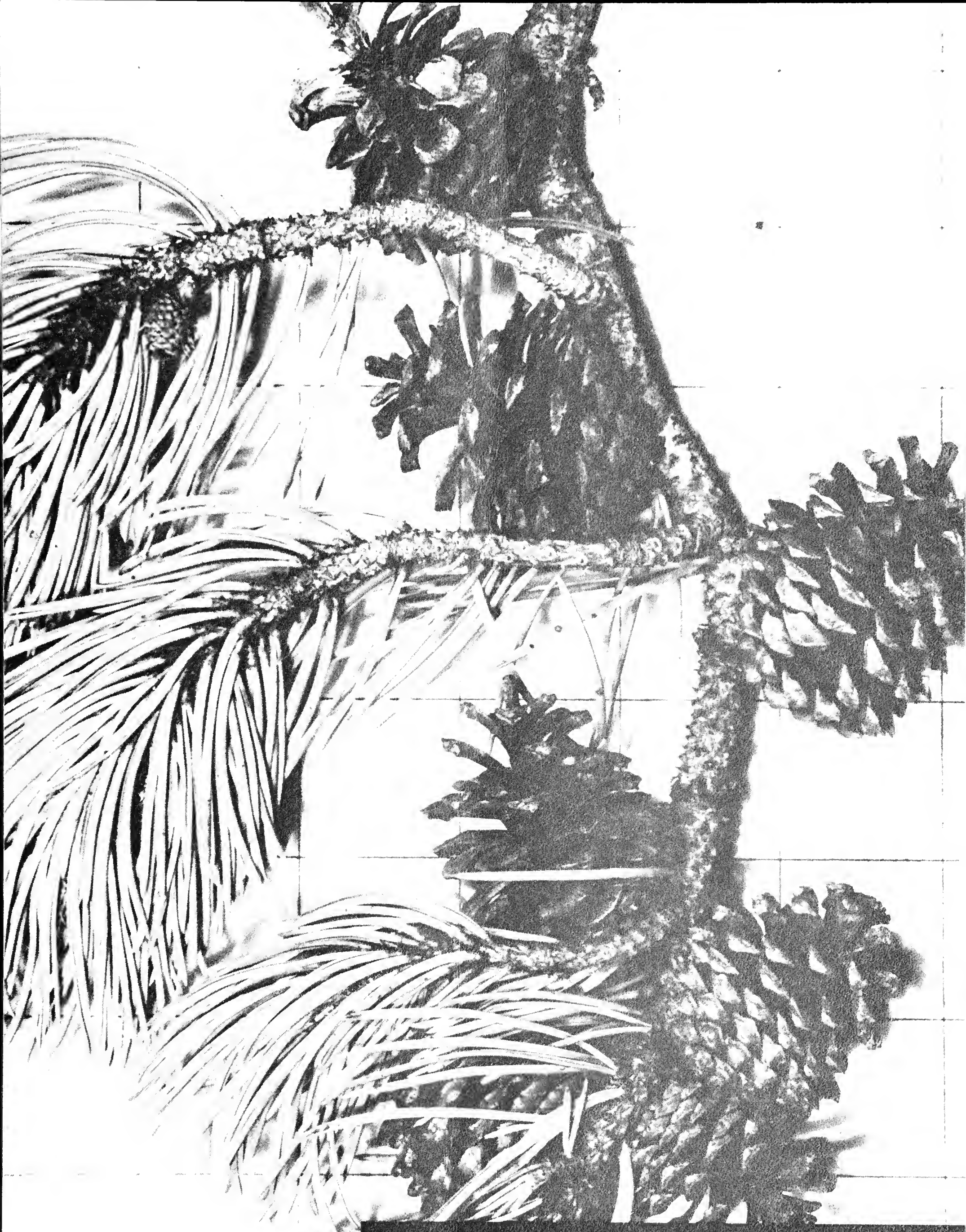
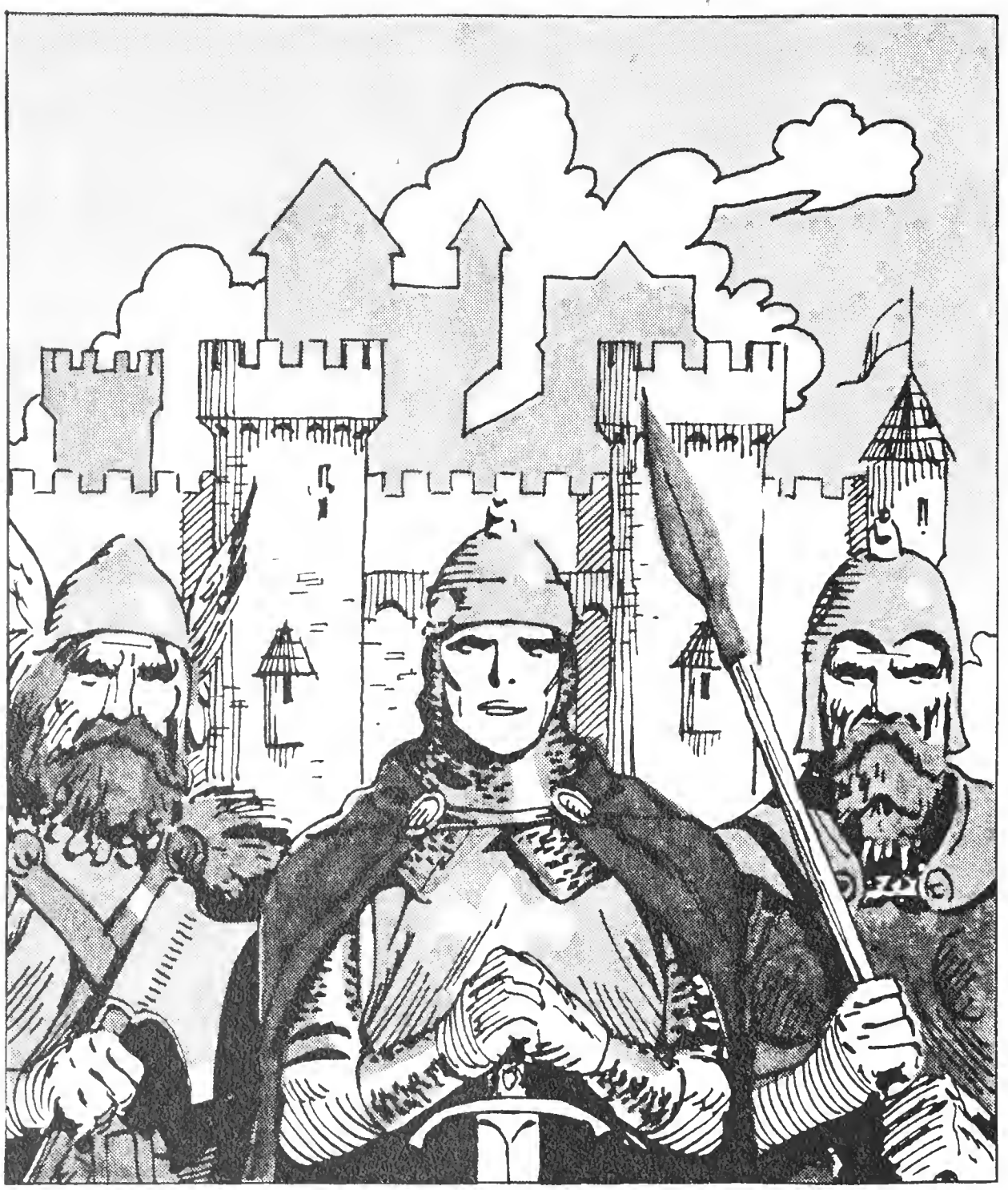


THE UNIVERSITY OF WASHINGTON

Arboretum bulletin

FALL
1965



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Arboretum bulletin

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Cones and Foliage of the Lodgepole Pine—Pinus contorta

Photo by: C. Frank Brockman

A View of the Landscaping—*Seattle University*

Raymond L. Nichols, S.J.*

The campus of Seattle University is unusual in that over the years it has been carved out from one of the most blighted areas the city knew back in the 1930's. It grew from one city block to fourteen with the accompanying asphalt jungle of interlacing paved streets. From such raw material it is obvious that drastic efforts had to be made in order to create a scholastic atmosphere from the ashes of blight.

