, only with some elevation is it moist and cool enough for the existence of forests. Mention woods and one thinks immediately of his "backyard" mountains, be they Sierra Nevada, Coast Ranges, the San Gabriel Mountains, or other highlands. Almost everywhere within the state one is within view of mountains, and the majority of them are wooded, at least at the higher elevations. By far the larger amount of the arborescent growth consists of conifers. Ranging in density from the scrubby open stands of semi-desert lands with their pinon pine and juniper to the deep, dense redwood forests of the northwest coast, these evergreen trees present an exceedingly interesting array. One generally held theory which attempts to account for the predominance of conifers in the silva of California holds that the amount of rainfall received during the growing season is in most places insufficient to support the heavy water requirements of many broadleaved, deciduous or hardwood trees.

Few regions of the world have a greater variety of coniferous trees in their native flora than does the Golden State. Close to fifty species are now recognized as growing there naturally. However, a number of these are local endemics of very limited distribution, and are rarely seen by most visitors. The unusually large number of species is at least partly attributable to the great variation in climatic conditions created by the length of the state, the parallel series of mountains close to the coast, and the high Sierra Nevada along the eastern border. The humid northwestern coast supports a mixture of species, many of

which are common to the coastal forests north to Alaska, while farther south along the coast there are "arboreal islands" which represent the remnants of a Tertiary coastal pine forest, some species of which reappear in Baja (lower) California, Mexico, and there are yet other elements in the mountain forests which show affinities with the flora of the Mexican mountains.

Of these fifty species, two belong to the redwood family (*Taxodiaceae*), two to the yew family (*Taxaceae*), something like twelve are found in the cypress family (*Cupressaceae*), and the remaining species are grouped in five genera of the pine family (*Pinaceae*). All told, there are twenty species of *Pinus*, which is by far the largest genus represented.

Most famous of this group are the two *Sequoias*. The coast redwood (*Sequoia sempervirens*), by far the more abundant, often occurs in dense pure stands and is the taller of the two. It will reproduce by sprouts from the stump as well as by seed, and is confined in its distribution to a narrow belt about fifteen to thirty miles or so in width near the coast from extreme southwestern Oregon to the foggy coastal gulches of the Santa Lucia Mountains south of Carmel. This tree produces the famous lumber of commerce, well known for its durability and the size of clear pieces which can be manufactured. The Redwood Highway traverses much of its domain, and the forests of this species in Humboldt and Del Norte Counties are hailed as the heaviest and tallest stands of timber on the globe. The tallest tree measured, found in Humboldt County near Dyerville, reaches 364 feet, and many boles exceed twelve to fourteen feet in diameter. Both the diameter and the age are often much exaggerated. The forests are not even-aged stands of uniform giants, but contain trees of many ages and sizes, most of which are less than 1,000 years old although a few may reach as much as 2,000 years in age. An interesting fact in relation to the local distribution of the

*Dr. Philip G. Haddock, assistant professor of Forestry, University of Washington, Seattle, is, in his own words, "somewhat of a 'Californiac' and has had the Sequoia as a sort of 'hobby' for over twenty years."



coast redwood is that it is usually absent from the exposed, windy promontories facing the sea and is limited to the regions near the coast frequented by heavy summer fogs. This has been attributed by plant physiologists in part to the precarious water balance maintained by the individuals of this species.

There are marked differences between the coast redwood and the giant Sequoia, Big Tree, or Sierra redwood (*Sequoia gigantea*). The foliage is quite different, the cones of the giant Sequoia are considerably larger, it reproduces only by seed, grows to a much larger size and greater age, but is not quite so tall. The Sierra species is also much more limited in distribution and rarely occurs in pure stands of any extent. Recently conducted studies of the embryology and other reproductive aspects of the two species have led Dr. Buchholz of the University of Illinois to suggest that sufficiently important differences exist to warrant the creation of a separate genus for the Sierran species. Hence it is now recognized by many botanists as *Sequoiadendron giganteum*. This mammoth red tree is found only on the western slopes of the Sierra Nevada, growing in scattered groves at elevations of from 4,000 to 8,000 feet above sea level in the main coniferous forest belt, extending from southern Tulare County north to the latitude of Lake Tahoe. It is much more abundant toward the south. The sugar pine and white fir are its almost constant companions, while incense cedar and ponderosa pine are less common associates. The best known groves are the Calaveras, east of Stockton, the Mariposa in Yosemite National Park, and the magnificent groves and forests of the Kings Canyon and Sequoia National Parks. Perhaps even more significant than the tremendous bulk of their trunks is their great age, vitality and seeming near immunity to disease, and their colorful majesty. Although no description can do justice to these trees in their native haunts, John Muir, Clarence



Western Yellow Pine (*Pinus ponderosa*) in Pyramid Camp, 5,000 feet altitude, south of Lake Tahoe, California, estimated diameter 5-6 feet at head height. —PHOTO BY B. O. MULLIGAN

King, and others have written eloquently of these great forest kings, and there are several more modern monographs available. In horticulture, both Sequoias have been widely used, though the Sierran one has proved somewhat more adaptable because of its greater hardiness and the symmetry of the young trees. Both do well in Seattle, and the giant Sequoia particularly has been planted extensively in Great Britain and in the milder parts of the European continent and the eastern part of the United States. There are some particularly fine specimens in England and northern Italy.

Of the yew family there are two genera represented here, *Taxus* and *Torreya*. The western yew (*Taxus brevifolia*) is nowhere abundant but is widely distributed as a low understory tree in both the Sierra Nevada and the wetter sections of the coast ranges. The California nutmeg (*Torreya californica*) has a similar range in general to that of the yew, and is noteworthy for its interesting nutmeg-like fruit which resembles a large green olive, and for the glossy green, sharp pointed leaves.

Within the cypress family, California is represented by *Thuja*, *Chamaecyparis*, *Cupressus*, *Juniperus* and *Libocedrus*. The western red cedar, canoe cedar, or giant arborvitae (*Thuja plicata*) is present in Del Norte and Humboldt Counties in portions of the redwood belt, but it is not abundant. Port Orford cedar or Lawson cypress (*Chamaecyparis lawsoniana*) is found on moist slopes and along streams in the northwestern part of the state as far east as Shasta County. It is just as beautiful a tree here in the forest as it is in horticultural use. However, in California it does not reach the size or abundance that it attains in Southwestern Oregon at the center of its all too limited natural range. California may also claim, "by the skin of its teeth" a second species of *Chamaecyparis*. Alaska or yellow cedar (*C. nootkatensis*) was discovered in 1939 growing in the northwest slopes of Mt. Emily in the Siskiyou Mountains just about two miles south of the Oregon line.

The true cypresses of the state exhibit a very interesting type of endemism. For example, Monterey cypress (*Cupressus macrocarpa*), the best known of the group, was originally found growing on Montara granite in only two very small areas, at Cypress Point and Point Lobos, respectively at the north and south sides of Carmel Bay. Early in the history of the state it was used extensively as windbreaks and hedges, but has since suffered severely except near the immediate coast from *Coryneum* canker. The Sargent cypress (*C. sargentii*) grows in several limited localities in the central section of the coastal mountains on, or near, serpentine rock outcroppings. Other rare species include *C. forbesi*, *C. macnabiana*, and *C. goveniana*. The best place to see this group in cultivation is at the Rancho Santa Ana Botanical Garden, in Orange County southeast of Los Angeles.

Three species of junipers crouch in the high mountains and on the deserts. *J. occidentalis*, the Sierra juniper, is found commonly as a sub-alpine tree clinging to clefts on the glacially sculptured rocks. *J. californica* is a small, round-headed tree, essentially a shrub, of the desert edges and Sierra foothills. The dwarf juniper, (*J. communis* var. *montana*), is rare in the state, limited to a few localities in the Sierra, at Mt. Shasta, and in Del Norte County.

Incense cedar (*Libocedrus decurrens*) is the most abundant and widely distributed tree in this family within California, being present in the mountains from Oregon nearly to the Mexican border. Its warm, yellow-green foliage sprays and fluted, fibrous red bark create a nice contrast with the pine family members of the main Sierra timber belt. A distinctive feature of this fragrant tree is its habit of shedding pollen in the dead of winter. Its wood is valued for durability and finds use in pencil manufacture and for fence posts.

In the great genus *Pinus*, California has a wealth of species. Chief among them is the sugar pine (*Pinus lambertiana*), the "Queen of the Sierra." This largest of the world's pines gives character to the Sierran forests

more than any other single species. Like all true white pines, it has needles in groups of five of a beautiful blue green color. Its giant cones, occasionally nearly two feet in length, hanging from the tips of long branches are most decorative and much sought after by tourists. A most valuable timber tree, it is exceedingly unfortunate that it is most susceptible to the white pine blister rust. Sugar pine reaches its finest development in the middle Sierra from the Yosemite region north to the slopes west of Lake Tahoe between four and seven thousand feet in elevation. Much less common and of no commercial importance here is the rather closely related western white pine (*P. monticola*), which in California grows at a considerably higher elevation than in northern Idaho where this species is the most important timber tree. In the Sierra Nevada it approaches timberline. Other five-needled pines include the distinctive foxtail pine (*P. balfouriana*), a subalpine tree native to the southern Sierra and Klamath Mountains, and the whitebark pine (*P. albicaulis*), a widely distributed timberline species of the high mountains. Less common in California are the timber pine (*P. flexilis*) and the bristlecone or hickory pine (*P. aristata*), which are limited to a few of the higher and drier mountain ranges of the southern and eastern parts of the state.

The singleleaf pine or pinon (*P. monophylla*) is a small, roundheaded tree confined mostly to the Great Basin, desert mountains and adjacent semi-arid sections near the Nevada border. The seeds of this species and its close relatives are those much used by native Indians and sold in the markets as "pine nuts." Two others, *P. parryana* and *P. edulis* are four- and two-needled species closely related to the singleleaf pine, but in California are much less abundant.

Torrey pine (*P. torreyana*) is one of the most restricted in range of the several pines endemic to the state. It is a five leaved species with long needles and large seeds produced in medium-sized cones. Short and much branched, it grows in open groves on the bluffs by the sea, only near Del Mar in San Diego County

and on Santa Rosa Island off Santa Barbara. Another endemic which has a much wider distribution is the Digger pine (*P. sabiniana*). This three needled member of the genus has sparse gray foliage and with its much branched, often leaning habit adds a grotesque touch to the Sierra foothills. Here it is quite common, growing in open stands among the blue and interior live oaks and chaparral. It is found in the foothills of the coast ranges as well as the Sierra above the floor of the Great Valley. The cones are large and heavy, and the scales possess sharp spurs. Even more heavily armored are the large pine-apple like fruits of the big-cone or Coulter pine (*P. coulteri*). This three needled yellow pine grows on dry slopes of the central coast ranges and mountains of Southern California. A natural hybrid between this species and the Jeffrey pine is proving of great interest and potential value for breeding purposes at the Institute of Forest Genetics near Placerville.

Ponderosa or western yellow pine (*P. ponderosa*) is more abundant and of greater commercial importance than any other pine in the state. With long green needles in threes and brown furrowed bark which develops with the maturing tree into scale-like plates of coppery yellow hue, it is the chief timber tree of the main Sierra forest belt and also forms extensive, pure stands on the lava plateaus about the bases of Mt. Shasta and Lassen Peak. Also found on the higher coast ranges and Southern Californian mountains, it varies widely in growth rate and in form. Most of the large fruit and vegetable crops of the fertile valleys goes to market in containers made from ponderosa pine. Jeffrey pine (*P. jeffreyi*) is a close relative of ponderosa pine which differs in the biochemical nature of its oleoresin and in some morphological features. It is also considered more hardy than ponderosa pine.

The so-called "fire type" or closed cone pines are very well represented in California. The Monterey pine (*P. radiata* or *P. insignis*), Santa Cruz Island pine (*P. remorata*), and

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Conifers of the Cascades

C. FRANK BROCKMAN*

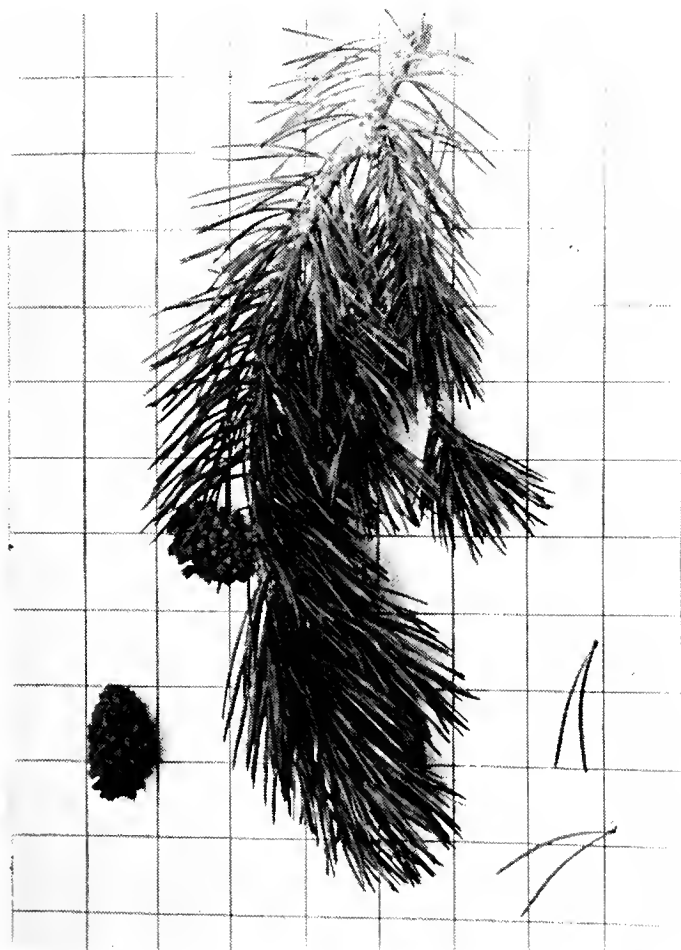
THE terms "conifer" and "Cascades" are practically synonymous. Visitors to this region are invariably impressed by the vast expanse of evergreen forests characteristic of this area. Further, not only does this area contain a considerable variety of coniferous species in abundance, but in forming a climatic boundary in the Pacific Northwest, the Cascade Range greatly affects the distribution, character and relationship of these species.

For purposes of clarity the Cascade region may be defined as encompassing that area from Mount Baker, Washington, south through the states of Washington and Oregon to the vicinity of Mount Lassen in California. It includes large areas of the moist, humid forests of the western slope, such as occur in the Puget Sound Basin and the Willamette Valley, as well as the more arid regions on the eastern side bordering the inter-mountain basin. This range, characterized by extensive areas of barren, rocky battlements that often lift their crests above timberline, is dominated by numerous volcanic peaks such as Baker, Glacier, Rainier, Adams, St. Helens, Hood, Jefferson and Shasta. Most of these bear extensive glacier systems on their broad flanks and are thus literally "arctic islands in a temperate sea".