As you enter the campus grounds from Broadway and East Madison, descent is made down a large stairway done in red terrazza with aluminum railings. A large sweep of lawn traversed by a broad sidewalk, also in red and flanked by golden Berkman Cyprus, terminates at the Arts and Science Building. The lawn replaces a gravel bed which was a boy's playfied in 1930; and the sloping banks which once surrounded the pit are now heavily wooded with evergreens, deciduous trees and heavy intermixed plantings of well-grown *Forsythia, Cydonia* (pink), Escallonia (Apple Blossom) and Philadelphus. The face of the Arts building is softened with *Pyrancantha* (Laland) which has grown 30 feet tall and has been trained by trimming the lateral branches into tufts in the Japanese manner. The old gravel pit has been transformed into a veritable monastery garden, and a shrine in one corner heightens the effect.

Passing through the foyer of the Arts Building, you come out onto what was once 10th Avenue and what is now known simply as the Mall. The 30 feet black top street has been narrowed to a width of 20 feet and planter urns have been placed in the center line to soften the stark expanse of black. Here you have the typical planting on both sides: Atlas Cedar and Deodar to give the evergreen effect; Pin and Red Oak for high deciduous; cherry, plum, and crabapple for a succession of high spring color. The base plantings are: Azalea (evergreen and assorated), assorted barberry, a few Camdia, with Hinodegiri dominating.

From the Mall there is a gradual descent to 11th Avenue and the main level of the Pigott Building. Here, in addition to the usual groupings of foundation planting—rhododendrons, azaleas, yews, columnar cedars—a special garden encircles the Broderick Fountain. The plantings, a rich variety of contrasts and blendings, are set among mountain boulders. Thus, the formality of the fountain and surrounding lawn is modified by the trees and shrubs. The use of five well-grown cedars achieves an arresting interspercing height effect.

The areas of the campus we have discussed represent the worst features of terrain which S. U. inherited and it is in these that landscaping is most pronounced. The Butchart Gardens outside of Victoria share with us the distinction of working from disadvantageous terrain, and we have both surmounted the initial handicap very much in the same fashion. However, Seattle University has not used annuals on the grounds. We have, rather, employed very effectively Japanese landscaping on a large scale; rock placements, tall and low plantings with contrasting foliage, bonzai pines, both black and red. Such arrangements have been very effective in tempting the passer-by to pause and study.

The uneven character of most of the campus terrain has compelled us to use much rock, some as walls, others in rock place-

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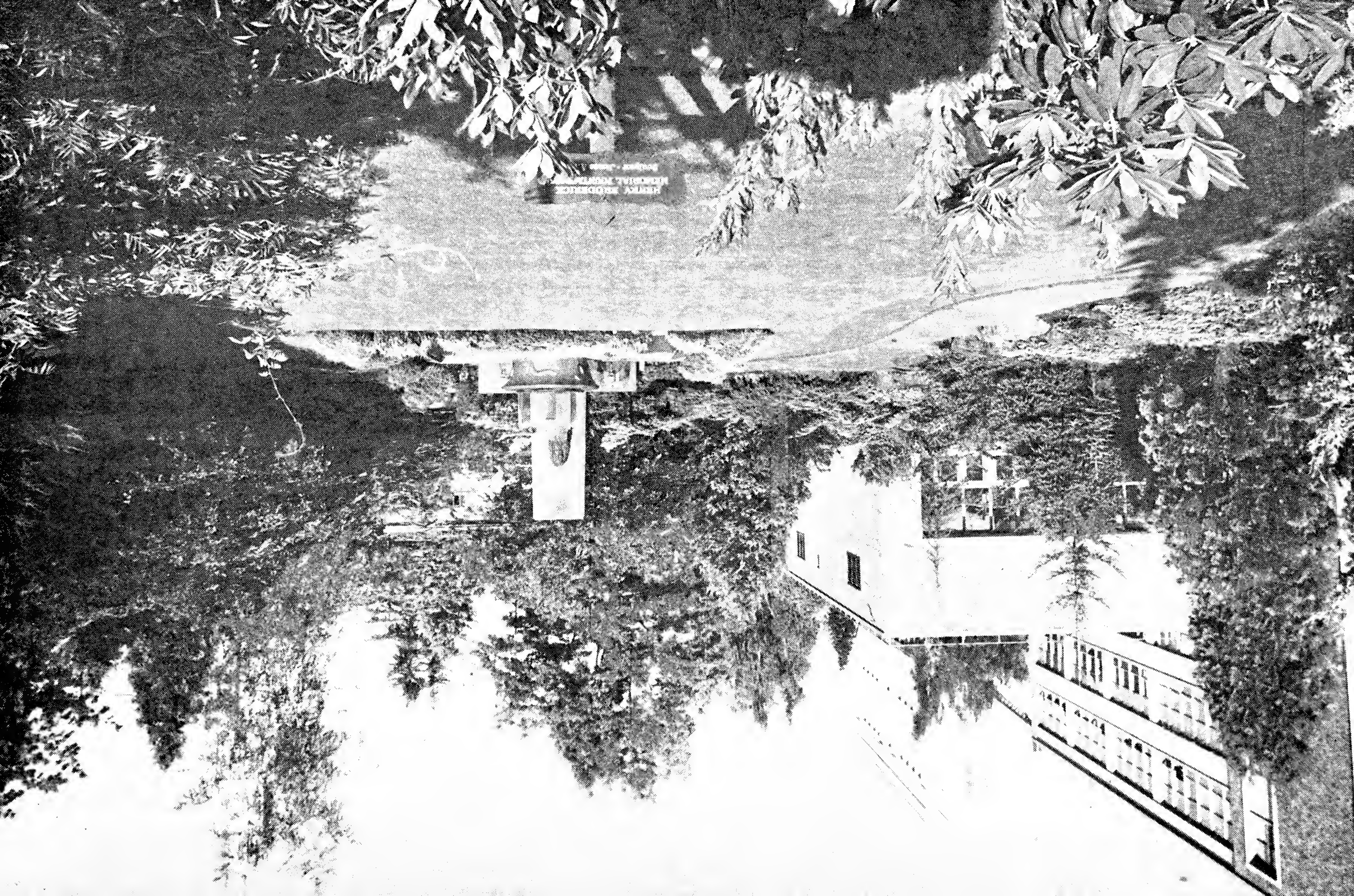
The Henry Broderick Memorial Fountain reflects the "intimate" landscaping technique characteristic of Seattle University's Campus.
Fig. 11 Photo: Courtesy Seattle University

*The Rev. Raymond L. Nichols, S. J., is Superintendent of Buildings and Grounds and is responsible for the present layout of the Seattle University Campus.



Choice Plants in Pacific Northwest Gardens

B. O. Mulligan*

The native vine maple, *Acer circinatum,* seen in its natural setting in the Cascade mountains, is probably the most conspicuous large shrub or small tree for fall color effect which we have in the Northwest.

With us, it should be grown in full sun in well drained soil and not given much water to obtain best results. Height, 15-20 ft., depending upon local conditions. It often produces several main branches from the base, but can be kept to one stem if so desired.

The evergreen manzanitas (Spanish, little apples, referring to the fruits) are chiefly California shrubs, with a few species extending north and south, and one, *Arctostaphylos uva-ursi,* the bearberry, circumpolar in its distribution. Of the hardier, taller species we find *A. Manzanita* one of the most reliable and at the same time most attractive, for its tough, spoon-shaped, shining leaves held up and out from twigs, the pendent bunches of pale pink or white urn-shaped flowers in early spring, and finally the smooth dark brown trunk and branches. Here, on a bank of sandy soil facing west it has attained about nine feet in 17 years, including (for Seattle) two unusually cold winters. All manzanitas should be transplanted from containers into their permanent places when not more than two years old.