The area is characterized by twenty-four species of cone-bearing trees. Of this number the family *Pinaceae* is represented by six species each of pine and true fir, two species each of larch, spruce and hemlock, as well as the indomitable Douglas fir which belongs to the genus *Pseudotsuga*. Representing the family *Cupressaceae* are one species each of *Chamaecyparis*, *Thuja*, and *Libocedrus*, and two species of *Juniperus*. One member of the family *Taxaceae*, the Pacific yew (*Taxus brevifolia*) should also be noted. Although this is not a cone-bearing tree, the family to

which it belongs is included in the order Coniferales, as are the conifers. Its evergreen, needle-like foliage bears such a striking resemblance to many of its associates that it rarely receives the attention that it deserves.

Perhaps the most logical manner in which one may become familiar with our native Cascade conifers is by reason of their association. Elevation, latitude, soil, moisture, and general climatic factors combine to produce a variety of habitat preferred by specific groups of trees. At the lower elevations on the west side of the Cascades the most important of these associations is made up principally of that all-important commercial triumvirate—the Douglas fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*). All achieve considerable size and add greatly to the interest as well as the commercial aspect of Pacific Northwest forests, which, in many respects at least,



Foliage and cones of lodgepole pine. *Pinus contorta*.
—PHOTO BY C. FRANK BROCKMAN

* Mr. C. Frank Brockman, author of widely read books on plant life in this area, "Flora of Mount Rainier," and "Trees of Mount Rainier," is associate professor of Forestry, University of Washington.

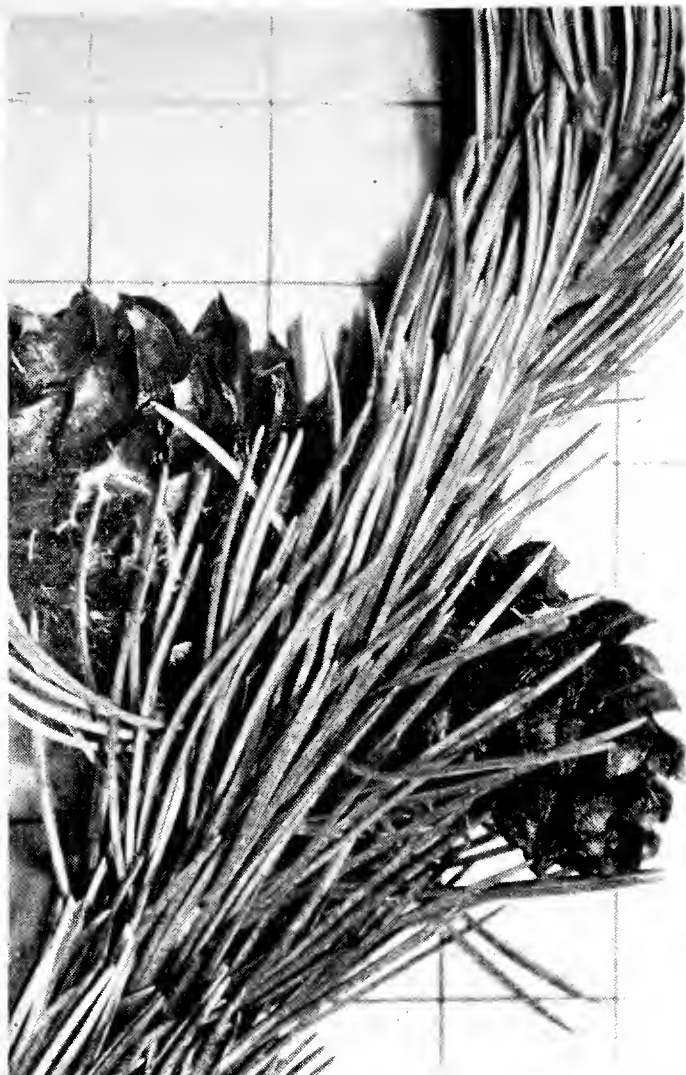


are some of the most remarkable in the world.

In addition to these species one also finds such trees as the grand fir (*Abies grandis*) and white fir (*Abies concolor*). The former, while common throughout the Cascade region at lower levels, is most prominent in the forests of the northern Cascade latitudes. White fir, on the other hand, is most evident in the southern part of this region. Sitka spruce (*Picea sitchensis*), a prominent species in the coastal forests of the Pacific Northwest, is often noted on the west side of the Cascades at lower elevations, but rarely does it assume as important a place as do other species characteristic of this area.

Other species noted in the lower forests of the west side are the Pacific yew (*Taxus brevifolia*), which has already been mentioned; the western white pine (*Pinus monticola*), and the lodgepole pine (*Pinus contorta*). Although the western white pine generally occurs sparingly, it sometimes is found in sufficient abundance to make its individuality felt. It is normally a species of the montane forests. The lodgepole pine grows under a wide variety of conditions—one finds it near timberline as well as, under certain conditions, at sea level. In fact, so cosmopolitan is its habit that it is considered as a dimorphic species. Some botanists even class its two forms as distinct from one another.

As one climbs higher, above the heavily timbered, humid forests of the lower elevations, the character and general complexion of the forest undergoes noticeable changes. In addition to being characterized by trees of smaller size, the species mixture is noticeably different. Pacific silver fir (*Abies amabilis*) replaces the grand fir as one gains altitude, until, before the middle elevations are reached, it becomes the dominant true fir in the area. Just below the sub-alpine meadow country—distinctive because of its flower-decked mead-



Foliage and cones of whitebark pine, *Pinus albicaulis*.
—PHOTO BY C. FRANK BROCKMAN

ows—the most characteristic tree association is composed of noble fir (*Abies nobilis*), Alaska yellow cedar (*Chamaecyparis nootkatensis*), and western white pine (*Pinus monticola*). Intermingled with these principal species one finds occasional Douglas firs, while western hemlock is often encountered in some abundance here. Toward the upper limits of the inter-mountain zone one also notes numerous mountain hemlocks, although this species is primarily one of the sub-alpine and timberline regions. The red fir (*Abies magnifica*) although most abundant in the forests of the upper elevations in California, will be noted in the montane zone in the Southern Oregon Cascades as well. This latter species, however, does not occur in Northern Oregon or in Washington.

It is in the sub-alpine and timberline forests that one finds the alpine fir (*Abies lasiocarpa*), mountain hemlock (*Tsuga mertensiana*), and

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Alpine Fir (*Abies lasiocarpa*) and Engelmann Spruce (*Picea Engelmanni*) in Cascade Mountains, Washington. In background Ingall's Peak, 7,600 feet.

—PHOTO BY B. O. MULLIGAN

Cypresses

CARL B. WOLF*

THE name Cypress has been applied to many genera of conifers, but rightfully is restricted to the genus *Cupressus* of which there are approximately 20 species confined to temperate regions of the northern hemisphere. In the Old World they are found from the Mediterranean region to China; in the New World from Southern Oregon to Baja California east to Arizona, New Mexico and Western Texas, thence south in Mexico to Guatemala and possibly Costa Rica.

Chamaecyparis, *Callitris* and *Juniperus* are closely related to *Cupressus* and without mature female cones the vegetative parts are sometimes difficult to distinguish from *Cupressus*.

Cypresses have been cultivated for at least two thousand years. The first species used was probably the Italian Cypress (*Cupressus sempervirens*). A few other Old World species have been cultivated but have never attained much popularity in the New World. Only the Mexican Cypress seems to have reached Europe early (about 1600). All the rest of the New World kinds have been in cultivation just a few years, with the exception of several species introduced to England about 100 years ago. Some of the least known and recently described species apparently were never cultivated until introduced at Rancho Santa Ana Botanic Garden, Orange Co., California, since its founding in 1927, where extensive studies of Cypresses have been carried out and the results published.¹

Propagation of Cypresses may be by seeds, cuttings or grafting. Of these methods, propagation by seeds is relatively easy and the plants produced have been true to type. Seeds planted in flats in early fall give about

a 15 per cent germination in about one month, are ready to transplant in about 90 days and can be set out the following fall. Seeds vary from 1,600 to 15,000 per ounce, average about 5,700 per ounce; ordinarily about two ounces of seeds to a standard 18-inch square flat have been used with an average of about 500 to 600 plants per flat.

Permanent planting sites for Cypresses should be selected on the basis of good drainage and adequate sunlight. Most species from inland habitats are failures when grown too near the coast, and several of those from coastal areas do poorly under inland conditions. Several species can be clipped to produce dense hedges or windbreaks but the process must be commenced when the plants are small and continued regularly, or large dead areas will be formed over which no new live growth will be produced.

Cypresses once were an important feature of gardening, when formal hedges and plantings were in vogue. It is unlikely that such plantings will ever again become popular. Nevertheless, some of the New World Cypresses do seem to have some value either for use as hedges and windbreaks or for specimen plantings. The varying degrees of foliage color from dark green to blue-green and silvery-gray, along with rough, fibrous bark to cherry-red or purplish smooth bark, and the several types of growth habit, offer an opportunity for considerable choice to the discriminating gardener.

Very briefly the 16 known kinds of Cypresses native to the New World are listed below and a few of their features discussed.

1. Monterey Cypress (*Cupressus macrocarpa*)

Two groves, Monterey Co., California; discovered by Theodore Hartwig in 1846-47; cultivated shortly thereafter in England; apparently also taken to Europe by Russians prior to 1838; widely used in Africa, Australia, New Zealand and California. Wild trees up to 75 feet often flat-topped, deep

* Dr. Carl B. Wolf has been interested in cypresses for more than 25 years, studying them thoroughly at Rancho Santa Ana Botanic Gardens from 1930 to 1945. His monograph, "The New World Cypresses," written in collaboration with Willis W. Wagener, is the most authoritative work on the genus.

(1) The New World Cypresses, by Carl B. Wolf and W. W. Wagener. El Aliso 1: 1-444. 1948.

green foliage. Very rapid growth in cultivation. Subject to Cypress Canker (*Coryneum cardinale*), therefore should not be used, at least in California.

2. Gowen Cypress (*Cupressus Goveniana*)

Two small groves in Monterey Co., California, each inland less than one mile and adjacent to groves of Monterey Cypress; discovered by Theodore Hartwig, 1846-47; cultivated shortly thereafter in Europe, under numerous varietal names; never given serious consideration in California. Wild trees 20 feet high or less, growing in thickets. Cultivated trees beautiful rich green but subject to Cypress Canker; therefore should not be planted.

3. Mendocino Cypress (*Cupressus pygmaea*)

Known only two areas of Mendocino Co., California, one inland a couple of miles from Fort Bragg, the other back of Anchor Bay. Both of these are in the so-called Pine Barrens, where sandstone formations cause dwarfing. Wild trees may fruit at heights of one foot or in good soil may grow to 150 feet; thus becoming one of the tallest of all Cupresses. Early confused with Gowen Cypress but is different in seeds and deep green foliage as well as in taller growth. Described by Lemon in 1895 as a variety of Gowen Cypress. Apparently never used in cultivation except in botanical gardens. At Rancho Santa Ana Botanic Garden extensively propagated from 1927, but extremely susceptible to Cypress Canker as well as unable to stand dry air of inland habitat.

4. Santa Cruz Cypress (*Cupressus Abramsiana*).

Two localities in the Santa Cruz Mountains, California, one at Bonnie Doon, the other at Eagle Rock. An exceedingly rare species intermediate between Gowen and Sargent Cypress and long confused with them. Wild trees less than 30 feet high, beautiful rich green foliage. Under cultivation since 1935, but highly susceptible to Cypress Canker.

5. Sargent Cypress (*Cupressus Sargentii*)

Numerous groves scattered in Coast Range Mountains from Santa Barbara Co., to north-

ern Mendocino Co., California. Early regarded as a form of Gowen Cypress, but described as distinct in 1909. Wild trees sometimes 80 feet high with dull green or slightly gray foliage. In cultivation of little merit and subject to Cypress Canker.

6. Mexican Cypress (*Cupressus lusitanica*; also sometimes listed as *C. Benthami* or *C. Lindleyi*)

Widely distributed in Mexico, Guatemala, and perhaps in Costa Rica. Appears to have been introduced into Portugal about 1600 where cultivated as Portuguese Cypress, but thought to have come from India and known as Cedar of Goa. Wild trees in Mexico grow to heights of 100 feet, have attractive blue-green, often drooping branchlets and silvery cones. Somewhat cultivated for many years in California, but not particularly outstanding as it apparently does not thrive in our dry air. Somewhat susceptible to Cypress Canker.

7. McNab Cypress (*Cupressus Macnabiana*)

Central to Northern California in both the Coast Ranges and Sierra Nevada, usually on hot, dry, rocky hillsides; seldom much more than a large shrub; foliage very glandular, aromatic and arranged somewhat in flat *Thuja*-like sprays. Introduced into England about 1855 but has little merit in cultivation. Susceptible to Cypress Canker. Several references to this species being under cultivation refer to the next two cupresses below.

8. Modoc Cypress (*Cupressus Bakeri* subsp. *typica*)

Lava beds, extreme southeastern Siskiyou Co. and adjacent Shasta Co., Northern California, where it is a small tree rarely over 50 feet high with reddish bark, gray glandular foliage and small cones. It was discovered in 1898, but does not appear to have ever been cultivated until 1930 when it was introduced at Rancho Santa Ana Botanic Garden. Young cultivated trees make attractive gray specimens and the species appears to be worthy of trial in regions wherever the Western Yellow Pine thrives. It is almost immune to Cypress Canker.

9. Siskiyou Cypress (*Cupressus Bakeri* subsp. *Matthewsii*)

Northern California and adjacent Southern Oregon, restricted to two main groves, one in the Siskiyou Mountains and the other on Goose Nest Mountain. Wild trees attain heights of over 100 feet, have red bark, gray-green foliage and are less glandular than the Modoc Cypress. Apparently, seeds of this Cypress have been cultivated at various times as McNab Cypress and it is only in recent years that the identity of this plant has been cleared up. Siskiyou Cypress is probably the hardiest of all Cupresses and will likely succeed anywhere that the White Fir (*Abies concolor*) will grow. It is practically immune to Cypress Canker.

10. Arizona Cypress (*Cupressus arizonica*)

Southern Arizona, New Mexico, Western Texas and Northern Mexico. Wild trees 50 to 75 feet high with cherry bark when young, later fibrous bark on main trunk. Foliage gray to gray-green, glands on leaves mostly inactive. Discovered about 1880, seeds sent to Europe and elsewhere, but in later years those of the smooth Arizona Cypress were sent out under the same name and much confusion exists as which species is referred to in horticultural literature. Arizona Cypress is as good as Smooth Arizona Cypress, but at least in California is not cultivated except in botanic gardens. Practically immune to Cypress Canker, and well suited to hot, interior, high elevation desert regions.

11. Smooth Arizona Cypress (*Cupressus glabra*)

Central Arizona; long confused with Arizona Cypress from which it differs in retaining smooth cherry bark on main trunk throughout life, in its grayer more glandular foliage, and in tending to develop a multiple branch system rather than a central leader. Seeds have been widely distributed as Arizona Cypress, so that much of literature on Arizona Cypress refers to this species. It is well suited to dry interior climates, but does poorly near the coast. Practically immune to Cypress Canker.