Of all the broad-leaved evergreen shrubs introduced to the Northwest since 1945, perhaps the most valuable is the group of hybrid camellias known under the name of *C. williamsii,* after their orginator, Mr. J. C. Williams of Cornwall, England. Of the single pink flowered types, 'J. C. Williams' and 'Mary Christian' are to be found in Pacific Coast nurseries, and perhaps also a few others. 'Donation' is a very beautiful semi-double form with flowers four inches or more in width, of a soft rose color, usually appearing in March. At present we grow it in a lath house to give the plant some protection from wind. These camellias, like *C. sasanqua,* can also be trained in fan shape against shaded walls or fences; they dislike dry, sunny conditions.

One of the earliest shrubs to bloom in Seattle each year, contemporarily with the Chinese witch-hazel, *Hamamelis mollis,* to which we look forward with a good deal of anticipation, is the winter sweet, *Chimonanthus praecox,* likewise a native of China, introduced to Europe almost 200 years ago.

It it deciduous, botanically related to the Carolina allspice, *Calycanthus floridus,* and produces its small, highly fragrant, pale yellow bell-shaped flowers, marked with red inside, usually about the end of December or early in January, depending upon the weather. One small flowering branch will scent a room, so they should be cut and enjoyed indoors. A warm sheltered corner is recommended, with a west wall or fence behind the plant.

Clerodendron trichotomum, a small tree from Japan and eastern China, is seldom seen around Seattle, but is capable of forming a very handsome specimen. The fragrant white flowers, surrounded by a red calyx, appear in August, when they are especially valued. The conspicuous, bright blue fruits follow in October-November and are then useful for decorative purposes.

Many of the broom (Cytisus) family are not hardy in colder climates, but *C. battandieri,* which grows at altitudes up to 6,500 ft. in the Middle Atlas Mountains of Morocco, should be and is more so than most of its race.

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*This article appeared in the Garden Club of America Bulletin, March 1965 as "Notes on some of the slides" which Mr. Mulligan showed at the Forum held in New York City in Nov. 1964. It is reprinted here with the kind permission of the Editor.

A vigorous, fast-growing leafy shrub ten to 12 feet in height, having large silky, trifoliate leaves like a laburnum, it does not much resemble the usual types of almost leafless brooms. The golden flowers are produced in June, in short dense heads, and have an unusual fragrance, like ripe plums. A sunny very well drained situation is indicated, preferably against a wall or fence. It has flourished for 20 years in Seattle but seldom produces any seeds.

On the other hand, *Genista lydia*, from limestone rocks in Bulgaria and Macedonia, is more typical of this group of rock garden shrubs. Forming a dense mass of wiry gray-green branches about 18 inches tall but two or three feet across, it erupts in late May or early June into a mass of the brightest yellow flowers. For a dry, sunny bank or rock wall it is excellent, and can be propagated by cuttings taken in late summer or early fall.

Perhaps the most conspicuous and decorative shrub to bloom here in August is *Hydrangea aspera*, native to the Himalaya and China, possessing handsome though somewhat coarse foliage above which extend the flat heads of pale lavender colored flowers. It is deciduous and has no beauty of form in winter, so that it should be concealed by some other lower shrubs placed in front of it. Our oldest plant has now been with us for 20 years, but unfortunately seems to produce no good seesd and is not easily propagated by cuttings.

Of all the flowering trees in this Arboretum pride of place must undoubtedly go, at present, to our form of Magnolia kobus, named "Wada's Memory' from the Japanese nurseryman who supplied it as a seedling in 1940.

Now more than 30 ft. tall, it is covered each year in April, before the leaves appear, with thousands of snowy-white blossoms, much larger than the usual forms of this species. It can be propagated by cuttings in summer, under mist, and will flower four or five years later. Plants have now been distributed to many other arboreta and botanical gardens both in the United States and overseas, so it should not be long before they begin to show the quality as well as the quantity of their floral display.

Amongst crab apples, one which we particularly enjoy and recommend for smaller gardens is 'Blanche Ames,' raised by Dr. Karl Sax at the Arnold Arboretum and introduced in 1947. Of somewhat drooping habit, it does not seem likely to exceed 20 ft. in height. The semi-double white flowers, an inch across, flesh-pink in the bud, usually open here in April and are borne in great quantities. The fruits, however, are sparse, small, and have no ornamental value.

For dry, sunbaked slopes or in rock crevices the native western *Penstemon rupicola*, found in the Cascade range from central Washington to northern California, is one of the most effective small shrubs we can grow. The brilliant carmine tubular flowers, borne on six-inch stems in May, contrast beautifully with the glaucous grey, rounded leaves. It can be grown either from seeds or cuttings, requiring only the best possible drainage and little or no water in summer.

Among the smaller species of *rhododendron* the Japanese *R. degronianum* has much to recommend it. The habit is low and compact, the long narrow leaves with fawn-colored idumentum beneath are distinct and attractive, while the clear pink flowers are bright and charming in April. In 20 years our plants are no more than three ft. tall. Hardiness rating by the American Rhododendron Society is H_3 or to -5° F.

A tree which is proving to have real value as a landscape feature in the summer is the silver-leaved form of the European white willow, *Salix alba* var. *sericea (regalis)*, obtained from a nursery in Ohio in 1954. At present more or less oval in form, the trees are likely to become broader with age; growth has been almost three feet per year, in a situation near water which supplies

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Scenes in the Arboretum, I

Woodland Garden in the Fall

J. A. Witt

Certain areas in the Arboretum have a strong seasonal interest, that is, they are more attractive during certain months than in others. For instance the holly collection, the Winter Garden, even Rhododendron Glen, have periods when they are full of flower or fruit which are followed by more quiescent periods when there is little general interest. Other areas have a more or less sameness about them. The Pinetum doesn't really change character from spring to winter.

A few sections, however, remain sprightly throughout the year with a constant succession of plants. Two of the best examples of these are Azalea Way and Woodland Garden. Azalea Way, of course, is an ever changing riot of flowers from the time of the first spring cherries in late March until the end of the last of the Azaleas in late June or early July.

Woodland Garden on the other hand, may lack the flamboyant impact of Azalea Way but in my estimation at least, is especially interesting for its subtle shades and textures which change almost weekly from spring to late summer. The play of reflections on the ponds, the filtered light through the tall evergreens, the delicate colors and shapes of the Japanese maples, the feeling of defined spaces all combine to make this little valley an area of quiet but varying beauty. Only in the fall does Woodland Garden step out of its quiet character and become a scene of blazing glowing fall color.

The setting of Woodland Garden is nearly ideal for such a display as this. The east end adjoining Arboretum Drive East is especially fine in October and early November. Let us take a closer look at this section to see why.

Physically it is a shallow valley with steep sides on the north and south. The center and west is occupied by a small rock-rimmed pond backed by a tall screen of native firs, cedars and hemlocks. The east opens on Arboretum Drive and is screened by the western red cedars planted along the nursery fence. The northeast slope, a dry warm site, is planted to a collection of sumac species, largely *Rhus glabra,* the smooth sumac interplanted with *Rhus copallina,* shining sumac, with a fringe of the low growing *R. aromatica* along the base of the hill. The sumacs can be expected to furnish bright red and scarlet colors during most of the latter half of October. Further along the north slope we find a short row of *Viburnum dilatatum,* a Japanese species with large clusters of ruby-red fruit set off by golden hued leaves. West of this the bank is planted with a number of the beautiful Japanese maple clones imported in 1940 and 1941. These little trees are a study in themselves and well worth viewing at any time but they are particularly lovely in the fall. We may except shades of yellow, red, and orange from their dying foliage. There is a trail which starts here and continues west along the bank, leading one beneath and through one of the most colorful displays of foliage in the entire Arboretum. If, however, we turn left and take a lower trail here another grouping of brilliant-leaved plants becomes evident; the planting of *Fothergilla monticola,* from southeastern United States. The leaves of these tall shrubs resemble those of their relatives, the witch-hazels, and color equally or better. One individual plant on the south east side of the group is perhaps the finest in the collection for its crimson

and yellow hues but the entire group is very fine.

Near the west end of the pond several Chinese witch-hazels *(Hamamelis mollis)* rise above the bronzy-green foliage of the native *Vaccinium ovatum*, evergreen huckleberry. Their large golden-yellow leaves brighten an area made dark by the thick overhead canopy of tall native conifers.

Attractive as is the north bank, it can hardly compete with the vibrant colors found to the south. A planting of some seventeen sourwoods, *Oxydendrum arboreum*, the largest about twenty feet tall, is the flamming heart of the fall display here. They are concentrated above the pond on both sides of a service road leading west and form a grove which defines the grassy space to the northeast. Their rich reds are equally beautiful viewed with the morning sun, or back-lighted in the afternoon.

The shrubby border leading to the east from the Oxydendrum group is very rich in plants that have fine fall color. The Virginiana witch-hazel, *Hamamelis virginiana*, not only produces its tiny yellow flowers in October, but also develops golden foliage. The largest specimens here are approaching twenty feet in height. Smaller in size but equally brilliant are the royal azalea, *Rhododendron Schlippenbachii*, with rich maroon leaves. At the east end of the bank, near the road, three small maples may have bright leaf colors. At the east we find the native vine maple, *Acer circinatum*, famous for its autumnal tints. Next to the west is *Acer Sieboldianum from* Japan whose foliage usually turns yellow; then comes the fullmoon maple, *Acer japonicum* which produces leaves of the deepest blood-red. Unfortunately, these trees do not put on an equal show every year—some seasons are much better than others. Still further to the west at the top of the bank surrounded by a thicket of tall *Mahonia aquifolium* we see the piece-de-resistance of the Japanese maple collection, *A. palmatum* 'Harusame', an upright tree with many ascending branches whose leaves turn to pure flame in late October or early November.

The pond serves as a reflecting basin for the native bigleaf maples, *Acer macrophyllum*, growing to the north and the white-stemmed birch (probably *Betula pendula*) to the west, both of which produce golden yellow leaves. The real feature here, however, is a twenty-foot tall *(Liquidamber styraciflua)* sweet gum set on the brink of the pool at the eastern end where its star-shaped leaves of scarlet, red and purple are mirrored in the quiet water. Several small but brightly colored Japanese maples are planted beneath the sweet gum.

Not truly in Woodland Garden, but certainly part of it visually are several katsura trees, *Cercidiphyllum japonicum*. They are perhaps thirty feet tall, with rounded crowns and during the last two years have displayed apricot colored leaves in mid-October. Prior to then their autumnal hues were bright gold. Apricot or gold, they are best seen with the sun behind them, in mid-afternoon.

Our climate and geologic history has mitigated against the development of many native plants which give the brilliant autumn colors of those from northeastern America or northern Asia but Woodland Garden is a living demonstration that they will thrive here. Come to see them in October—and bring your camera with plenty of color film.

International Dendrology Society

At a meeting of the Council of this Society held in London, England, June 15, 1965, the Director of the Arboretum was elected a member of the Council, of which Dr. Donald Wyman, Horticulturist at the Arnold Arboretum, Boston, Mass., is already a member.

The objectives of this Society are "to promote the study and cultivation of woody plants and for this purpose to bring together persons and bodies interested in these objects all over the world."

Lodgepole Pine*

Pinus contorta Dougl.

C. Frank Brockman*

This, one of the most widely distributed conifers of western North America, grows under such a diversity of soil, moisture and climatic conditions that it is dimorphic – with two forms quite distinct in general appearance. The coastal form, often known as "shore pine," occurs along the Pacific slope from Alaska to northern California. It it a small ragged tree, rarely more than 25 to 30 feet tall and 6 to 18 inches in diameter, with a long crown of stout stiff branches and relatively thin, scaly dark brown to black bark. Some people confuse it with the jack pine *(Pinus banksiana)* of the Lake States and far north, also a relatively small tree of somewhat similar size and ragged appearance. The inland form of lodgepole pine *(Pinus contorta* var. *latifolia)* occurs farther eastward, being one of the most common trees throughout the northern and central Rockies from northern British Columbia to southern Colorado, as well as in the mountains of Eastern Washington and Oregon and the Sierra Nevada in California. The inland form is a larger, better formed tree with thin, scaly, usually reddish brown or gray bark. Under most suitable conditions it achieves a height of 60 to more than 100 feet and diameter up to 2 or, occasionally, 3 feet. The better specimens usually have a long clear trunk and short crown and consequently have commercial value, being used for a variety of purposes, including telephone poles and railroad ties. The common name, lodgepole pine, is said to have been derived from the fact that the plains Indians customarily used the straight slender trunks of smaller specimens of the inland form of this species for tepee or lodge poles.

Although residents of Puget Sound may observe the inland form of the lodgepole pine by driving to eastern Washington, it is the ragged coast form that is more familiar to us. It may be encountered here under a wide variety of soil and moisture conditions, including boggy locations, sandy coastal sites or even situations higher on Cascade slopes approaching the lower limits of the Hudsonian Zone.

The needles of the lodgepole pine are 1 to 3 inches long and occur two in a "bundle" or fascicle. This makes it easy to distinguish it from the other three indigenous Washington pines for both western white pine and whitebark pine—which occur at different altitudinal levels – bear their needles in "fives," while the longer ponderosa pine needles usually occur in "threes."

The ovoid, asymmetrical cones of lodgepole pine are up to two inches in length with the ends of the scales characterized by a long, recurved prickle. These cones remain closed and attached to the branches for many years, opening slowly to shed the seed. Since the cones open most readily upon the application of heat extensive areas, particularly in the Rocky Mountain region, are typified by dense stands of lodgepole pine—the result of natural seeding following a ground fire. Although the fire killed the original stand it provided for a new forest cover by supplying necessary heat required for dispersal of seed developed over several years and exposed the mineral soil wherein the seed of this species germinates most readily.

A continuation of our "Native Northwest Trees" by Prof. Brockman of the College of Forestry, University of Washington.

*Note cover picture—Cones and Foliage of the Lodgepole Pine—*Pinus contorta.*

Intraspecific Variation

Reinhard F. Stettler*

On a recent trip to the Olympic Peninsula I collected twigs from a number of Sitka spruces, *Picea sitchensis,* growing right at the ocean. Back at the college, almost all students who looked at these twigs, at first glance, identified them as *Abies* material. On closer inspection, however, most of them revised this diagnosis and concluded that the twigs came from some "odd form of spruce" or from some never-heard-of spruce-fir hybird. Had I shown them the cones from the same trees there would have been no question that this was perfectly good Sitka spruce material.

Now, I must admit that the needles on these twigs were as atypical of spruce as I had ever seen: they were short, broad and flat and had a blunt tip rather than a sharp point. At a gross morphological level they very much resembled the foliage of *Abies lasiocarpa* except that they were sessile. In contrast, the cones showed all characteristic features of the female strobili of Sitka spruce.

This episode illustrates a phenomenon that is apparent to the student of almost any organism in nature, namely, that two members of the same species never are exactly alike. Such variation is called *intraspecific* (from the Latin *intra*=within) variation. In the following paragraphs we shall briefly consider several types of intraspecific variation, their major causes, and their general significance. For convenience of discussion, we will address ourselves first to the variation at the population level and secondly to that of the occasional individual deviant.