12. San Pedro Martir Cypress (*Cupressus montana*)

Known only from the Sierra San Pedro Martir of Baja California. Wild trees reach heights of 60 feet, are dull green to gray in appearance and have cherry bark on branches but main trunk becomes fibrous barked. The species is known only in cultivation from plants grown at Rancho Santa Ana Botanic Garden, but on the basis of its appearance and performance there it has little to recommend it except that it appears to be immune to Cypress Canker.

13. Cuyamaca Cypress (*Cupressus Stephensonii*)

Confined to a small grove on the headwaters of King Creek, Cuyamaca Mountains, San Diego Co., California, where there are probably less than 500 trees none of which are much over 50 feet high, with dull gray-green foliage and a rich smooth cherry bark on the branches and trunk. Except for two trees transplanted from the wild to an adjacent ranch about 40 years ago the only other attempt to cultivate this rare species has been at Rancho Santa Ana Botanic Garden. Although the species seems to be immune to Cypress Canker, it does not appear to be nearly as valuable as either of the Arizona Cupresses to which it is closely related.

14. Piute Cypress (*Cupressus nevadensis*)

Known only from two or three small areas in the Piute Mountains of Kern Co., Southern California. This is another rare species consisting of only a few thousand individuals. The trees are erect, seldom over 30 or 40 feet high and often as broad, forming beautiful dense gray pyramids. It is closely related to the Arizona Cupresses but is more beautiful than either; in fact, it is probably the most beautiful of any gray-foliaged cypress and merits considerable attention for use in mild interior areas.

15. Guadalupe Cypress (*Cupressus guadalupensis*)

This beautiful blue-green foliaged, cherry-barked tree is known in the wild only from Guadalupe Island off the west coast of Mex-

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The Pines of the Eddy Arboretum

JOHN W. DUFFIELD*

THE Eddy Arboretum at Placerville, California, contains more than 90 species, varieties, and hybrids of pines, and is therefore of great interest to horticulturists. The Arboretum was established in 1925 as a source of breeding stock for the Eddy Tree Breeding Station, founded in the same year by Mr. James G. Eddy of Seattle. In 1934 Mr. Eddy presented the Arboretum and Station, now called the Institute of Forest Genetics, to the people of the United States, and the U. S. Forest Service carries on the program of tree breeding.

Here the principles of genetics and the techniques of plant breeding are used to produce improved types of pines.¹ The site includes 106 acres of ridge top and slope at 2,400 to 2,700 feet above sea level on the west side of the Sierra Nevada. The soil, Aiken clay loam, supports rapid-growing ponderosa, sugar, and digger pines in those areas still in timber. Water-holding capacity of this soil is 30 per cent, wilting point 18 per cent; nitrogen and phosphorus are not readily available.

Extolling our climate is a habit of long standing, but perhaps it will suffice here to give some figures from the 25-year records of the Institute's weather station and let the reader supply the adjectives. Annual precipitation averages 42 inches, of which about 20 per cent falls during the average frost-free period of 210 days. As much as 36 inches of snow have fallen in a single storm, but lighter snowfalls are the rule. Those, however, are usually quite wet and sticky; they break the tops and branches of many of the yellow pines, especially those from warmer climates. The more flexible white pines generally shed the snow without damage. Winters are generally mild with minimum temperatures near

20 degrees F.; in 1937 a temperature of 12 degrees was recorded. Such species as *Pinus canariensis*, *caribaea*, *insularis*, *oocarpa* and *tropicalis* have been seriously damaged and some individuals killed during exceptionally cold winters. Summer days are hot, with maximum temperatures sometimes exceeding 100 degrees F.; but down-mountain breezes cool the Arboretum every evening. Atmospheric humidity is low during the growing season and sunlight is intense. The ridge-top location of the Arboretum gives it a milder climate and longer growing season than the adjacent lower-lying areas.

Most of the trees were planted as 2-year seedlings in the late 1920's. Planting was done in large holes and roots were covered with forest top-soil. Pine needle mulching conserved water, and certain species were shaded by burlap screens for the first year or two. In the first two years after planting two buckets of water were applied three or four times a summer to basins about each tree.

Pines in the species collection are usually planted 15 by 15 feet. In the hybrid tests and local race collections, spacings of 7½ and 8 feet are used. Each tree in this square layout has its unique row and line number. Thinnings have begun even in the wider-spaced plantings, and successive thinnings break up the regularity of the stand without introducing confusion into the records. Embossed aluminum labels are attached to a stake by each tree.

Table 1 lists 72 species and varieties and 21 inter-species and inter-variety hybrids growing in the Arboretum.² Other species and hybrids are in propagation but not yet established in the Arboretum. A consistent effort has been made to assemble the local races and botanical varieties of each species. Most trees in the species collection are 20 to 25 years; hybrids are 5 to 21 years old. The height of

* Mr. John W. Duffield is geneticist at the Institute of Forest Genetics, Placerville, which is maintained by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of California, Berkeley.

1. This work is described in: Tree Breeding at the Institute of Forest Genetics, U. S. Department of Agriculture. Miscellaneous Publication No. 659. 14pp. 1948.

2. This table is based on a more complete list published in 1947: Weidman, R. H. Trees in the Eddy Arboretum. Calif. Forest and Range Exp. Sta. Research Note No. 53. Spp. Multilithed.

the tallest trees and a brief description of condition are given for each species in the table; some of these species deserve special comment.

Pinus ayacahuite, a candidate for horticultural use, now occupies an uncertain taxonomic position. Two distinct types of trees bearing this name grow in the Arboretum. One, with somewhat coherent needles, is like *P. flexilis*. The other has each needle rather distinct as in *P. Lambertiana*. This diversity, recognized by several varietal names, is not surprising in view of the many isolated populations found in Mexico and the Southwestern United States. Much can be learned by the garden cultivation of these various forms of the Mexican white pine, provided seed of definitely known origin can be obtained.

P. Bungeana, a distinctive pine having many stems and bark like sycamore, does almost as well in the Arboretum as in cooler, more humid climates. A close relative, *P. Gerardiana*, does fairly well, differing principally in its single-

stemmed, somewhat fastigate habit. Both species suffer occasionally from sun-scald of their thin bark.

P. canariensis has been winter-killed to the ground at least once during the history of the Arboretum, but has recovered well by stump-sprouting. Lesser damage has occurred at other times. *P. longifolia*, a related species, has been somewhat more cold resistant, but is less attractive than *P. canariensis* which grows faster and has a fuller crown and greener foliage.

Of the American nut pines, *P. cembroides* is the most tree-like, with a single stem and rather narrow, sparse crown. *P. monophylla* is likewise single stemmed, but up to 25 years our trees have maintained a full, pyramidal crown. This silvery pine merits wider trial; it is adapted to semi-arid regions. *P. quadri-fovia* resembles *P. monophylla* in general habit and color but is somewhat more squat. It shows an interesting two-toned foliage during most of the summer, since only the inner surfaces of the needles bear the conspicuously wax-bordered stomata which give them their silvery color. During most of their first season, the needles cohere strongly so that the new growth is a light green contrasting with the grey-green of the older foliage. Finally, *P. edulis* is a glaucous, squat shrub, which has produced nuts earlier and more abundantly than its relatives in the Arboretum.

Taxonomy-minded visitors are usually interested in the relationship between *P. contorta*, the shore pine of the Pacific Coast, and *P. contorta* var. *latifolia*, the lodgepole pine of the Sierra-Cascades and Rocky Mountains. The specimens in the Arboretum demonstrate the importance of using seed of a geographic race appropriate to the horticultural end in view. Shore pine from California's north coast has made the most rapid height growth, but is generally many-stemmed and has suffered some snowbreak. Lodgepole pine from an elevation of 6,000 feet in the Sierra Nevada has attained only about half the height of the shore pine, but has a stout trunk and a compact pyramidal crown. As in its native haunts,



Calabrian pine. Winter or summer, this pine delights both forester and gardener with its straight trunk, rapid growth, and light branches.

—PHOTO BY J. W. DUFFIELD

our lodgepole pines include several individuals with forked stems; this, however, does not interfere materially with the symmetry of the crown. Some lodgepole pines from British Columbia are intermediate between the two California types; they have made rapid height growth, have remained single-stemmed, but have long limbs and an open crown with fine foliage. They have suffered some snowbreak.

P. Coulteri is an outstanding tree. Its rapid growth, long limbs and coarse grey-green foliage make it most interesting as a solitary specimen. Its cones, which mature on trees as young as 7 years, are the most massive and formidably armed of any of the pines. Although native to Central and Southern California, it thrives at least as far north as the Wind River Arboretum in southern Washington.

A pine which deserves wider testing is *P. glabra*, the spruce pine. This species has proven better adapted in the Arboretum than two of its associates of the southeastern United States, *P. palustris* and *P. caribaea*, and may prove hardy throughout a wide area on the Pacific Coast. Spruce pine makes a strong appeal with its warm green color and "soft-textured" look. Its bark is grey, thin and somewhat flaky. Its rate of growth is moderate in the Arboretum.

Jeffrey pine is worthy of special mention because of the vanilla-like odor given off by the bark. The cones are large and shaped like an old-fashioned bee hive.

Sugar pine, *P. Lambertiana*, the largest native pine, thrives in the Arboretum as well as in adjacent wild stands. Its full silver-green crown makes it one of our most striking trees. Ours started to bear cones at 20 years.

Apache pine has possibly as confused a list of aliases as any of our pines. Currently, it is known as *P. latifolia* Sarg. Once commonly called Arizona longleaf pine, this species has needles exceeded in length only by those of *P. palustris*, which it also resembles in the plume-like appearance of its seedlings. Apache pine is badly damaged by snow, but when this is not a consideration, its luxuriant foliage



Coulter pine. At 25 years, 60 feet tall and almost two feet in diameter at breast height. The bags protect artificially pollinated cones from insect and squirrel attacks.

—PHOTO BY J. W. DUFFIELD

and sturdy habit make it an outstanding candidate for landscape planting.

An accent pine with great possibilities is *P. leucodermis*. This tree from the Balkans is quite resistant to snow damage. At Placerville it grows slowly, with little secondary branching, so that its crown is an open but highly symmetrical cone of upward-curving branches. The dark green, rigid needles are in strong contrast to the ashy-grey bark. This pine has been considered by some botanists as a variety of *P. nigra*, but for horticultural use *P. leucodermis* is totally unlike any of the other recognized varieties of *P. nigra*.

For rapid height-growth, few pines exceed *P. montezumae*. This tree has slender wide-spreading branches, sparsely clothed with drooping needles. After the cold winter of 1948-49, some of our trees were badly

browned. Each of the several lots of this species grown in the Arboretum show a wide variation in growth and form. It appears necessary to grow a large number of plants to secure the best types.

Bishop pine, *P. muricata*, with its strictly coastal and insular distribution ranging from Guadalupe Island almost to the Oregon line, is broken up into a number of distinct types. Those from Mexico and Southern California have smooth, grey bark, long slender branches and coarse, sparse, green needles. Those from Northern California have very rough, rusty bark, short branches and fine, dense, blue-green foliage. The races of *P. muricata* have shown no differences in winter hardiness or snow damage in the Arboretum.

Another species of complex make-up and scattered distribution is *P. nigra*. For horticultural purposes the varieties may be divided into two groups. The Austrian pine is comparatively slow-growing, with dense, long-persistent needles. The Mediterranean varieties, particularly *calabrica*, grow much more rapidly and have sparser needles which persist no longer than two years. Austrian pine is quite cold-hardy and even var. *calabrica* should prove hardy if kept close to the ocean.

P. patula is noteworthy for its fine pendulous foliage and rusty, flaky bark. It appears to be close to the limits of its cold tolerance in the Arboretum, for it has failed completely in a nearby plantation about 1,000 feet higher.

The undisputed leader among the timber pines of the west is *P. ponderosa*. The Arboretum has trees of this species and its variety *scopulorum* from more than fifty widely scattered geographical races. These races show wide variation in growth rate and form, but, in general, the Pacific Coast races are more thrifty than others. Studies of local races at several Western arboreta have shown that those who plant ponderosa pine would do well to secure seed of local origin.

An Eastern pine of great ornamental potentialities is *P. pungens*, a tree that should prove hardy throughout the Northwest. The trunk and branches are pleasingly irregular

and sturdy, covered with gray, scaly bark. The rich, red-purple catkins contrast strikingly with rigid, dark green needles.

Digger pine, *P. Sabiniana*, is distinctive because of its extremely sparse but attractive foliage, which seems scarcely adequate to support the rapid growth this tree makes in warm climates. The grotesque form of *P. Sabiniana* over most of its native range seems to be associated with its rapid growth, for in more northerly or higher plantations, where it grows more slowly, it is also straighter and unforked.

Scots pine, *P. sylvestris*, has ornamental possibilities, although the unfortunate planting of inferior European races has discouraged its use by foresters. Most of the geographical races thrive in the Arboretum, but differ widely in form and rate of growth. Among the most attractive are the slow-growing but straight and symmetrical trees from Finland and northern Sweden. Some of the more southerly races of *P. sylvestris* suffer snowbreak; all are attacked by sapsuckers.

Some mention should be made of the hybrids listed in Table 1, for their production and testing is the chief business of the Institute of Forest Genetics. Many of them show promise of offering certain advantages over one or both parent species. For example, hybrid vigor, enhanced cold hardiness, or resistance to the attacks of certain diseases and insects. Some of these hybrids are being produced in quantity for field testing by public agencies, but our production of hybrid seed is still limited. One of the unpleasant duties of the Institute staff is to decline offers made by numerous individuals to test these hybrids. We hope that this will not always be necessary, and look forward to the time when those who plant forests or ornamental trees will be able to use new and better pedigreed pines.

(Table 1, Page 40.)

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A useful reference book, The Directory of Arboretums and Botanical Gardens, published by the Association of Botanical Gardens and Arboretums in 1947, is still available. Copies may be purchased from the Morton Arboretum, Lisle, Illinois, at a price of \$1.50.

Dwarf Conifers in the Rock Garden

FRANCES KINNE ROBERSON*

THE most frequent complaint against shrubs used in rock gardens is that they grow out of bounds too readily and have to be taken out, or else pruned so drastically that their appearance detracts from the picture. The home gardener will avoid much of this trouble if he selects shrubs from among the many dwarf conifers available. Another advantage of these particular shrubs is their evergreen foliage. While I would not recommend their use to the exclusion of broadleaved evergreen and deciduous shrubs, I know they have a definite place in the rock garden. Formal rock gardening will be excluded from our present discussion since we are primarily interested in natural rock gardening and the use of dwarf conifers in that way.

The combination of several types of dwarf conifers is by far the most pleasing way of planting them. Small areas may require only one of each of several kinds, while large areas may need several of each kind to keep the planting in scale. The contrast in form and foliage thus provided presents an interesting study.

The characteristics of these various groups of dwarf conifers are diversified within each group. For example, short, prickly needles are common to all dwarf spruce but the habit of growth differs with each species and variety. *Picea abies repens* spreads horizontally in a loose, almost ragged manner, reaching only several feet across after ten or twenty years of growth. *Picea abies clanbrasiliana* maintains more compact growth with a domed top. It is especially neat in appearance.