Variation among populations

It takes only casual observation to discover that populations of the same species, occupying different habitats, may differ considerably in their appearance. These differences may pertain to characteristics of the population, such as size, density, horizontal and vertical structure, age distribution etc.; or they may pertain to characteristics, such as morphology, anatomy etc., of the individuals that make up the population.

Much of the variation can be explained by the immediate effect of the environment in which the population grows. It is not surprising that Douglas-fir trees *(Pseudotsuga menziesii)* from the windswept conifer stands along the ocean shore should look different from their relatives growing in a sheltered valley of the Olympic Peninsula. It may be more striking to see two practically adjacent Douglas-fir stands one consisting of trees with dark green foliage and long internodes, the other having exclusively trees with yellowish needles and short internodes. However, a cursory inspection of the soil may fully explain this difference. In fact it is not uncommon to encounter this situation wherever a deep, residual loam and a very gravelly glacial outwash occur in close proximity, as they do in many areas of Western Washington. When we try to visualize the multitude of factors, physical, chemical, and biological, that, in combination with time, define the environment of a perennial plant; furthermore, when we are aware of the chain of events in the physiology of a plant, set in motion by the change in concentration of a single micronutrient; then we begin to realize that it would be exceptional, indeed, to discover two plants that in the sum total of their characteristics are identical.

However, in few cases only will the environmental variables fully account for the observable variation among populations—or if so, not necessarily in a direct fashion. Some of the observed differences, some-

*Assistant Professor of Forestry and Genetics, University of Washington

times even their majority, may be caused by genetic differences: by the presence in one population of genes that are different or absent in the other.

Each plant species has a characteristic distribution range. In an extreme case, as in that of a Wild Buckwheat *(Eriogonum apricum)* in California, this range may be restricted to a single area not larger than an acre (G. L. Stebbins, personal communication). More typically, the range of a species extends over larger regions embracing many geographic areas, sometimes several continents. Douglas-fir, for example, can be found from New Mexico to British Columbia, from the Pacific to the Rocky Mountains, from sea level to 8000 ft. elevation. Scotch Pine *(Pinus sylvestris)* occurs naturally anywhere between Spain and Northern Finland in latitude, and between Scotland and central Siberia in longitude. Geographic spaces of such order of magnitude harbor a wealth of different local enviroments. While some of the variables affecting these local environments may follow more or less random patterns, dictated by the uniqueness of local geological and climatological history, many will follow systematic trends in response to large scale gradients. Furthermore, many of these environmental patterns have been persistent enough to assume evolutionary significance. In other words, natural selection, over long periods of time, may have favored different types of individuals in different portions of a species range.

Since it is characteristic for genetic changes brought about by natural selection, to be of a stable, permanent, nature one would not only expect that population P_1 of a particular species, occupying an environment E_1, may appear and react differently from population P_2 in environment E_2; but one would also postulate that some of the characteristics of P_2 would be retained if this population were transferred to environment E_1. Experiments designed to test this postulate have been initiated as early as in 1821, when Philip A. de Vilmorin, a French seedsman, planted seed from different seed sources of Scotch Pine on his estate in the Department of Loire in France. He found that some of his seed sources were clearly different from others in their genetic constitution. (6).

Probably the most comprehensive and systematic of such studies aimed at revealing the genetic differentiation of populations has been carried out by three scientists of the Carnegie Institution of Washington at Stanford, California (Clausen et al., 1). Following a transect across California that took them from the Pacific Coast to the High Sierra they collected plants and seeds from populations of different genera and established them in a number of transplant gardens along this transect. Careful observation and measurement of the original collections as well as of their subsequent generations at their new location permitted them to evaluate the degree of genetic control of certain characteristics.

These experiments served as a model for a large number of similar studies that were initiated by many researchers around the world and were concerned with almost any plant genus from conifers to grasses. Much of this work is described and discussed in Stebbins' classic "Variation and Evolution in Plants" (5). The results from these studies have generally shown that most plant species, certainly those with a wide distribution range, are a conglomerate of populations more or less distinct from each other in their genetic constitution.

In some species this genetic differentiation may have proceeded far enough to lead to morphologically distinguishable races, varieties, or subspecies. A cursory inspection of any Flora will convince the reader of the abundance of such species. Other species—or any of the subspecies or varieties within a species—while relatively uniform at the morphological level, may harbor much concealed genetic variation at the physiological and biochemical level.

Let us look again at our native Douglas-

fir. *Pseudotsuga menziesii* is composed of three groups of populations that have been classified by many taxonomists as three distinct geographic races or varieties, *viridis*, *caesia*, and *glauca*.* They inhabit different portions of the distribution range, *viridis* occupying the coastal area, *caesia* the Interior of British Columbia, and *glauca* the Rocky Mountains. The three forms can be quite easily distinguished on the basis of needle shape, color, and certain cone characteristics. They are different in many of their physiological properties such as drought resistance, frost hardiness, time of bud burst, etc. Yet, they have so many things in common that, as a group, they can be kept apart, without difficulty, from *Pseudotsuga macrocarpa*, the only other native member of the same genus on the North American Continent (C. L. Hitchcock, personal communication).

However, this is not the whole story on intraspecific variation in Douglas-fir. Most foresters concerned with this species have begun to realize that within the *viridis* variety alone there are numerous populations sufficiently different from each other to warrant special consideration in management decisions, let alone breeding programs. Present information indicates that it would be unwise to restock high elevation areas with seed collected from populations growing at low elevation because there has been enough opportunity, apparently, for the selection in low-level populations of genes that would make their carriers maladjusted to a high altitude environment.

It is safe to say that in Douglas-fir or any other species that we address ourselves to, as our analytical tools improve, we will discover more and more variability, hitherto concealed, that will not only be of significance to the taxonomist but to all concerned with the growth and utilization of plants.

Individual Deviants

Even with our present tools, often with the naked eye alone, we can detect occasional plants that, in their appearance, are clearly outside the pattern of population variability of their species. Typically, we encounter such individuals in horticultural collections, arboreta, or botanical gardens. They may be dwarf forms, "weepers," color deviants and are labeled with such colorful names as *monstrosa, denudata, gracilis, pendula.* Many such forms can be found in our own Arboretum (see list of collections in previous Bulletins).

We often forget that most of these collection specimens arose somewhere in a natural population or were recognized in a nursery as deviants among hundreds of normal sister plants. A good example is the "weeping" Douglas fir illustrated in the adjacent picture.* (fig. 12) It grew on a road bank relatively free from competition and has maintained vigorous, if unusual, growth to the present day. Similar "weepers" have been reported in various natural stands in

(Continued on Page 69)

*See the articles by A. Kruckeberg on the naming of plants, Arboretum Bull. 27 (1 & 2).

*Thanks are due to Mr. J. G. Wheat, Industrial Forestry Association, Nisqually, Wash., for pointing out the tree to me.

A "weeping" form of Douglas Fir
Photo by: G. E. Howe

Fig. 12

Ceanothus 'Olympic Lake'

J. A. Witt

The Ceanothus from southern Oregon and California are among the finest of the flowering broadleaved ornamental shrubs but they are, it must be admitted, on the tender side for Puget Sound gardens. The freezing weather of last December either killed or crippled many of the plants growing in the Arboretum's collection. Several plants of the beautiful *C. Impressus* 'Puget Blue' were defoliated and had tips killed even though they were growing on south-facing walls and received a minimum of summer water. Another hard hit specimen was the low growing *Ceanothus thyrsiflorus* 'Repens' in a dry situation on the south east corner of the office.

This particular plant has often set quantities of seeds and two years ago, in the summer of 1963, some of these seeds fell to the ground and germinated, probably in the spring of 1964. We first noticed a group of seedlings rising through the mat of leaves formed by the parent plant early last summer. A casual examination of these indicated that they did not have the same type of leaf as *C. thyrsiflorus* so we assumed they probably represented hybrids of some sort. The nearest ceanothus was *C.* 'Puget Blue' growing on the same wall perhaps 15 feet to the east. This seemed likely to be the pollen parent. By mid-September, 1964, one of the seedlings was obviously semi-prostrate in habit wtih bright green leaves and seemed to be enough different from our other ceanothus to make it worthy of propagation, on the offchance that it might be a useful plant. Also it was growing in such a position that it would probably have to be removed before another growing season, lest it smother the seed parent. Cuttings taken then rooted well and we soon had several dozen growing in the greenhouse.

Then came mid-December. By early spring *Ceanothus* 'Puget Blue' was crippled, *C. thyrsiflorus* 'Repens' was badly burned and most of its seedlings were defoliated; not however, our hybrid which had hardly a leaf touched by the cold. In mid-May 1965, the first flowers appeared on the now large spreading plant. While not as exciting a color as 'Puget Blue' nor producing such masses of flowers, they were, nevertheless, most pleasing and it seemed to us that this hardy ceanothus deserved a clonal name. In keeping with our past efforts to give local developments local names we are calling it *Ceanothus* 'Olympic Lake.'

A complete description follows:

Habit:

A densely branched shrub about 2 1/2 ft. high and 9 ft. across at the end of 18 months, with spreading and ascending branches. Young shoots moderately ridged and angled, soon becoming terete, green turning to greenish brown or brown on the older wood, sparsely clad with strigose hairs.

Leaves:

Evergreen, elliptic, obtuse, 3-nerved from the broadly cuneate to rounded base, varying size from 0.8 to 3 cm. long and 0.5 to 2 cm. broad, margin serrulate to serrulate-crenate, the teeth tipped by reddish to yellow glands; upper surface bullate, glabrous, shining green, the underside pale green furnished with appressed white hairs on the veins.

Inflorescence:

A dense axillary cylindrical panicle 4 to 8 cm. long, 2 to 3 cm broad; peduncles slightly pubescent, pedicels glabrous; flowers very small and differing only in color from those of the two putative parents, sea blue (HCC 043/2).

Fruit:

Differing not at all from that of the assumed parents, a 3-celled capsule, black when ripe, each cell containing a single round black seed about the size of a BB shot.

A superficial analysis of certain characters of *C.* 'Olympic Lake' adds credence to its presumed hybrid nature. Its flowers are darker in color than *C. thryrsiflorus* 'Repens' but paler than *C.* 'Puget Blue.'

The leaf with its appressed hairs on the veins is intermediate between 'Repens' which is glabrous and 'Puget Blue' which has a dense undercoat of hairs. The same is true of the pubescence on the twigs and the flower stems; sparse in 'Olympic Lake', glabrous in 'Repens', and dense in 'Puget Blue'.

It is probably presumptive of us to name a two year seedling after seeing it flower only once, but we were so impressed with its performance during a hard year we felt it deserved recognition without full testing. Young plants have been sent to several California gardens for trial and we shall test it more widely before releasing it to the public.

Some of Our Favorites ☆

☆ *Won't You Send Us Yours?*

Lantern Tree

Crinodendron Hookerianum

If you are gambler and you have a sheltered south wall, there is a good chance that this exotic little gem will grow well for you. Certainly it is well worth trying. It is a small evergreen tree with slender arching branches and narrow, dark green, glossy leaves. In June it is laden with blossoms of rich coral red that resemble small tulips hanging from the branches by long pedicals.

The flower buds form in late summer and early fall. They have short stalks and look rather like tiny green cherries. They remain dormant through the winter. They start to grow again the following spring and color begins to appear while they are still quite small. The color increases in intensity until the flower is mature. By then they will be about an inch long and not quite so wide; the texture is waxy and crisp. Although the main flowering season is in June, not all the flower buds develop at the same time so that the flowering season really extends from mid-May through early July. Indeed, in August it is not unusual to see a few flowers, seed capsules and next year's flower buds all at the same time. I have wondered if, in South America where it is native, it may bloom continuously.

Admittedly, *Crinodendron Hookerianum* is a plant of marginal hardiness but the small plant that I acquired in 1958 is now over eight feet tall and has never suffered any winter damage until this last year when it was completely defoliated. However, it has grown well this summer and has already set its flower buds for next year. If I should lose it during a hard winter and certainly this is a calculated risk, I have taken the precaution of rooting a few cuttings so that I shall not be without it. It roots easily from half ripened cuttings taken in July or August and kept in a closed frame. It produces quantities of large round seed capsules which are quite decorative but I have not succeeded in germinating any of the seed.

If the plant has a serious fault it is the tendency to send up new shoots from the base of the trunk. If these are not removed it would become a multi-stemmed shrub which, to my eye, would not be pleasing or nearly so useful. It is striking as a background plant for *Rhododendron* 'Autumn Gold' and *R.* 'C.I.S.' and the evergreen *Azalea* 'Greeting'. I think it would be very effective planted with Exbury azaleas in the coral red and straw gold colors. When it is in flower it is the most dramatic plant in the garden.

ESTHER BERRY

The Arboretum Bulletin

Vol. XXVIII, No. 3 Seattle, Wash. Fall 1965

SPECIAL NOTICE

To keep membership in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears will be dropped and The Bulletin will be discontinued.

MEMBERSHIP BLANK

☐ Life	$500.00
☐ Sponsor	$100.00 to 500.00
☐ Supporting	50.00
☐ Contributing	25.00
☐ Sustaining	10.00
☐ Annual	5.00
☐ Group Affiliation Garden Clubs, etc.	10.00 or more

The Arboretum Foundation,
University of Washington Arboretum
Seattle, Washington

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

Name .....

Address .....

All memberships are non-assessable.

NOTES & COMMENT

At the hearing before the City Council on June 18, 1965, relative to the route of the R. H. Thomson Expressway, Dr. Henry T. Skinner, Director, U.S. National Arboretum,, Washington, D.C., stated:

"The University of Washington Arboretum of Seattle, Washington, enjoys an international reputation as the leading arboretum-botanical garden of the Pacific Northwest and as one of the outstanding institutions of this kind of the entire country.

"As a cooperator in plant dissemination and testing programs of the United States National Arboretum in Washington, D.C., it receives, tests, displays, and distributes many kinds of new plant introductions. As a University-directed botanical garden open to the visiting public, it makes continuing contribution, both research-wise and educationally, to citizens of the city of Seattle, to the state of Washington, and the nation.

"Despite remarkably complete collections in areas of plant specialization, present acreage of the University of Washington Arboretum is already sharply restrictive as to the numbers of climatically-adapted plants which can be physically accommodated. Any reductions of this acreage must necessarily reduce the Arboretum's level of contribution and any division by a major traffic artery could be catastrophic in terms of the scientific, educational, and recreational purposes which the institution serves.

"The dilemma of meeting the service requirements of expanding urban populations without encroachment upon botanic gardens, parks, and other equally-needed open spaces is a recurring one throughout the country, but solutions have usually been found.

"In case of the National Arboretum which occupies some 400 acres of the District of Columbia, the Congress of the United States has gone on record as recog-

nizing the importance to citizens of the District of Columbia and the nation of maintaining this institution and this open space intact. A bill (H.R. 7341) authorized construction of an important highway bridge in 1950 "Provided, that neither the bridge, approaches, nor connecting roads provided for herein shall be planned or constructed through the National Arboretum on the west bank of the Anacostia River." This provision has been referred to, and honored, in all later development and highway planning including current development of an inner loop freeway which will border the Arboretum without encroachment.

"It is to be hoped that the Arboretum of the University of Washington may be spared undue land deprivation in the interest of preserving as intact as possible an outstanding means for providing education, recreation, and horticultural advancement toward further beautification and liveability of the fine city of Seattle."