Foreground plantings of low heaths make an excellent association with dwarf conifers, especially since the heaths flower in addition to continuing the picture harmoniously with evergreen foliage. Some other plants easily

combined with dwarf conifers are the tiny leaved prostrate shrubs such as *Ilex crenata*, *Hebe (Veronica) guthrieana* or *H. hectori*, *Dryas suendermannii*, or *Cotoneaster microphylla*. However, in using these less compact plants it is advisable to plant them on a lower elevation, with plenty of space allotted to each, so that the conifers, which are really trees on a dwarf scale, do not become overshadowed by the shrubs which develop more rapidly and with more open habit.

Well known among the dwarf conifers and quite adaptable to many situations is the Mugho Pine with its dark green needles. It is relatively large and so should be reserved for large rock gardens.

Bronze tones may be introduced into a planting of dwarf conifers with *Cryptomeria japonica nana*, but should be used sparingly since masses of this coloring detract from the liveliness of green tones. Gray greens are characteristic of many junipers and of *Chamaecyparis pisifera filifera nana*. The latter needs fairly dry conditions with only moderately rich soil or it will extend its filamentous branches too rapidly and lose its charm. Unlike some of the other conifers we will mention, it requires annual pruning for best appearance.

The cumulative growth of *Chamaecyparis lawsoniana nana*, on the other hand, is strictly broadening so that no pruning is required. The gray backed, deep green branches divide and subdivide until the tips resemble fern fronds to the eye but are raspy to the touch. This conifer serves admirably to knit dissimilarly shaped shrubs into a related group because of the neutrality of its low, broad stature as well as the ease with which it blends its coloring with that of other shrubs.

Upright conifers of dwarf proportions climax many group plantings. *Chamaecyparis lawsoniana ellwoodi* and *Juniperus communis compressa* are both columnar, while *Picea abies conica*, as its variety name suggests, is

* Another welcome article from the busy pen of Mrs. Frances Kinne Roberson ("Waterside Plants," Spring 1949), on a topic about which she is unquestionably well informed—plants for rock gardens.

conical and looks more than anything like a symmetrical miniature Christmas tree, for which purpose it is often taken up and used indoors. Root pruning of such potted specimens helps to keep them in good shape.

Two outstanding hemlocks for rock gardens are *Tsuga canadensis minuta* and *Tsuga canadensis pendula*. The former makes a slight outward and downward sweep at the tips of its branches while the latter sends out horizontal branches which pile up one above the other to an ultimate height of several feet, but with a consistent air of grace in all stages of development.

Another especially fine rock garden shrub is the Japanese Yew, *Taxus cuspidata nana*. Each specimen achieves considerable individuality since balanced symmetry is non-existent. A well-chosen Japanese Yew will sometimes give great distinction to a small rock garden near a pool. The Golden Yew, *Taxus cuspidata aurea*, develops more symmetrically with many

upright branches quite densely grouped and with all the tips golden in color.

Taxus canadensis serves best as a background shrub. The dark green foliage may even silhouette smaller foreground shrubs of lighter substance and color as it fans out against a building or in the open. It needs some pruning to keep the branches full and the plant compact.

A large yew, *Taxus baccata repandens*, spreads horizontal branches much beyond the range of a small rock garden but is a handsome shrub where space permits its use. The bright red berries resemble those of the English Yew.

The dwarf conifers are a varied enough group to fit into almost any rock garden planting to give variety to an otherwise plain contour, to increase the feeling of permanence with their evergreen foliage, and, most of all, to create a natural landscape picture in scale.

The Pinetum at Wellesley, Massachusetts

WALTER HUNNEWELL*

THE planting of conifers at Wellesley, Massachusetts, by H. Hollis Hunnewell started about 1855. The first plantings were mostly *Pinus Strobus*, and there are many still standing about ninety feet high. In H. H. Hunnewell's diary, under date of 1866, the following appears: "Commenced improving piece of land bought last year for a Pinetum," and under 1867: "It will be my aim to plant every conifer, native or foreign, that will be found sufficiently hardy to thrive in our cold New England climate." His success in fulfilling this aim is shown by the fact that when he died in 1902, he had one hundred and two species and varieties growing.

The tract of land is of a light, thoroughly drained soil which seems well-suited to the growing of conifers. The range of temperature at Wellesley is large, maximum of 104

degrees having been recorded on July 4, 1911, and a minimum of 30 degrees below zero on February 9, 1934. The yearly mean temperature is about 50 degrees. The average yearly rainfall is 40 inches, a maximum of 66 inches in 1869, and a minimum of 28 in 1910. It is interesting to note that from 1866 to 1875, there were only two years with less than 50 inches, whereas only once since 1881 has there been more than 50 inches. This year (1949), to November 1, there has been only 26.2 inches, which is 7½ inches less than normal to that date.

In the early days very little was known about the question of hardiness. For many years almost every form of conifer that could be found in the nurseries of the United States and Europe was tried time and again, and many had to be discarded as they could not withstand our climate. T. D. Hatfield, the former superintendent, wrote in his notes on the Pinetum: "It is really surprising how per-

*Mr. Walter Hunnewell is owner of the famous Hunnewell Arboretum, possessing one of the oldest collections of conifers in the East, and also featuring rhododendrons and topiary specimens

sistent Mr. H. H. Hunnewell was, for he held on to plants when it was plain that he would ultimately lose them. We have, nevertheless, the benefit of his experience. As an example, he noted in 1867 that *Araucaria araucana* (*imbricata*) was not hardy, but the same old plant, twelve feet high when it should have been fifty feet, was carried on until 1900." As another illustration of the same point, T. D. Hatfield wrote in reference to *Pinus ponderosa*: "We have had it over forty years to my knowledge, and although it is said to grow to be a very large tree in its native country, its promise of attaining any considerable size here is very poor. The tree may be twenty feet high and it seems to lose more than it gains. If it was not *Pinus ponderosa*, it would have been cut down long ago."

Many of the first plants came from England. Some, strange to say, were American species and were grafted plants. A few of these grafts are still alive. Many seeds of western species were received from Dr. C. C. Parry (1823-1890) and several varieties came from C. Harrison of Colorado.

In later years, many specimens were given to us by the Arnold Arboretum, which is about ten miles away. They have always been very generous and hundreds of specimens of conifers and deciduous trees have come from them. Once when Professor Charles S. Sargent, of the Arboretum, was here he saw two small *Abies holophylla* and remarked: "I now see where the two *holophylla* that are missing from our nursery stock have gone." Besides receiving many specimens from the Arnold Arboretum, we have had the advice and assistance of Professor C. S. Sargent, Dr. Ernest H. Wilson, Mr. William H. Judd, Dr. Alfred Rehder and Dr. Donald Wyman, who have all gladly given their time and help.

The Pinetum has suffered two major disasters in the last thirty years. An ice storm in 1921, which did not destroy anything, but broke innumerable branches, and a hurricane in 1938, which blew down many of the largest specimens including a *Picea Abies* probably one hundred and ten feet high and planted in 1852, also several large firs, a *cephalonica* prob-

ably 80 feet, a *Nordmanniana* probably 70 feet, a *homolepis* about 55 feet and two *concolor*, one of which was about 80 feet; all these trees were about 80 years old. We lost as well a *Picea orientalis*, many *Pinus Strobus* and *Tsuga canadensis*.

H. H. Hunnewell had written in his journal in 1898 that he considered *Nordmanniana*, *cilicica* and *concolor* the finest firs, and he wondered how they would be classed in fifty years. Now, fifty years later, we consider the *cilicica* the finest fir in the collection, and if the *Nordmanniana* and *concolor* had not blown down in 1938, they would probably be rated second and third.

Some of the more interesting specimens today are:

ABIES amabilis, age 70 years, height 25 ft., spread 20 ft. This tree has always been healthy, but it will not grow. It is probably one of the early grafted specimens from England.

cilicica, age 80 years, height 82 ft., spread 30 ft. The finest fir in the collection.

concolor violacea, age 55 years, height 50 ft.

holophylla, age 40 years, height 47 ft., spread 35 ft.

homolepis, age 70 years, height 69 ft

koreana, age 40 years, height 19 ft.

lasiocarpa arizonica, height 37 ft., spread 19 ft., girth 3 ft., 3 in.

nephrolepis, age 35 years, height 35 ft.

sachalinensis nemorensis, age 35 years, height 35 ft., spread 6 ft.

Veitchii, height 52 ft.

CEDRUS libani, age 35 years, height 50 ft., spread 28 ft., girth 4 ft., 10 in. This tree has produced many bushels of cones. It was never hurt until the winter of 1947-48 when it was severely damaged, although another *libani*, not one hundred feet away, was not hurt at all.

CHAMAECYPARIS obtusa, age 70 years, height 47 ft., spread 40 ft.

pisifera, age 70 years, height 56 ft., spread 40 ft., girth 6 ft., 7 in.

pisifera filifera, age 70 years, height 45 ft., spread 50 ft.

pisifera squarrosa, age 70 years, height 50 ft., spread 45 ft.

GINKGO biloba, age over 50 years, height 52 ft.

LARIX eurolepis, age 36 years, height 60 ft. This plant was brought here in a four-inch pot by Professor I. Bayley Balfour of Edinburgh Botanic Garden, on one of the early trips of the Lusitania.

PICEA Abies, age 97 years, height 70 ft., spread 90 ft. The top of this tree was injured about thirty years ago. The lowest branches have rooted and have sent up about twenty small trees from fifteen to twenty feet high around the parent tree.

PICEA asperata notabilis, age 30 years, height 25 ft.

bicolor, age 78 years, height 65 ft., spread 58 ft.

(Continued on Page Thirty-three)

The Conifer Collection at Brook Hall, Londonderry, Northern Ireland

COMMANDER F. GILLILAND*

SITUATED on the banks of the River Foyle, 15 miles from the Atlantic, with shelter and good soil, I started to collect in 1919, using the mature trees of normal types as shelter. The collection is now (1949) a representative one, especially in garden forms of the Lawson Cypress and Thujas, not usually found together. I have been successful with nearly all conifers, except Widdringtonias, *Cupressus cashmeriana*, and most of the Mexican Pines. Of the latter only *P. Ayacahuite* is hardy. All the Pacific Slope trees do well except *Picea sitchensis*, which is subject to disease and spring frosts. New Zealand conifers and trees are not hardy here, but Tasmanian ones are. *Picea morrisonicola* is doubtfully hardy, but others from Formosa are all right. The age at which my conifers cone is most irregular. Some 35 years old have not done so; others cone at 7 years. Garden forms are slow to cone, but can be raised from cuttings. Many British nurserymen distribute grafted plants, both rare and common—a very bad habit.

The following abbreviations are used:

Ab.=Abies

Cham.=Chamaecyparis

Cup.=Cupressus

Jun.=Juniperus

Pic.=Picea

Pin.=Pinus.

Moving up the avenue, some of the oldest of my plantings can be seen. Several good *Pic. orientalis*, a good *Ab. Veitchii* and a *Pin. Laricio*, better than *nigra*. The so-called *Ab. recurvata* hardly justifies its name. Then a large *Ab. homolepis* and my favorite Spruce, *Pic. jezoensis* var. *hondoensis*. In winter this tree shows up the glaucous undersides of its branches. *Pic. brachytyla* is one of the best of

the blue spruces and resists disease better than *Pic. pungens glauca* which is a failure in this moist climate. In a section called the Hemlock plot are *Tsuga diversifolia*, *T. caroliniana* and *T. Mertensiana*; along with the tender Himalayan *T. dumosa* (*Brunoniana*) all grow as round-topped bushy plants. The Canadian *T. canadensis*, and *T. heterophylla*, on the contrary, even when young, are more upright and of tree form. Like many Himalayan trees *Ab. pindrow* is not too happy, although another one is much better. *Ab. Nordmanniana* is very fastigate, but suffers from aphids. A group of *Ab. nobilis*, now renamed *Ab. procera*, does well here, except for having lost their leaders from some undefined cause. The glaucous form shows several variations in color. The Colorado Douglas grows much slower here than the Oregon form, which does not like wind or frost. *Ab. grandis* is a bit thin, and *Sequoia sempervirens* is much more susceptible to frost than its relative the Wellingtonia (*S. gigantea*). A fine young Deodar is close to a green spruce originally received as *Pic. Engelmanni*, but now called *Pic. pungens*. Whatever its name, it is free of disease and rust; not far off are well-spaced Japanese larch. *Pin. flexilis* is not very distinct, and has not coned. *Pin. peuce* cones regularly and is a dense tree. The Tasmanian *Athrotaxis cupressoides* is hardy but slow growing.

In the old Cypress plot is a good plant of the form of Lawson Cypress called *Westermanni* with "old gold" foliage.

I have had much difficulty in growing *Cup. sempervirens*, because it becomes leggy, and its side branches are displaced by snow and rain. One here, confirmed at last by Kew on the spot, does not do all this. It is confused with *Cup. macrocarpa*. *Thuja koraiensis* is very distinct for its white under-leaves. *Jun. chinensis japonica aurea*, the form of Lawson cypress called *Wisselii*, and *Cham. obtusa* var.

* Commander F. Gilliland, R.N.V.R., is owner of the exceptional garden of conifers of which he writes, located in the North of Ireland, and a well-informed authority also on other British collections.

lycopodioides are distinct and slow growing. The type of *Cup. arizonica* is uncommon over here. Either var. *glabra* or var. *conica* are better known. Both are beautiful and distinct. *Thujopsis dolobrata* always feathers down to the ground. The "Fern Spray Cypress" is most distinct (*Cham. obtusa* var. *flicoides*) but of varying habit. The upright Irish Yew is one of the slowest growing of conifers.

In the Arboretum of six acres, commenced in 1932, are many good plants. Here chief place must be given to two trees which attained awards of merit from the Royal Horticultural Society in 1944. One is *Cup. lusitanica* var. *glauca pendula*. The name explains its beautiful appearance. It was found in Hillier's Nursery at Winchester and cones freely.

Young plants of *Cup. lusitanica* type, and of var. *Benthami*, are not very striking here. The other one is a hybrid (between *Ab. pindrow* and *Ab. spectabilis*), called *Ab. pindrow* var. *intermedia*; it has leaves up to three inches long with very white undersides. *Ab. magnifica*, sometimes confused with *Ab. procera*, has very level tiers of branches and never suffers from spring frosts. A slow grower, but distinct. A hybrid cypress called *Leylandii* has made 28 feet of growth from a cutting in 15 years, forming a dense, fastigate pyramid, (*macrocarpa* x *nootkatensis*). The Western Chinese *Abies* have not been properly studied in Great Britain. *Ab. Delavayi* is thought by some to be the type for this group. A small plant of this name here, with short radial leaves and revolute margins, held by Edinburgh to be correctly named, is one of the most outstanding *Abies* in my collection. Kew considers it is not in full vigor, but true. Very slow in growth, 4 inches for *Delavayi* against 24 of *Ab. Forrestii*, of which I have five from various sources with different leaves. All are handsome and healthy and never lose leaders.

Several Tasmanian trees are hardy and equally handsome. *Athrotaxis laxifolia* and *A. selaginoides*, which cones, and *Dacrydium Franklinii*. *Pin. Pinaster*, a dense tree with coarse leaves, is here. *Pin. radiata* is not

always easy to grow here, but when successful is a handsome tree of vigorous growth.

Uncommon trees are *Larix Potaninii* with bluish leaves, *Ab. Mariesii*, *Pic. Breweriana* and *Ab. cephalonica*, with sharp, radial leaves. *Pic. likiangensis* is subject to Aphis. Kew calls a supposed variety here, *purpurea*, the type. This escapes disease. *Pin. Ayacahuite* is the only Mexican pine hardy here. Another previously called *Pin. Montezumae* var. *Hartwegii* is now regarded as the Oregon-Californian Pine named *Pin. Jeffreyi*, with very coarse leaves like *Pin. Coulteri*.

Small plants of *Pin. Lambertiana* are difficult here, but the rare *Ab. venusta* and *Pin. Torreyana*, both from Southern California, do better.

A fine golden form of *Cup. macrocarpa*, found by chance in Northern Ireland and named "Donard Gold," is thought by Kew to be a hybrid, as is another tree here now under consideration by Kew as a probable hybrid between *Cup. lusitanica* and *Cup. macrocarpa*. The latter bears large, glaucous cones freely, but the former none.

I have several forms of *Ab. concolor*, viz. *violacea*, *candicans*, and *Wattezii*. The last two, though striking in color, are grafts, and consequently hard to grow. The variety of *Ab. lasiocarpa*, called *arizonica*, is small and of good color. The garden form of the Douglas Fir called *Moerheimii* is of blue color. *Pin. contorta* and its variety *Murrayana* are here.

In a sheltered corner are found *Ab. numidica* (from N. Africa), *Ab. firma*, *Pin. Griffithii* (*excelsa*), a blue-leaved Himalayan pine with big cones. Two more recently introduced conifers, *Jun. Coxii* and *Cham. formosensis*, are both hardy, the latter coning freely; a fine *Pic. omorika*, of excellent shape, and *Cham. thyoides*. Two western Chinese spruces, *Pic. brachytyla*, and *Pic. spinulosa*, with white under leaves. *Pic. mariana* (*nigra*) does well and has a good shape and color. Of the numerous garden forms of the Lawson Cypress and its allies may be mentioned *Allumii*, for blue color and shape, *Pottenii*, with soft, pale green foliage, and for a good gold, *Cham.*

(Continued on Page Thirty-nine)

Conifers at Rochester, New York

BERNARD HARKNESS*

TWO collections of conifers are, in fact, maintained by the Rochester Parks. In Highland Park plantings were begun around a nucleus of Austrian Pines left in nursery rows on the area donated by the Ellwanger and Barry Nursery for the park in 1888. The soil is derived from a morainic deposit rich in limestone; the topography is broken into hills and valleys of varied exposure. Growth of the city has added smoke deposits; in short, Highland Park has become increasingly a test of the adaption of its conifers to an adverse environment. At Durand-Eastman Park on the shore of Lake Ontario more nearly ideal conditions prevail. The soil is derived from a river delta deposit in a lake of the glacial era. It varies from sand to a silt loam near neutral in reaction. The conifer collection spreads over the area of one of the recently stream-eroded, steep-sided north to south valleys.

With the Great Lakes tempering its climatic extremes, the Rochester area supports commercial peach orchards. *Acer palmatum*, *Berberis Julianae*, *Euonymus kiautschovica* and *Ilex opaca* have been cited as critical plants surviving here but injured in a colder zone.

Most of the available sources of conifer seeds and plants of the first decades of this century seem to have been utilized. Especial mention is due to the close cooperation from the Arnold Arboretum which gave the Rochester Parks early access to the seeds coming in from the Wilson and other explorations in China. With the growing of quantities of plants from seed, many odd growth forms were noted and preserved; some have been described and named, others are still grown under number. It is not possible in a brief, comprehensive sketch to include a discussion of the dwarf, slow-growing, or other horticultural forms.

* Mr. Bernard Harkness, who brings us this comprehensive article on the conifers at Highland and Durand-Eastman Park Arboretum, Rochester, New York, is a member of the Herbarium staff at the arboretum.

The Firs

Abies alba. No satisfactory specimens of silver fir have developed from the early plantings in Highland Park (hereafter referred to as HP). One tree has reached fifty feet in height but the foliage is poor from burning of the needles nearly every winter.

Abies amabilis. One tree of Cascade fir persists in fair condition in HP probably from a 1905 planting, but it is only slightly over twenty feet high.

Abies balsamea. Not even at Durand-Eastman Park (hereafter referred to as DEP) do balsam firs persist in good condition.

Abies cephalonica. A group of seedlings of Greek fir from a Long Island nursery planted in 1922 in DEP are excellent specimen trees now from 25 to 30 feet high, one or two appear to be hybrids. A specimen of var. *Apollinis* planted in HP in 1905 is now about 45 feet high and in fair condition.

Abies cilicica. A confusion has existed here, as there seems to have been elsewhere, concerning Cilician fir. Good specimens so labelled here invariably produce cones that must be referred to Nordmann fir. There is a tree in HP, however, which this year has borne cones with bracts almost entirely hidden. It appears quite miserable due to excessive winter-burning of the foliage. I regard this as characteristic of Cilician fir in this climate and it is distinctly not to be recommended.

Abies concolor. Rochester experience with the white fir confirms its reputation as the best for ornamental planting in this area.

Abies Ernesti. Cones borne this year seem to agree with descriptions for this Chinese fir. Two trees now somewhat over 20 feet tall are in HP.

Abies Fabri. Fifty-foot specimens in good condition are in DEP. The earliest record of receipt of plants is that for seedlings of Wilson's No. 4078 sent from England by Vicary Gibbs in 1911. They have made remarkable growth if that date is correct.

Abies homolepis. Trees forty to fifty feet high in good condition in various situations make the Nikko fir well worth more consideration as an ornamental for this region. The reddish, scaly bark of the trunks is an attractive characteristic.

Abies koreana. A single tree in DEP received in 1921 and now only 14 feet high has not made good growth, although it has coned heavily the past two years.

Abies lasiocarpa. HP has an alpine fir, a survival of several, that is now nearly 30 feet high, narrowly-pyramidal in outline and in fair condition. Numerous good specimens of its var. *arizonica* are of ornamental value in the DEP plantings.

Abies Nordmanniana. The oldest tree of Nordmann fir in HP is now somewhat over fifty feet in height; other specimens have made satisfactory growth and are of ornamental value.

Abies recurvata. The best specimen at DEP of this Chinese fir from Wilson's No. 4051 is now 18 feet high and in good condition. At HP

growth is slow but exhibits clearly the recurved needles on year-old branches.

Abies sachalinensis. One good plant of Saghalin fir has developed at DEP, adding 17 feet to its height in ten years. Generally its record has not been so promising.

Abies sibirica. A single specimen of Siberian fir has grown to nearly forty feet in HP and presents a fairly good appearance.

Abies Veitchii. Two trees of Veitch fir have found conditions at HP to their liking, having reached sixty feet in height and still appearing vigorous and healthy. It is recorded that four-foot plants were received from the Veitch Nurseries in 1899.

Inasmuch as the survivors here of a group of *Abies* hybrids, the results of controlled crosses by Jackson Dawson on the Wellesley estate, may be the only ones of record a few notes concerning them may be of interest. Received here as small grafted plants in 1923, they were eventually planted in DEP.

Wellesley No. 1. (*Nordmanniana* x *cilicica*). Two plants about 15 feet high in DEP. General appearance poor, growth seems stunted, branches horizontal, branchlets pendulous, joints of annual growth conspicuously swollen. Needles 3 to 3.8 cm. long, mostly directed forward. X-section of needle as that of *Nordmanniana* with resin canals small and marginal. Branchlets brown and pubescent.

Wellesley No. 8 (*Nordmanniana* x *cilicica*). One plant 17 feet high of good, pyramidal form, branches ascendant. Needles to 4 cm. long and spreading outward, in x-section as *Nordmanniana* with resin canals marginal. Branchlets light yellow-green, shining, not pubescent.

Wellesley No. 14 (*Nordmanniana* x *cephalonica*). Two plants of over 25 feet in height. Branches nearly horizontal. One tree coned in 1948 and abundantly in 1949. Needles rather stiff and harsh to touch, radially spreading, up to 3.5 cm. long, in x-section resembling *cephalonica* with small, marginal resin canals. Stomata are present on the inferior surface. Branchlets shining orange-brown, no pubescence. Limb of bract on cone-scales not contracted and but little reflexed.

Douglas Fir

Pseudotsuga taxifolia. In their early maturity as a forty-foot tree branched to the ground, covered in the spring with purplish-red flowers followed by a profusion of cones from top to bottom, Douglas-fir becomes for us a superlatively ornamental tree.

The Hemlocks

Tsuga canadensis. Numerous groups of trees of 50 feet or more of Canadian hemlock in HP indicate its adaptability to conditions differing from its natural habitat.

Tsuga caroliniana. Forty-foot trees in HP of good appearance indicate the ability of individual trees of Carolina hemlock to survive but many were lost for reasons sometimes unexplainable.

Tsuga diversifolia. The northern Japanese hemlock has made trees of 25 feet since 1906 in HP.

Tsuga Sieboldii. The southern Japanese hemlock seems equally hardy and vigorous as it also has reached 25 feet in height in HP.

The Spruces

Picea Abies. The universally planted Norway spruce is not held in very high esteem as an ornamental here but many of its horticultural forms are grown for their especial interest.

Picea asperata. The dragon spruce from China somewhat resembles Norway spruce but is easily distinguished by its gray, flaky bark. Trees in HP have reached 35 feet, but mostly are of only fair ornamental value.

Picea bicolor. The specimen in HP dating from 1906 is now thirty feet in height and of fair vigor. Good younger trees are growing in DEP.

Picea brachytyla. A twenty-foot plant representing the flat-needled spruces and Chinese growing in DEP has recently been identified.

Picea Breweriana. A plant of Brewer spruce persists in HP but does not thrive. Planted in 1923, it is now only 14 feet in height.

Picea Engelmanni. Though generally recommended as a better ornamental than Norway or Colorado spruces no Rochester tree over 25 feet in height can be rated better than fair for appearance.

Picea glauca. A few white spruce in HP are from 45 to 55 feet in height though mostly only of fair ornamental value. Seedlings from Montana seed (Jack No. 2411) in DEP now averaging 20 feet show promise of continued good growth.

Picea Glehnii. Healthy appearing plants of Saghalin spruce at DEP increased only from 18 feet to 24 feet in ten years. Plants received at HP in 1902 are only 36 feet high but in good condition and coning.

Picea jezoensis. Neither the type at HP nor the variety from Hondo at DEP have made a satisfactory ornamental tree.

Picea Koyamai. Good specimens of Koyama spruce are now thirty feet high in DEP.

Picea Maximowiczii. The oldest plants in HP of Maximowicz spruce are 45 feet tall. Some excellent, dense younger trees are growing in DEP which in ten years have increased their height by eight feet. One twenty feet high has a basal branch spread of 14 feet.

Picea obovata. Siberian spruce has grown to the height of forty feet in HP but has no ornamental value.

Picea Omorika. After reaching the height of 45 feet in HP, Serbian spruce has deteriorated rapidly. Hillside groups in DEP are effective.

Picea orientalis. Quite the best spruce to be seen in HP is a fifty-foot Oriental spruce. Several more in varied locations seem to indicate a tolerance of lime-bearing soils.

Picea polita. Tigertail spruce in HP are now forty feet high, of fairly good appearance, outstanding for their large cones.

Picea pungens. The older Colorado spruce plantings in HP have suffered the usual loss of lower branches with age.

Picea rubens. The survival and thirty-foot growth of a red spruce in HP indicates some tolerance of our conditions.

Picea Schrenkiana. Plants of Schrenk spruce at DEP have grown to 28 feet in height. They are mostly of good appearance. Their light grey branchlets are distinctive.

(Continued on Page Thirty-four)

The Arboretum Bulletin

VOL. XII, No. 4 SEATTLE, WASH. WINTER, 1949

ARBORETUM FOUNDATION OFFICE HOURS

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Special Notice

To keep memberships in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears and previously established \$2 memberships more than thirty days in arrears will be dropped and THE BULLETIN will be discontinued.

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I hereby apply for membership in the Arboretum Foundation and remittance for same is enclosed to cover dues for the next succeeding 12 months.

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All memberships are non-assessable.

Notes and Comment

THE winter issue of *Plants & Gardens*, Brooklyn Botanic Garden's Horticultural Journal, will feature condensations of articles that have appeared in other horticultural and gardening magazines during the past year. Among these will be an article from the ARBORETUM BULLETIN. Two articles were selected, one of which will be published.

Mr. George S. Avery, Jr., director of the Gardens, writes: "This annual selection of articles is the Brooklyn Botanic Garden's way of recognizing the permanent quality of these written contributions to horticulture—a sort of intangible Pulitzer Prize."

THE BULLETIN takes this opportunity of congratulating the authors whose articles were chosen:

Mrs. Frances Kinne Roberson, "Waterside Plants," Spring, 1949.

Mrs. Carl McNeilan Ballard, "The Christmas Rose," Winter, 1948.

✓ ✓ ✓

The annual membership meeting of the Arboretum Foundation was held September 29, 1949, in the Auditorium of the University's new Health and Sciences Building. Officers and directors were elected for the ensuing year. We are happy to welcome the following new members to the Board of Directors: Cebert Baillargeon, William Blethen, Mrs. Burle D. Bramhall, Mrs. James Brennen, Mrs. William Calvert, Jr., Dr. Jackson K. Holloway, Mrs. Harry B. Jones, Dr. Brien King, Mrs. Harry P. Lawton, C. B. Lindeman, Mrs. Hazel M. Pringle, Victor Rabel, Mrs. Chester Reitze, Edward L. Rosling, S. L. Savidge, Dr. Frank Wanamaker, Thomas Youell, all of Seattle, and Mrs. Walter B. Beals of Olympia, Lawrence R. Hamblen of Spokane and Mrs. Howe Rushmore, Tacoma.

✓ ✓ ✓

Just received and available for use in the Arboretum Library is a completely revised edition of "Plant Buyers Guide." The book has been arranged with a simple system which permits location of plants and source of supply easily. Published by the Massachusetts Hor-

tical Society, Boston, Massachusetts.
Price \$7.50.

Our national capital, founded by George Washington in 1800, is to have an impressive sesqui-centennial celebration in 1950.

One of the most generous birthday gifts to be made to the Capital City will be the planting of three ravines in the National Arboretum in Washington—an expenditure of \$5,000—by the Garden Club of America. Donations from member clubs, members at large and the National Capital Committee made this possible.

The dedication of the ravines will take place in 1950 when many Garden Club of America officers, directors and members plan to take part in the ceremony.

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Book Reviews

American Wild Flowers, by Harold N. Moldenke, published by D. Van Nostrand Company, Inc., New York (1949). Price \$6.95.