* * * *

In a letter to Mr. Mulligan, dated April 26, 1965, commenting on the Arboretum and the route of the R. H. Thomson Expressway, Dr. Richard A. Howard, Director of the Arnold Arboretum, Boston, Massachusetts, stated in part, "I wonder if the residents of your area are aware of the unique character of the University of Washington Arboretum within the United States. Recently, you mentioned to me your plan to have a catalogue of species in your Arboretum and you received my endorsement of this program for the reason that many, even in the botanical world, do not know as you do and I do what is grown in your area. I compare Windsor Great Park, Sir Eric Savill's garden, the Royal Botanical Garden in Edinburgh, the Test Gardens of the Royal Horticultural Society in Wisley and sections of the Royal Botanical Garden in Kew with the plantings and the plants of the University of Washington Arboretum. Only in your area and in your Arboretum does the American have the chance to see Magnolias at their best, Rhododendron and other members of the Ericaceae in size and represented by species beyond anything the best gardens on the East Coast can grow. I firmly believe that the University of Washington Arboretum has the greatest potential of any American arboreum for adding new plants to our use and for maintaining different kinds of plants for scientific study. There certainly should be no encroachment on this potential by demands for highway purposes."

G.D.M.

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (June 3 through August 31, 1965): *Sustaining*—Cash M. Beardsley, Mr. & Mrs. Robert B. Carl, Mrs. L. W. Eilertson, Mrs. Robert O. Hickman. *Annual*—Mrs. John D. Allen, Mrs. Peter Baehr, James S. Bethel, Mrs. John Boesflug, Mrs. Clayton Chenaur, Mr. & Mrs. Robert Donham, Mrs. Larry H. Dugan, Mrs. F. T. Engebretsen, Mrs. Lowell H. Ericsson, Mr. & Mrs. John W. Florence, Dr. Trygve Fortun, Mrs. I. J. Garwin, Kenneth Hitching, Mrs. Ronald E. Kucher, Evelyn MacDonald, Mrs. Charles V. Moren, Michael Nagata, Mrs. Bennett N. Nelson, Edna A. Nelson, Mrs. Kennard Nelson, Mrs. Frank Newman, Mrs. Robert H. Olschewsky, Mrs. Nils Ostrom, Miss Mildred Patton, Mr. & Mrs. P. B. Richardson, Mrs. Jack Rohrer, William A. Smith, University of Michigan General Library, City of Walla Walla, Mrs. Harry Warden, Mrs. Jerry M. Winkle.

We are also grateful to the following members who have increased their dues to: *Sustaining*—Mrs. Robert H. Barden, Mrs. William Griffith.

BOOK REVIEWS

Building a Greenhouse and Potting Shed by A. K. Berry, F.R.H.S., Head of Rural Science Depart., Haworth School. Pergamon Press. (The Commonwealth and International Library).

To quote the author—"The aim of this book is to provide the layman with the knowledge and information he requires to enable him to build for himself a greenhouse and potting shed". It does just that, but I believe was written primarily for schools or colleges with a rural science department. Details for construction are explicit. The small specialist (orchids, rhododendrons, etc.) in this country would require additional information such as mist systems, use of plastic covering, etc. Chapters 1 and 2 contain the more interesting general facts. The following notes are examples: "As little non-transparent top structure as possible should be used so as to have a minimum of shadow but enough for structural soundness; the more slender type wood framing can be reinforced by metal strips inside. The angle of roof and orientation of house for light and air circulation are important items for consideration.

Eleven black and white plates show stages of construction of a large greenhouse. The sixty-five word glossary contains 32 words pertaining to general carpentry, 17 pertaining to brick work, and 10 pertaining to concrete work. On doing a bit of research with a construction expert, I found that some of these had interesting American "translations": bottom rail—cill, cladding—siding, damp course—flashing, door post—jamb, eaves trough—gutter, fall pine —down spout, housing joint—mortise and tennon, rail—plate, shuttering boards, forms. M . W. B.

The Heather Garden, by Fred J. Chapple. Second Revised Edition, 1964. W. H. & L. Collingridge Ltd., London. U. S. Price, $6.75.

The number of Royal Horticultural Society awards in the past four years alone (to **Calluna vulgaris** varieties, 8 First Class Certificates, 25 Awards of Merit, 8 Highly Commendeds) indicate the spurt of interest among British gardeners in heathers. It has come with the recognition that these plants are a splendid answer, in a broad temperate zone belt, to the necessities of modern do-it-yourself gardening. With the simple basic requirements of non-alkaline soil, some moisture and good drainage they can provide complete groundcover of beautiful and interesting foliage, and highlights of color throughout the year—all with a minimum of necessary upkeep.

We hesitate to refer to anyone who writes with such youthful zest as the Grand Old Man of Heathers, but the phrase would be applicable to Fred J. Chapple if the allusion to advanced years can be read out of it. His book, "The Heather Garden", has long been the basic reference work which probably every serious, English-reading hardy heather grower keeps always within reach. It is absolutely invaluable because of its inclusive coverage of the subject and because it is written from really first-hand knowledge from the author's decades of actual experience with the gamut of heath (ERICA and DABOECIA) and heather (CALLUNA) varieties. His great enthusiasm for these plants which "do not lose their identity or their individual charm throughout the whole year, even when the flowering period has long been over" is tempered with sound practical knowledge of what can and cannot be expected of them and which varieties are superior and which are not.

The avenues of communication have been much expanded by the organization early in 1963, in Britain, of The Heather Society (of which Mr. Chapple is the first president) and the available data on the subject are correspondingly more plentiful. For example, the Royal Horticultural Society awards of years past, some of which were overlooked in the 1952 edition of this book, are here included with their dates. Also now come to light are many interesting notes on the native locations in which the varieties were found—for heath and heather varieties have generally been the result of nature's handiwork, not man's. These facts are treated in a new chapter on "The Origins of Heathers" in which it is particularly gratifying to us to see our Arboretum director, Mr. Brian Mulligan, finally credited for his discovery of **ERICA cinera** Colligan Bridge.

As we all know, whenever a few botanists get together they bandy about names, with the resulting hazard of nomenclature changes to keep the hopefully knowing gardener on his literary toes. Mr. Chapple has made a strenuous effort to give the correct terms as of 1964.

The freely self-seeding heathers, particularly **CALLUNA vulgaris** varieties, are naturally the ones for which a larger number of new varieties are recorded. Over 40 white-flowered forms of **CALLUNA** are here listed, as against 24 in the 1952 edition. (One of the new whites, an old-timer in the Northwest, is Seattle's own **C. v.** Else Frye—indicating that some of the U.S. novelties are filtering back to their ancestral land.)

Winterability ratings have been revised to include data from Britain's extraordinarily severe winter of 1963.

There is mention of correspondence with a number of U. S. growers, particularly reporting observations of growers on Cape Cod.

The author now includes a short chapter describing his new heather garden on The Isle of Man, to which he moved, along with some at least of the 30,000 heather plants he grew in the Pennines in Derbyshire. His new location has given him ample opportunity to observe the growth of Heathers by the Sea—a subject of particular concern to a number of Puget Sound gardeners.

The description of the Calluna collection established at the Royal Horticultural Society's Gardens at Wisley in 1959 gives what amounts to a roll-call of the currently elect varieties which make "even a long journey to Wisley—well worth while to one interested in heathers."

As in the former editions, the concluding chapter is titled "The Heather Calendar." It has been revised to include the many new varieties now available and now offers an even wider selection of plants to flower in one's garden from the first day of January to the 31st of December. The November list, formerly providing a lean choice of six plants, has now been expanded to thirteen, and December from six to ten. As, in our climate, many

plants listed by Mr. Chapple as spring flowering come along in mid-winter there should be no reason for us ever to have any thoroughly dull season at all in our gardens.

The 1952 edition of this indispensable-to-heather-growers book was published both in England and the U. S. The 1964 edition is published only in London, but can be obtained by ordering through local bookstores with only a two-or three-week delay.