HAROLD MOLDENKE'S beautifully illustrated "American Wild Flowers" was specifically planned, according to the author, to furnish travelers over the highways and byways of the areas north of the Rio Grande with a single volume, easily used, which would describe and identify for nature lovers the most prominent herbaceous flowering plants which they might encounter.

The author, whose splendid background of botanical education and work with plants in various parts of the world, coupled with his present position as curator and administrator of the New York Botanical Garden, admirably fits him to undertake such a work, has availed himself of the opinions of over 1,100 naturalists and botanists living in all parts of the United States, Alaska and Canada in making his selections of plants to be included in the book. Each of the 1,100 was asked to list the twelve showiest, most conspicuous, and most interesting wild herbaceous plants of his area, likely to be encountered by the nature-loving traveler. More than a thousand different plants were nominated by them. Over 2,000 named forms and species are described by Dr. Moldenke. There are 88 eye-catching, four-color illustrations and 69 gravure illustrations.

The various plants are described within their family groups, usually a chapter to each family. Entertainingly written, every chapter beginning and ending with a delightful bit of quoted verse or prose, it is a book easily enjoyed by the veriest amateur as well as by the informed botanist, who will recognize the integrity of workmanship and soundness of botanical procedures. It is to be regretted that Dr. Moldenke did not devise some method of enabling the casual reader to place in the correct family group whatever plant he might encounter and wish to identify. Unless he be fortunate enough to recognize general family characteristics, or to chance upon a colored illustration of his find, it is still going to be difficult for the average person to identify what he is seeing. But, in spite of not being entirely successful in furnishing answers readily to the ubiquitous question "what is the name of this one?" it none-the-less should be of much help to the traveler and provide both him and the fireside reader with many hours of informative and pleasurable reading.

MRS. ELLIOTT DEFOREST

✓ ✓ ✓

Shrubs and Vines for American Gardens, by Dr. Donald Wyman. The Macmillan Company, New York, 1949. \$7.50.

HERE is a book written for the general gardening public, professional and non-professional alike, who want a good reference index on woody shrubs and vines.

The major portion of the book is devoted to a general list of recommended plants of superior landscape qualities. The plant index gives all the desired information as to Latin and common name, hardiness zone, plant height, form, foliage, flowers, blooming time, fruit, habitat and year

of introduction to gardens. Not all of these items will be listed after each plant, as the ornamental qualities are only mentioned when significant to a particular plant.

Added to this are notes of interest about the plant, including requirements as to situation and soil. Preceding the discussion of the numerous species and varieties of a genus will be found an excellent introduction to their particular requirements and general cultural notes and evaluations.

Of particular value is the secondary plant list in the back of the book giving those of less ornamental value and inferior qualities.

The chapters on "Ornamental Fruits" and "Foliage Colors" fulfill a long-standing need for study and discussion of these important aspects. The lists in the chapter "Shrubs for Various Purposes" will prove to be a well-thumbed part of the book. Not to be overlooked are chapters on "Hardiness" and "Order of Bloom" which are valuable additions.

ROBERT J. HANSEN

✓ ✓ ✓

Colorado Evergreens, by Robert E. More. Revised edition. Denver Museum of Natural History, 1949. Paper cover, \$1.50. Cloth cover, \$2.50.

THIS small book of 89 pages contains in the simplest terms all that the ordinary resident or visitor will want to learn about the conifers of Colorado—five pines, three true firs, two spruce, the Douglas fir and four or perhaps five junipers. There is some doubt as to whether the creeping juniper (*Juniperus horizontalis*) really grows within the state boundaries.

The foreword by the director of the Denver Museum of Natural History succinctly expresses the contents of the book. ". . . The first edition of 'Colorado Evergreens' dealt solely with the identification of forest specimens. Because our native evergreens are by far the most generally satisfactory for landscape purposes, Mr. More has added a chapter in this second edition, on the horticultural uses of our native evergreens. A third, profusely illustrated chapter on our fascinating and fantastic timberline trees completes what we believe to be an unique volume that is informative, interesting and beautiful."

The quality and variety of the 67 photographs, of which the frontispiece is in color and the great majority taken in natural sites, indeed forms a unique feature of this excellent little work and alone is well worth its price. For the present reviewer those of the mature old trees hold the greatest interest, but others show bark, cones, shoots, habit and young specimen trees, representing almost all stages of growth save seedlings. As some seven of these species grow in Washington, we also have a direct interest in them, but it would be preferable if our own and other neighboring states would follow this admirable example and produce such a clear and informative handbook. There is no lack of material, nor of knowledgeable authors.

In any future editions it might be preferable to add the scientific names to the description of each species instead of confining them to the index and an "appendix of technical names"; some information as to distribution within the

state, preferably in the form of a small map, would be particularly welcome to visitors who want to see some of them, if not all, growing wild.

The work is printed in a large, clear type on glossy paper which materially helps reproduction of the photographs; typographical errors are extremely few and unimportant. As a Christmas or New Year gift, this has great possibilities and first-rate credentials.

B. O. M.

1 1 1

Conifers of the Cascades

(Continued from Page Thirteen)

whitebark pine (*Pinus albicaulis*) as the principal tree inhabitants. The former is particularly noteworthy because of the manner in which it arranges itself in artistic groups in the meadows—its erect, conical, spire-like form rendering it quite distinct from the more ragged appearance of its principal associate—the mountain hemlock. At timberline these species often take on grotesque forms due to the rigors of that region, for they are constantly buffeted by high winds, beaten down by the heavy snows and retarded in growth by poor, rocky soil and an extremely short growing season.

Engelmann spruce (*Picea engelmanni*) is also an inhabitant of the upper levels in the Cascades, and the lodgepole pine, although it is occasionally found at lower elevations as previously noted, will be encountered here principally in the higher regions. In addition, in the extreme northern section of the Cascades, alpine larch (*Larix lyallii*) will be noted if a search is made among the rocky, inhospitable crags.

The Cascade forest typical of the eastern slope is quite different from that on the west.

A number of species common in the more humid section of this area is found on the eastern slope, but the complexion of the forest here is rendered distinct because of the prevalence of the ponderosa pine (*Pinus ponderosa*) and the western larch (*Larix occidentalis*). The latter is the only deciduous conifer in this region. Although it is more typical in California, one may also note some Jeffrey pine (*Pinus jeffreyi*)—a species that closely resembles ponderosa pine in some respects—in the forests of Southern Oregon. In Northern California and in Oregon the incense cedar (*Libocedrus decurrens*) is an important member of the forest in a similar situation. The Rocky Mountain red cedar (*Juniperus scopulorum*) will be noted in dry soils in many localities and, in addition, the western juniper (*Juniperus occidentalis*) is also found sparingly in some localities. Neither, however, are important components of the Cascade forest except in certain specific localities.

One species of considerable importance farther south—the sugar pine (*Pinus lambertiana*)—is found in the southern portion of the Cascades. The range of this species extends into Oregon, the most northerly location of its presence being in the Warm Springs Indian Reservation south and east of Mount Hood.

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ARBORETUM NOTEBOOK

This department is published for correspondence and pertinent comments by experienced growers on interesting plants and their culture. We solicit your questions but space limitation necessitates the publishing of only such answers as we deem of general interest.

IT IS really something to have branches of *Rhododendron mucronulatum* blooming at Christmas time. About two weeks before that time, place the branches in a deep container so they will have plenty of water and keep them in a cool room. If they seem slow in developing, move them to a warmer room.

Ajuga reptans is a boon to the new garden and has more human virtues than most humans. It is a modest little thing, preferring a shady spot, but if exposed to the sun and wind will carry on bravely, holding its blossoms on their trim little stems with quiet dignity. It generally covers the untidy feet of its neighbors without depleting their sustenance as it touches the soil lightly and is easily removed if desired. It makes an excellent edging for much used paths as it charitably ignores the careless tramping of humans. It has great productivity which is really a boon to the new garden against the time the garden grows up. The blossoms are a lovely blue and the foliage being bronzy blends with most other plants. E. H.

Many of us think of Camellias as specimens or group members of a planting but in this climate and with modern propagation methods Camellias are excellent material for both hedge and screen usage. Select hardy upright growing types. Plant them as you would a hedge of laurel and prune them in the same fashion. Flowers growing under the protection of the sturdy growth engendered by pruning last long and do not burn from the effect of winds and sun. E. H.

Most of the Hellebores are winter flowering plants and add a great deal of interest to the garden when there is little or no brilliance in the general aspect. *H. corsicus* is a stunning plant with pale, greyish-green blossoms. It may form a background for *H. orientalis* (the Lenten Rose) especially the white varieties, or white with green splotches. Toward the front of this group a plant of *Megasea* with its substantial spikes of clear pink in February adds considerably to the interest of the picture.

The pale purples and pale reds of *H. orientalis* take on more brilliance if planted near a bush of *Daphne Mezereum* with perhaps a few plants of *Erica carnea rosea* in the foreground. *Helleborus niger* needs the contrast of some evergreen ferns planted near them. There is a long list of these to choose from but the British ferns of the Hart's Tongue varieties give a variation of form and a fresh green color that is pleasant. G. T. D.

If you want to be sure of having your *Helleborus niger* blooming at Christmas time, commence watering copiously early in September, keeping the flower buds exposed to the light and air. If they should be frozen stiff when wanted, immerse them completely in cold water and leave in a cool room overnight. In the morning, if the stems have not split, split them

a third of the length of the stems. The blossoms should last a week or more in the house.

E. H.

A gardener in Portland, Oregon, solved a problem last summer in a most novel way. Her new house was finished before she had decided on the landscaping. Summer had almost arrived and something had to be done. There was a bed around the foundation of the house and a border down a driveway waiting to be planted. In desperation she bought 30 packages of marigold seed, all different varieties, tall, short and medium height. All packages were emptied and well mixed in a bowl. The seeds were then broadcast in the waiting beds. The effect when in bloom was entrancing. Each plant played its part. The low-growing marigolds were a ground cover, the tall ones gave the necessary height and the intermediate growths tied them all together. People passing the house invariably stopped to admire and exclaim at the unusual and beautiful planting. E. O.

A hydrangea not commonly seen in gardens is *H. macrophylla* var. *Mariesii*. It is often listed as *H. hortensis* and again as *H. opuloides* and *H. macrophylla*, but the Kew Hand List gives the name *H. macrophylla* var. *Mariesii* as it was discovered by Maries when collecting in Japan for James Veitch and Sons. The plant is perhaps of greater substance than the garden form of *H. macrophylla* and the sterile flowers forming a circle around the corymb are a lavender-pink, sometimes three inches across. The flower head itself is a beautiful shade of blue with an occasional tiny flower of pink or purple. To do its most beautiful best it should have a moist, lime-free soil and it responds to an occasional treatment with alum. L. B.

I think every Anemone that opens in the spring is lovelier than the last. However, if I could only have one variety I would surely choose *A. Hepatica*. The first blooms open late in January with the big splash of color about the middle of February and the last bloom may come in May. The colors of my single blue ones are pretty consistently a true, deep blue with very little purple pigment. That is probably because I started from one plant and keep the white and pink ones far away in another part of the woodland. Seedlings appear in the path, and anywhere and everywhere the seed can find a place to lodge. They prefer a cool woodland soil but they are so obliging they will prosper in most situations. The fairly large plants are supposed to resent disturbance but I think I have never lost any by moving them. I separate the closely seeded plants soon after they get a start in the spring and they dig in again and go on with their business of growing. The little, silky trefoils are as fascinating in their own peculiar way as the blooms. The young leaves are covered with fine silvery hairs, probably a protection from January and February cold blasts. A. B.

List of Plant Names

(Continued from Fall Issue)

brachyandrus short stamened
brachyanthus short flowered
brachybotrys short clustered
Brachychiton short imbricated hairs and scales
Brachycome short hair
brachypetalus short petaled
brachypodus short stalked
brachytrichus short haired
bracteatus } bearing bracts
bracteosus }
brasilianus Brazilian
brassicaefolius brassica-leaved
Brassia after Wm. Brass, botanist
Brassica ancient name for cabbage
Brassicattleya compound name, Brassavola and Catoleya
Brassolaelia compound name, Brassavola and Laelia
brevicaudatus short tailed
brevicaulis short stemmed
brevifolius short leaved
brevifrons short fronded
brevipaniculatus short paniced
brevipedunculatus short peduncled
breripes short stalked
brevirostris short-beaked
brevis short
breviscapus short scaped
brevisetus short bristled
brevispathus short spathed
brevistylum with a short style
Brevoortia after J. Carson Breevort, naturalist
Breynia after J. P. Breyn, German botanist
Brickellia after Dr. John Brickell, early American naturalist
brilliantissimus very brilliant
britannicus of Britain
Briza ancient Gr. name for grain
Brodiaea after J. J. Brodie, Scotch botanist
Bromelia after Bromel, a Swedish botanist
Bromus ancient Gr. name for oats
bronchialis bronchial
Brosimum Gr. edible
Broughtonia after Arthur Broughton
Broussonetia after T. N. V. Broussonet, French naturalist
Browallia after John Browall, Sweden
Brownea after Patrick Brown
Bruckenthalia after S. von Bruckenthal
Brunella old German word meaning Quinsey
brunneus deep brown
brunneifolium brown colored foliage
Brunsfelsia after Otto Brunfels, 16th Century physician
Brunsvigia after Duke of Brunswick
Bryonia Gr. to sprout
Bryonopsis Gr. Bryony-like
bucephalus ox-headed
buddleifolius buddleja-leaved
buddleoides buddleja-like
bufonus pertaining to the toad
bulbifera bulb-bearing
bulbosus bulbous
bulgaricus Bulgarian

bullatus blistered, puckered
Bureavii after Edouard Bureau
bureavioides resembling *Bureavii*
burmanicum from Burma
Cacalia ancient Greek name
cacaliaefolius cacalia-leaved
cachemiricus of Cashmere
cadmicus metallic, like tin
caerulescens becoming dark-blue
caerulea cerulean
Caesalpinia after Andreas Caesalpini, Italian botanist
caesius bluish-gray
caespitosus cespitose, tufted
coffer, caffra of Kaffir (Africa)
cajanifolius cajanus-leaved
Cajanus aboriginal name
calabricus from Calabria (Italy)
Caladium origin of name obscure
calamifolius reed-leaved
Calamus Greek for reed
Calandrinia after J. L. Calandrini, Italian botanist

The Pinetum at Wellesley, Massachusetts

(Continued from Page Twenty-three)

Engelmanni, height 36 ft., spread 18 ft.
glauca, height 52 ft.
glauca conica, height 12 ft.
Glehnii, height 49 ft., spread 19 ft.
Koyamai, age 30 years, height 45 ft., spread 30 ft.
Omorika, age 75 years, height 41 ft., spread 20 ft.
orientalis, age 70 years, height 64 ft., spread 23 ft
polita, age 60 years, height 57 ft.
pungens, height 69 ft.
PINUS Bungeana, height 20 ft.
echinata, height 45 ft.
flexilis, height 37 ft.
koraiensis, height 35 ft., spread 29 ft
Peuce, age 55 years, height 29 ft.
ponderosa, age 61 years, height 36 ft
resinosa, height 64 ft, spread 33 ft.
Strobus, age 98 years, height 90 ft., spread 60 ft.
PSEUDOLARIX amabilis, age 80 years, height 54 ft., spread 50 ft.
SCIADOPITYS verticillata, height 31 ft.
TAXODIUM distichum age 55 years, height 54 ft., spread 33 ft., girth 7 ft., 4 in.
TAXUS cuspidata, age 50 years, height 12 ft., spread 45 ft. Spreading form.
cuspidata nana, age 50 years, height 10 ft., spread 35 ft
media Hatfieldii, age 35 years, height 15 ft.
 This plant was raised by T. D. Hatfield when he was superintendent here.
THUJA plicata, age 50 years, height 36 ft.
Standishii, age 55 years, height 45 ft., spread 41 ft.
TORREYA nucifera, age 65 years, height 26 ft.
TSUGA canadensis, age 90 years, height 86 ft.
diversifolia, age over 50 years, height 37 ft.
Sieboldii, age 55 years, height 31 ft.

At the present time there are about four hundred trees in the Pinetum representing about ninety-one species and forty varieties.

Conifers at Rochester, New York

(Continued from Page Twenty-seven)

Golden Larch

Pseudolarix amabilis. Three plants, two feet in height, were received at HP in 1905. They have grown to fine specimen trees with wide-spreading branches, the tallest is now over fifty feet. The dictum that golden-larch dislikes limestone soil perhaps needs modification.

The Larches

Larix decidua. European larch mostly makes good growth under the varying site conditions in the Rochester Parks. A plant with white female flowers is grown here.

Larix eurolepis. A good tree of the hybrid Dunkeld larch stands over 50 feet high in HP which is thought to have been planted about 1900.

Larix Gmelini. Several Dahurian larch are in fair shape in DEP. A good specimen of var. *japonica* stands nearly 40 feet high in HP.

Larix laricina. Early transplantings from local swamps to the dry hillsides of HP have resulted in impressive mature trees.

Larix leptolepis. Nearly sixty feet in height, with great wide-spreading horizontal branches, a Japanese larch stands in HP. It is a heritage from the Ellwanger and Barry Nursery and is known to have been grafted on European larch stock in 1880.

Larix occidentalis. A specimen of the western larch seems hardy and healthy in HP where it has stood for about twenty-five years.

Larix sibirica. Three Siberian larches remain in HP from a distribution of the U. S. D. A. in 1919. Two are in only fair condition but the other has reached 40 feet in height and looks well.

Cedar of Lebanon

Cedrus libani. The only *Cedrus* that stands in Rochester is the hardy form of the Cedar of Lebanon. In HP it has reached forty feet in height.

The Pines

Pinus aristata. Hickory pine has faded away from the Rochester collections and only a puny four-foot plant represents it now.

Pinus Armandi. In HP the best tree of the Chinese white pine stands 45 feet high. There is usually some winter burning of the needles.

Pinus Bungeana. The HP tree suffered the loss of several limbs in a winter storm in 1942. It has regained a height of 28 feet. Our tree displays the chalky-white bark character very well.

Pinus Cembra. Swiss stone pines in HP now are around thirty feet in height. Their growth is dense, columnar in outline, making a most satisfactory ornamental.

Pinus contorta latifolia. Plants of lodgepole pine in HP have not survived. A plant in DEP doubled its height to fifteen feet in ten years and seems fairly happy.

Pinus densiflora. Coning trees up to 24 feet stand in DEP in good condition. One picturesque old specimen remains in HP but it appears none too healthy.

Pinus flexilis. Limber pine in good form has attained 45 feet in HP. Young plants in DEP

have averaged a foot or better of growth per year for the past ten years.

Pinus Griffithii. Old plants (received from English nurseries in 1898) of Himalayan pine in HP are perhaps the best to be seen in the country. Nearly sixty feet in height, they have suffered winter-burning only in the most severe winters.

Pinus Jeffreyi. The first plantings of Jeffrey pine came from England in 1898. Now fifty feet high they appear likely to stay with us for a long time.

Pinus koraiensis. A good tree of Korean pine stands forty feet high in HP, the earliest date of acquisition being 1899.

Pinus monticola. Western white pine in HP since 1902 is no longer in good condition but excellent specimens of heights around 25 feet are in DEP.

Pinus Mugo. Suburbanites doting over their baby Mugo pines would be startled by the 18 x 18-foot-old specimens in HP. Of interest are the plants of var. *rostrata*, single-trunked, up to 28 feet in height growing in HP since 1902.

Pinus nigra. Most of the recognized geographical forms of Austrian pine are grown in the Rochester collections. Old plants in HP never transplanted from the Ellwanger and Barry Nursery rows are now 55 feet tall.

Pinus parviflora. In HP there are two good 30-foot specimens of typical Japanese white pine of picturesque outline and a profusion of cones. Having neither of these characteristics is a tree nearly 35 feet tall recorded as the "wild form," or, perhaps, var. *pentaphylla* of Mayr.

Pinus Peuce. Balkan pine exhibits a slightly looser, more pyramidal outline than Swiss stone pine. HP plants are around the 30-foot height, and of good ornamental value.

Pinus ponderosa. Good western yellow pines of fifty feet remain in HP from early plantings.

Pinus pungens. One tree of Table Mountain pine remains in HP now over 30 feet high from a planting of 1900.

Pinus resinosa. Mature red pines appear to fare better in the limy soils of HP than do white pines.

Pinus Strobus. Best specimens of white pine in HP have reached the height of 60 feet.

Pinus sylvestris. Many Scots pine were planted in HP but it would be hard to find one now of truly ornamental character.

Pinus tabulaeformis. Good Chinese pines up to 36 feet high are growing in DEP.

Pinus Thunbergii. One good, picturesque tree 35 feet high of Japanese black pine remains in HP from early plantings.

Umbrella Pine

Sciadopitys verticillata. In a sheltered position in HP an umbrella pine has very slowly attained twenty feet in height. It suffers winter-burning nearly every season.

Bald Cypress

Taxodium distichum. On the dry hillsides of HP the bald cypress has done surprisingly well. Planted since 1897 trees now range from 40 to 50 feet high.

Arbor-Vitae

Thuja occidentalis. Occasional plants remain in HP of eastern arbor-vitae, in fair to good condition, standing 35 to 40 feet high.

Thuja orientalis. The hardy strain raised here from seed from the Arnold Arboretum in 1909 remains outstanding. Landscape groups now over twenty feet high in DEP have never suffered any winter injury.

Thuja plicata. Excellent specimens of giant arbor-vitae stand now nearly fifty feet high in HP from one-foot plants received in 1896. Extensive use has been made of this species in DEP plantings.

Thuja Standishii. Slow-growing and of good ornamental value a plant of Japanese arbor-vitae stands over 25 feet high in HP from a 1902 planting.

The Cypresses

Chamaecyparis Lawsoniana. One plant in HP of Lawson cypress, now nearly 30 feet high, has retained good foliage to the ground. Its performance is uneven, however, and good plants are hard to get established.

Chamaecyparis nootkatensis. A plant received in 1897 in HP now exceeds 40 feet. It has passed the severest winters so far without losing any of its foliage and retains its pyramidal form clear to the ground. A highly valuable ornamental and much too little appreciated.

Chamaecyparis obtusa. The oldest plant of Hinoki cypress in HP is now 45 feet tall but in only fair condition.

Chamaecyparis pisifera. A good plant about 25 feet in height represents the Sawara cypress in HP. Trees of the juvenile-foliage form, var. *squarrosa*, nearby have reached 35 feet in height.

Chamaecyparis thyoides. A single plant, 30 feet high, remains from plantings made in HP in 1899.

Reports of interest that have come from studies of the Rochester collections are:

Horsey, Richard E. Hardihood of Coniferous Evergreens. Horticulture, Vol. 29, No. 1, Jan. 4, 1919.

Dunbar, John. Coniferous Evergreens in the Northeastern States. In Bailey, Cultivated Evergreens. 1923.

Slavin, Arthur D. Some Conifers Cultivated in the United States. In Report of the Conifer Conference, Royal Horticultural Society. London, 1932.

Slavin, Arthur D. Our Deciduous Conifers. The National Horticultural Magazine. Vol. 11, No. 4, et seq. Oct. 1932. (Arbor-vitae and pine are treated in subsequent issues.)

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The Conifers of California

(Continued from Page Ten)

Bishop pine (*P. muricata*), are all relics of the former more extensive coastal pine forests of the Pleistocene Period. They occur at scattered locations along the coast and on islands off California and Baja California, Mexico. Monterey pine is the most abundant in its native heath and is certainly the best known. Oddly enough, this tree is of far more importance in forestry in New Zealand than in California. Only very limited portions of the Californian coast are now suited to its growth in commercial forests. Transplanted to New Zealand, it is the primary support of a flourishing timber industry. It is one of the fastest growing conifers in the world and shows much promise in Australia, Italy and South Africa as well as in New Zealand. The knobcone pine (*P. attenuata*) is another of this group having serotinous cones which is more drought and cold resistant than the former three species. It occurs farther inland in the coast ranges and Sierra foothills. At the Institute of Forest Genetics a fertile hybrid between knobcone and Monterey pines has been produced, bearing the name of *P. attenu-radiata*, which combines the desirable features of both and is a valuable tree for planting in the Sierra foothills.

Only two more of the long list of Californian pines remain to be mentioned—the shore pine (*P. contorta*) and lodgepole pine (*P. murrayana*). The former is a short boled, often crooked, two needled, short leaved pine growing on sandy soils usually immediately along the coast in the northern redwood country. The lodgepole pine, sometimes considered only a variety of the other, is much more abundant and is a strikingly different tree in habit and range. It is the straight boled, thin barked, sparsely leaved tree which surrounds mountain meadows in the Sierra, ranges up to timberline there on rocky slopes, and on the lava plateaus of the northeastern part of the state grows in some places among the predominant ponderosa pines.

The spruces are nowhere common in California. Most distinctive is the beautiful and

rare weeping spruce (*Picea breweriana*), an endemic found in the high mountains from Castle Crags in Shasta County to Del Norte County. Engelmann spruce (*P. engelmanni*) is reported from the northeastern part of Shasta County, but is exceedingly rare. Sitka, or tideland spruce (*P. sitchensis*) is found along the cool wet coast north of Eureka. This giant of the genus is not abundant enough, however, here at the southern extremity of its range to be of any great commercial importance.

The western hemlock (*Tsuga heterophylla*), like the Sitka spruce, finds its southern limit on the coast north of San Francisco and likewise has little importance here compared to its greater role in the forests of the Pacific Northwest and Alaska. On the other hand, the mountain hemlock (*Tsuga mertensiana*) adds its graceful beauty to many parts of the timberline regions of the Sierra and also grows on the volcanic cones of Shasta and Lassen and on high mountains in the north.

The true firs of the genus *Abies* are quite well represented throughout the forested part

of the state. In the Sierra, white fir (*Abies concolor*), is abundant at middle elevations, often occurring as the predominating understory species in the mixed conifer forest of middle elevations. Its regularly whorled branches are nearly horizontal and the foliage fragrant, and while the wood is less valuable at present than that of associated timber species, it is destined to play a most important part in the future of Sierran forestry. Red fir (*A. magnifica*), along with the former species, constitutes an almost pure true fir forest at somewhat higher elevations than the main mixed conifer belt of the Sierra. Even more attractive in foliage and symmetry of branching than the white fir, it is a characteristic feature of the Canadian life zone in California. The closely related noble fir (*A. nobilis*) is very rare, but has been reported from the Klamath and Siskiyou Mountains. Another rare species also present in the northwestern mountains is the alpine fir (*A. lasiocarpa*). Reaching its southern limit in the coastal redwood belt is the lowland white or grand fir (*A. grandis*), with its flat sprays of two ranked leaves. Most individual of the genus and rarest of fir species in the state is the Santa Lucia or bristlecone fir (*A. venusta*). The spire-like columns of this fir grow in scattered groups high in the Santa Lucia Mountains of Monterey County. The very large winter buds and attractive sharp pointed needles make it popular in cultivation.

Last, but by no means least, we have the two species of *Pseudotsuga*, the well known Douglas fir (*P. taxifolia*) and the big cone spruce (*P. macrocarpa*). The former, world famous as a timber tree and the pride of the Pacific Northwest, is, in terms of actual saw timber volume now the most abundant wood in California. This revelation of the most recent timber surveys has been a surprise to many. Most of the cut since the early days has been of the more valuable pines and coast redwood. However, the timber quality of Douglas fir in California does not match that of the same species in coastal Oregon and Washington. Its tasseled, fragrant foliage and attractive bracted cones and fur-

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rowed rough bark are a familiar sight from the redwood forests of the coast around the head of the Sacramento Valley and through the middle elevations of the Sierra as far south as Yosemite. In parts of the inner portions of the redwood belt, and in the north coast ranges it forms nearly pure stands of considerable extent. Along with the redwood and several other plants it reaches its southern limits in the mountains south of Carmel. The bigcone spruce (*P. macrocarpa*), while but a pale imitation of its lordly cousin, is much appreciated where it grows naturally. Differing from Douglas fir principally in the size of cone, vigor of growth and size attained, this lesser species is found on the cooler slopes and in the gulches near the lower or "dry timberline" of the Southern California mountains. While of negligible importance for timber, by its greenery in an arid land of chaparral it is valued for landscape and watershed purposes. Many a canyon and ridge above Pasadena and Los Angeles owes its touch of forest fringe to this hardy tree. However, its Achilles heel is fire, and it has suffered much reduction in area from repeated fires in the chaparral.

All in all, this variety of conifers is hardly surpassed by that of any territory of similar area in the world, and a tour through the the mountains of California, if carefully chosen, may resemble a walk through an arboretum. The number of good books available which describe these beautiful trees with care and detail is large and their study rewarding.

Cypresses

(Continued from Page Sixteen)

ico. It was introduced into cultivation about 1880 and has done well in many places in California, there now being many cultivated trees 50 to 60 feet high with massive trunks. Recent plantings have been rare because of lack of seed, which seldom seems to be produced in California. It is closely related to the Tecate Cypress which differs mainly in its bright green foliage.

16. Tecate Cypress (*Cupressus Forbesii*)

One grove in Orange Co., several in San

Diego Co., California, and a few localities in Baja California, all comparatively near the coast and at elevation under 4,000 feet. Practically all of the trees in the California groves are rather young as the result of seeding following past fires, so it is difficult to venture a guess as to the real potentialities of this species. It is a green-foliaged, cherry-barked tree, usually with a very weak central leader or numerous main branches; rarely attains a height of over 30 feet.

First known cultivated plants of the Tecate Cypress were at Rancho Santa Ana Botanic Garden in 1927. Some of these reached heights of 30 feet in ten years. Among thousands in test plantings only a few contracted Cypress Canker, thus indicating that the species is practically immune. At least for mild regions such as Southern California, the Tecate Cypress is the outstanding green-foliaged substitute for the formerly useful Monterey Cypress.

Summary as to New World Cypresses

Of the sixteen known and named kinds of Cypresses native to the New World their horticultural status and possibilities can be summarized as follows:

1. The Monterey, Gowen, Mendocino and Santa Cruz Cypresses are green-foliaged, fine plants but cannot be used because of their high mortality from Cypress Canker.