DOROTHY METHENY

Pleasures of Herbs, by Audrey Wynne Hatfield. St. Martin's Press, New York, 1965. Price $3.95.

Audrey Wynne Hatfield is English and her pleasant book on the "Pleasures of Herbs (St. Martin's Press, New York, 1965) is one of the most delectable to come this way in a long time. Probably it is the tradition of England and the continent that allows them to partake of the various herbs and savor the fragrance and flavors frequently forgotten in the New World. Using her long, intimate knowledge of these plants, she re-introduces us all to the world of herbs with her very adequate historical sketches and fine drawings. She does this pleasantly and practically.

The reader becomes aware of the long forgotten tradition of herbs. There seems to be a delicate intertwining of scents, smells, and tastes. The presentation is directly aimed at winning the reader over to the herb conoisseur's point of view. Letting the tale of each plant combine with the intricate and interesting benefits of each plant, they speak for themselves and cause us to come to appreciate the long tradition behind their usage.

The book is divided technically into four parts. The first section is the presentation of the herbs themselves. The latter chapters of the book are spent elaborating on the obtainable pleasures derived from each plant and combinations of plants. The herb enters the kitchen and helps create things from biscuits and bread to teas and vinegars. Herbs of course have a delightful array of toilet uses and she spends time introducing us to the ability of herbs to add a touch of luxury with such ease.

Of course the book is practically oriented. The book closes on a discussion of the hows and whens of herb gardening for those who have caught the appeal of these plants.

No doubt a book like this is needed to refresh some memories or introduce new converts to the practice of herb usage. This fine book could introduce a student of plants to the significance of his subject matter and place before him a new awareness of these plants as they may pertain to his life. Most important of all, the book is good reading and surpasses the tendency to catalogue plants and classify them without due respect to the potential they have for making all of our lives richer. Perhaps Miss Hatfield's acquaintance with these plants will reach some of us. This is her hope. More of the old world "charm" will rub off. When that happens, we will not become more English nor will we become more continental. We will become enriched.

WILLARD G. JUE

Intraspecific Variation

(Continued from Page 59)

the Pacific Northwest; the "weeping," or *pendula,* form is only one of 34 distinctly different forms of Douglas fir listed by Kruessmann (4).

As in the case of variation at the population level there are two groups of factors that can account for the peculiar variation of such individual deviants: environment, or genetic constitution. Let me add that it is not strictly of academic interest that we often attempt to resolve which of the two groups of factors is more prominent in a particular case: some of these deviant forms have horticultural potential and often warrant propagation on a large scale. Typical tests to determine the cause of deviation involve the study of vegatatively propagated material (rooted cuttings, grafted scions, etc.) of the original deviant in different environments; additional insight is gained by the study of progenies resulting from appropriate matings of the deviant individual with itself, with others of its kind as well as with normal plants. Often, it is only the second generation progeny that will be diagnostic.

A genetic phenomenon frequently underlying such erratic variation is mutation. Mutations (from the Latin *mutare*=to change) are unpredictable changes, more or less of a random nature, in the genetical material itself. The change may involve the number of entire chromosome sets, the number or structure of individual chromosomes or of singles genes. Typically, once a mutation has occurred in a cell, the change is handed down in a stable fashion to all daughter cells. Mutations may affect an entire organism if they occur in the parental sex cells that gave rise to it; or they may affect only portions of an organism if they occur in the body cells during the development of the organism. This explains why a single branch may sometimes appear entirely different from the rest of a plant, even though it has shared the same environmental history with the remainder.

Most mutations probably go by unnoticed, largely because an organism can tolerate only minor alterations in its genetic make up without suffering; drastic changes often result in early mortality.

However, not every deviant need be a mutant. Many forms of erratic variation are associated with the infection of a plant by viruses, bacteria, or fungi; others are explained by the primary or secondary effects of insect attack. And, to make the interpretation more difficult: there are certain forms of deviations, such as brooming in conifers (3) that look practically alike whether they are caused by a pathogen or by a genetic change.

General Significance

Intraspecific variation, to the extent it is associated with genetic variation, indicates that organic evolution still is in progress. New forms are constantly evolving, partly sponsored by abrupt genetic change, partly

emerging from the subtle pressures of natural selection in an ever changing environment, and partly – maybe most significantly—as a result of man's activity. The history of man is a history of domestication: of perpetual effort to preserve as well as to proliferate variation in the organisms over which we have raised our head. As we gain new insight into cause and effect of biological phenomena, and as we acquire new tools to manipulate them, so will we step up the rate of intraspecific evolution in plants and animals. It is safe to predict that the taxonomist of tomorrow will envy his colleague of yesterday who had to cope with a flora only a fraction of the size of that of tomorrow.

This brings up one last question: How should we classify intraspecific variants? Or more precisely: When shall we recognize a group of populations as a new race, a new subspecies, a new species?

I will not attempt to answer this question. Let me say that the need for classification is real, but that all classification is meaningful only if considered as referring to a point in time. Or, in the words of the eminent geneticist, Dobzhansky (2): " . . . if some one should succeed in inventing a universally applicable, static definition of species, he would cast serious doubts on the validity of the theory of evolution."

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A View of Seattle University

(Continued from Page 50)

ments. In the latter, we have used mostly Cascade Mountain granite. We have employed as large a rock as the particular area has permitted, and so the landscape picture is often highlighted by boulders of immense proportions.

Intimacy is characteristic of the landscaping here at Seattle University. The passer-by is always very close to the myriad plantings which have been purposefully designed to arrest attention. Not surprisingly, the students on the whole do appreciate what has been created for them—they do notice. Perhaps that is one of the reasons S.U.'s campus has never been marred by unsightly litter receptacles.

Spring on Seattle University's campus is a constant parade of vivid color from middle March to the first of June. Great splashes of Forsythia literally surround the students, who were first alerted to the season by countless crocus peeking from every little area bordering the walks. The only annuals to enter the color spectrum of campus display are daffodils and red tulips (Emperor and Dover) in a few solid beds. The Oriental Plum trees, spotted everywhere, are preceded by the dominant and commanding pink of early cherry (Autumnalis and Whitcomb). One would think that these displays would be the ultimate in color entertainment, but then the Azaleas begin to burst out at unsuspected vantage points. Finally, the procession is terminated with the Rhododendrons, all hybrids of red and pink. True, some of the early Rhododendrons have already shown and gone, but the Loderi, Pink Pearl, Alice, Britannia and others are the rear guard of the spring spectacular.

Throughout the year, each season brings its own particular splendor which is heightened and made personal by the compulsion arising from the tight nature of the campus to plant with the intimacy usually found in your own private garden.

Choice Plants in Pacific Northwest Gardens

Continued from Page 53)

moisture all through the year. The mass of narrow, very silky, pale gray leaves, evident at a considerable distance provides a cool, almost ethereal effect which is quite unusual amongst trees. Propagation, as with most willows, is easy by means of cuttings taken in late summer or early fall.

Of all our large collection of hollies, which include about 50 forms of the English *(Ilex aquifolium)* and 30 of the American species *(Ilex opaca)* none gives us greater pleasure for its pyramidal habit, dark glossy green, almost spineless leaves, and large red fruits than *Ilex aquifolium* 'Camelliaefolia.' Planted in 1948, when about four ft. tall, it is now approaching 20 ft., a tree of great value throughout the year and apparently one of the hardiest forms of this polymorphic species.

Index to Volume XXVIII (1965)

EDITOR' NOTE: Index to Volume XXVIII appears in this issue instead of the usual year end Winter issue. Winter 1965 will carry a 10 year index compiled from Spring 1955 through Winter 1964.

The Arboretum Unit

ANNUAL FALL PLANT SALE

Wednesday-October 6, 1965

9:00 a.m.

The choicest of Plant Material will be offered
—Rhododendrons, Azaleas, Ground Covers,
Trees, Shrubs, Ferns, Herbs, Alpines
etc.

Be there early in order to find
the best selection

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