2. The McNab, Sargent and Mexican Cypress are of little use in California although the latter is a beautiful and highly valued tree in Mexico.

3. The Cuyamaca and San Pedro Martir Cypresses are too little known and have no really outstanding horticultural features to merit extensive use.

4. The Piute, Modoc and Siskiyou Cypresses are all outstanding, gray-foliaged trees, which may prove valuable in regions having considerable cold weather in winter.

5. The two Arizona Cypresses are both good trees for inland situations.

6. The Guadalupe and Tecate Cypresses are much alike botanically, but only the Tecate, because of its green foliage, is likely to acquire any widespread use in horticulture.

The Arboretum in Summer and Fall

(Continued from Page Three)

several volumes of bound Journals or periodicals, the total number of books is considerably larger. Worthy of mention are: "New Flora and Silva," 7 vols., (1928-35); "American Wild Flowers," H. N. Moldenke (1949); "Huntington Botanical Gardens," W. Hertich (1949); "Growth of Plants," W. Crocker (1948); "Himalayan Journals," J. D. Hooker (1854); "Silva of China," Vol. II, by Hsen-Hsu Hu (1948), and the U. S. D. A. Yearbook of Agriculture for 1949, "Trees."

A new glass-fronted bookcase, 5 ft. high, 4½ ft. wide, made by the Buildings and Grounds Department of the University, now contains some of our larger, older, and more valuable works. Miss Dorothy MacDonald, of Arboretum Unit No. 8, has presented us with a very handsome leather-bound visitors' book, which will be brought into use in 1950.

(d) Donations from garden clubs, usually for specific purposes, include the following:

From Seattle Garden Club, for maintenance of plantings, \$100.00, and for the purchase of more Japanese Cherries and Azaleas, \$200.00.

From West Seattle Garden Club, for work in Woodland Garden, \$400.00.

From Mercer Island Garden Club, for winter shrub garden, \$50.00.

From Unit No. 33, for a collection of Broom (*Cytisus*) varieties, \$75.00.

From Juanita Graham Unit, No. 30, for Peony collection, \$85.00.

From North End Flower Club, \$30.00 for purchase of book.

The Mercer Island Club also contributed six rustic benches, to be placed in the Arboretum; other clubs or units have made lesser contributions, all gratefully received.

Two donations from individuals are also warmly appreciated; \$50.00 from Mrs. Philip MacBride, of Woodinville, for general purposes, and \$35.00 from Mr. Robert Hitchman of Seattle, for a larger projection screen for showing our slide collection.

Such gifts clearly show an increasing public support for the work and objects of the Arboretum, and a realization that even though it is chiefly supported by State funds there is ample room for additional financial aid, especially for particular needs, if development is to proceed without unnecessary delay.

Miscellaneous

Amongst the 430 visitors who registered at the Arboretum during July, August and September were Mr. W. H. Warren, superintendent of Parks at Victoria, B. C.; Dr. Donald Wyman, Horticulturist at Arnold Arboretum, Massachusetts, whose talk and collection of colored slides shown on the Campus August 1 will be well remembered; Mr. Robert Williams, Superintendent of the same institution; Dr. William Robbins, Director of the New York Botanical Garden, and Professor H. Nelson, head of the Division of Horticulture, San Francisco Junior College.

On October 11 and 12 parties from the Society of American Foresters convention in Seattle visited and were shown around the

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Arboretum, while a regular meeting of the American Rhododendron Society was held there in August.

From July 1 to October 15 thirty-four more Kodachromes, of plants or views in the Arboretum, have been added, and a further twenty-eight were taken of fall color on November 1. Additional black-and-white pictures have been made for record purposes.

During Sept. and October about nine addresses or talks were given by the Director or Mr. Hansen, including those to the State Federation of Garden Clubs, the annual meeting of the Arboretum Foundation, to Helen Bush School, and at the West Seattle Garden Club plant sale.

The rainfall from June to September inclusive totalled 2.57 inches, or 1.86 inches less than normal, and 5.77 inches less than the same period in 1948, which was unusually wet. Fine sunny weather continued through most of September and October, so that the fall coloring of foliage has been exceptionally prolonged and much brighter than usual. Frost was recorded on four successive nights in mid-October, the lowest temperature being 26 degrees F. on the night of the 19th, resulting in some damage to soft young growths of various plants in the nursery, frames and lath-houses.

1 1 1

The Conifer Collection at Brook Hall, Londonderry, Northern Ireland

(Continued on Page Twenty-five)

obtusa var. *Crippsü*; *Cham. pisifera* var. *squarrosa* has soft glaucous foliage.

Sequoia gigantea, planted in 1885, was 83

feet high in 1945; *Tsuga heterophylla*, planted in 1919, had reached 73 feet in 1945, and *Cham. nootkatensis*, planted about 1890, is now 65 feet. These give some idea of the growth rate of Pacific Slope trees here. My highest native conifer is *Abies alba* (*pectinata*), planted about 1780, and Scots Pine, 78 feet, same age.

I have nearly all the Pacific Slope trees here except *Pin. albicaulis* and *attenuata* (*tuberculata*). I lost *Pin. monticola* and *Pin. Sabiniana* and have replaced *Pinus muricata*.

Cryptomeria japonica and its variety *elegans* and all Japanese conifers have done well here.

In the walled garden is a good collection of dwarf conifers, of many colors, sizes and shapes. These are hard to name. The flat, spreading junipers have been placed on flat ground and kept clear of grass.

I note the dwarf varieties of the common spruce are difficult to distinguish and apt to get aphid. These form a pleasant contrast to the giants of the family. The dwarf Thujas offer good colors in winter. Here also are many junipers like the Himalayan *Jun. Wallichiana*, which is hardy and cones freely. *Jun. pachyphloea*, a bit leggy; *Jun. rigida*, very prickly, and *Jun. drupacea*, from the Middle East, of distinct form. *Jun. virginiana* and its forms do not appeal to me as do some others of this family.

The correct names of many conifers here remain in doubt. Many are sent out under wrong names and their quality at present is low. However, the charm of conifers to me lies in their varying colors and shapes and that many provide a cheerful aspect in winter.

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The Pines of the Eddy Arboretum

TABLE NO. 1

Scientific and common name	Height of tallest tree (in feet)	Condition and other notes
<i>Pinus:</i>		
<i>arizonica</i> Engelm. Arizona pine	35	Good
<i>Armandi</i> Franch. Armand pine	15	Fair, poor color, slow growth
<i>attenuata</i> Lemm. knobcone pine	55	Good
<i>ayacahuite</i> Ehren. Mexican white pine	15	Good
<i>Banksiana</i> Lamb. jack pine	30	Fair, short-lived
<i>Bungeana</i> Zucc. lacebark pine	15	Good
<i>canariensis</i> C. Smith Canary Island pine	35	Fair, some cold damage, sprouts after top dies
<i>caribaea</i> Morelet slash pine	55	Fair to poor
<i>cembroides</i> Zucc. Mexican pinyon	25	Good
<i>clausa</i> (Engelm.) Vasey sand pine	30	Fair
<i>contorta</i> Dougl. shore pine	30	Good
<i>contorta</i> var. <i>latifolia</i> Engelm. lodgepole pine	25	Good
<i>Coulteri</i> D. Don Coulter pine	60	Good
<i>densiflora</i> Sieb. & Zucc. Japanese red pine	35	Fair
<i>durangensis</i> Martinez Durango pine	7	Good
<i>echinata</i> Mill. shortleaf pine	35	Good, many local races growing
<i>edulis</i> Engelm. pinyon	10	Good
<i>flexilis</i> James limber pine	35	Good
<i>Gerardiana</i> Wall. Gerard pine	20	Good
<i>glabra</i> Walt. spruce pine	35	Good, some snow damage
<i>Greggii</i> Engelm. Gregg pine	30	Fair
<i>Griffithii</i> McClell. Himalayan pine	30	Fair
<i>halepensis</i> Mill. Aleppo pine	45	Good, heavy sapsucker attacks
<i>halepensis</i> var. <i>brutia</i> Elw. & Henry erect cone Aleppo pine	50	Good, heavy sapsucker attacks
<i>Jeffreyi</i> Grev. & Balf. Jeffrey pine	40	Good
<i>koraiensis</i> Sieb. & Zucc. Korean pine	3	Poor, slow growth
<i>Lambertiana</i> Dougl. sugar pine	50	Good
<i>latifolia</i> Sarg. Apache pine	35	Good, some snow damage
<i>leiophylla</i> Schl. & Cham. smoothleaf pine	35	Fair, much snow damage. vigorous sprouter

<i>leucodermis</i> Antoine		
graybark pine	20	Good
<i>luchuensis</i> Mayr.		
Luchu pine	20	Poor, much snow damage
<i>Massoniana</i> Lamb.		
Masson pine	45	Fair, some snow damage
<i>monophylla</i> Torr. & Frem.		
singleleaf pinyon	15	Good
<i>montana</i> Mill.		
Swiss mountain pine	20	Good
<i>Montezumae</i> Lamb.		
Montezuma pine	55	Good, some snow and cold damage
<i>monticola</i> Dougl.		
western white pine	45	Good
<i>muricata</i> D. Don		
Bishop pine	45	Good
<i>nigra</i> var. <i>austriaca</i> Asch. & Graeb.		
Austrian pine	35	Good
<i>nigra</i> var. <i>calabrica</i> Schneid.		
Corsican pine	50	Good
<i>nigra</i> var. <i>cebennensis</i> Rehder		
Cevennes pine	35	Good
<i>nigra</i> var. <i>mauretanica</i> Mair & Peyer		
Algerian pine	25	Good
<i>nigra</i> var. <i>pallasiana</i> Asch. & Graeb.		
Crimean pine	45	Good
<i>oocarpa</i> Schiede		
eggcone pine	1	Sprouts repeatedly after frost killing
<i>palustris</i> Mill.		
longleaf pine	45	Poor, much snow damage
<i>patula</i> Schl. & Cham.		
Mexican weeping pine	40	Fair
<i>peuce</i> Griseb.		
Macedonian pine	2	Poor, slow growth
<i>pinaster</i> Ait.		
maritime pine	50	Good, some snow damage
<i>Pinceana</i> Cord.		
Pinceana pine	1	Poor, may not survive
<i>pinea</i> L.		
Italian stone pine	40	Good, some snow damage
<i>ponderosa</i> Laws.		
ponderosa pine	55	Good, many local races growing
<i>ponderosa</i> var. <i>scopulorum</i> Engelm.		
Rocky Mountain ponderosa pine	30	Fair to poor
<i>pseudostrobus</i> Lindl.		
Nicaragua pine	15	Fair
<i>pungens</i> Lamb.		
Table Mountain pine	45	Good
<i>quadrifolia</i> Parl.		
Parry pinyon	15	Good
<i>radiata</i> D. Don		
Monterey pine	70	Good, some snow and occasional cold damage
<i>remorata</i> Mason		
Santa Cruz pine	35	Good
<i>resinosa</i> Ait.		
red pine	35	Good
<i>rigida</i> Mill.		
pitch pine	30	Fair, some snow damage
<i>rigida</i> var. <i>serotina</i> (Michx.) Loud.		
pond pine	35	Good
<i>Roxburghii</i> Sarg.		
chir pine	30	Fair
<i>Sabiniana</i> Dougl.		
Digger pine	65	Good
<i>Strobus</i> L.		
eastern white pine	30	Fair, color poor, sun scald
<i>sylvestris</i> L.		
Scotch pine	50	Good many trees attacked by sapsuckers

<i>tabulaeformis</i> Carr. (<i>sinensis</i> Mayr)		
Chinese pine	35	Good
<i>taeda</i> L.		
loblolly pine	50	Good, many local races growing
<i>taiwanensis</i> Hayata		
Formosa pine	20	Good
<i>teocote</i> Schl. & Cham.		
Aztec pine	25	Good
<i>Thunbergii</i> Parl.		
Japanese black pine	45	Fair
<i>Torreyana</i> Parry		
Torrey pine	35	Fair to poor, snow damage
<i>virginiana</i> Mill.		
Virginia pine	35	Good
<i>washoensis</i> Mason & Stockwell		
Washoe pine	2	Fair
<i>yunnanensis</i> Franch.		
Yunnan pine	35	Good

Pine Hybrids Growing in Eddy Arboretum

<i>x attenuradiata</i> Stockwell & Righter		
(<i>attenuata</i> x <i>radiata</i>)	65	Good
<i>arizonica</i> x <i>ponderosa</i>	5	Good
<i>caribaea</i> x <i>taeda</i>	30	Fair
(<i>x murraybanksiana</i> Stockwell & Righter)		
(<i>contorta</i> var. <i>latifolia</i> x <i>banksiana</i>)	10	Good
<i>echinata</i> x <i>caribaea</i>	30	Good
<i>echinata</i> x <i>rigida</i>	20	Good
<i>echinata</i> x <i>taeda</i>	25	Good
<i>Jeffreyi</i> x <i>Coulteri</i>	1	Good
<i>Jeffreyi</i> x <i>ponderosa</i>	30	Good
<i>monticola</i> x <i>excelsa</i>	2	Fair
<i>monticola</i> x <i>Strobus</i>	10	Fair
<i>palustris</i> x <i>caribaea</i>	35	Fair
<i>ponderosa</i> x <i>latifolia</i>	5	Good
<i>x Sondereggeri</i> H H. Chapman	50	Fair
(natural hybrid <i>taeda</i> x <i>palustris</i>)		

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**OPEN
SUNDAYS**

**RICHMOND
BEACH
WASH.**

SEATTLE - EVERETT HIGHWAY TO RICHMOND HIGH-
LANDS.... 1 MILE WEST ON RICHMOND BEACH ROAD

The Hemlock Arboretum

(Continued from Page Six)

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 scientists 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."

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 ducklings", 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.

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 varie-

ties. 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.

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.

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Zelkova crenata, 3:16
Zenobia pulverulenta, 2:42

The Foundation office is grateful for many hours of volunteer help during the past few months, and thanks those who extended this assistance: Mrs. Kenneth L. Mead of the Volunteer Committee; Mrs. C. J. Anderson; Mrs. Arnold Magnuson; Mrs. R. M. Shore; Mrs. K. Smerud and Mrs. Leon Sprague.

"Dwarf Rhododendrons in Seattle," an article appearing in the Brooklyn Botanic Garden's magazine "Plants & Gardens, Autumn, 1949," is by our Arboretum Director, B. O. Mulligan.

Interesting note: Total number of "gifts" received by the Brooklyn Botanic Gardens from July 1, 1947 to June 30, 1948, as listed in their annual report of activities, is \$24,630.94.

A helpful booklet issued by the Seattle Public Library lists our Northwest authors and their books on Northwest Flora.

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A two-day conference on and show of Magnolias and Camellias will be held in London by the Royal Horticultural Society, April 4th and 5th, 1950. It will be preceded by a six-day tour of the finest gardens in Cornwall, and two days near London. Write to the Secretary, Royal Horticultural Society, Vincent Square, London, S. W. 1, for details.



MRS. KARL H. ELLERBECK
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