



THE UNIVERSITY OF WASHINGTON

Arboretum
bulletin

SPRING
1969

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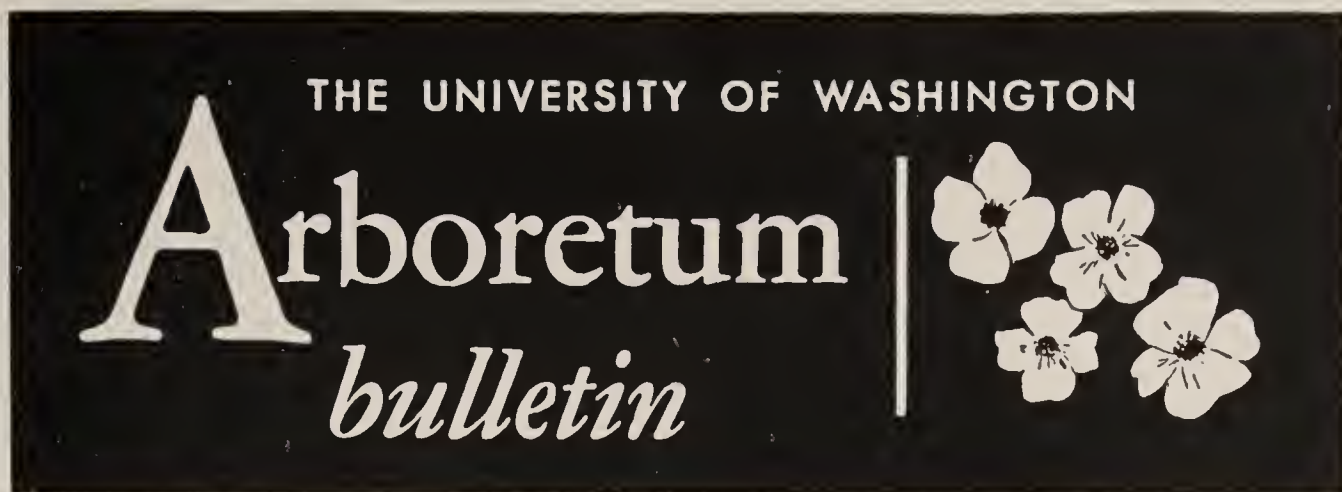
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A JOURNAL OF GENERAL HORTICULTURAL INFORMATION
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 ARBORETUM FOUNDATION • SEATTLE, WASHINGTON 98105

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VOLUME XXXII NUMBER 1

Spring, 1969

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COVER PHOTO:

Rhododendron nipponicum

PHOTO BY: WHITIE MARTEN

A Guide to Late-Flowering Rhododendron Species in the University of Washington Arboretum

MARJORIE BAIRD*

As this was being written, ice and snow were everywhere, as were browned leaves and "blasted" buds. But, undaunted, the rhododendron fancier goes on, ever-hopeful of what spring and summer may bring. I will, therefore, describe the late-flowering species which flowered in the Arboretum in 1967 and hope they will be on display for you this year. The staff reiterates my statement in the Early-Flowering Species article: many of these plants are seedlings and may not be true to type.

As there are several deciduous azaleas flowering during the summer, I should, perhaps, explain that azaleas are a large group of evergreen and deciduous plants lumped together in the Azalea Series of the genus *Rhododendron*. The Series, as with most others, is further divided into sub-series in order to keep together plants which have much in common. I found it interesting to learn in Frederic P. Lee's "Azalea Book" that in the distribution of the Azalea Series, most species are grouped on the east coast of our hemisphere and the east coast of Asia. One lone species, *R. occidentale*, inhabits our west coast, while another "loner," *R. luteum*, is indigenous to Asia Minor.

Let us start down Rhododendron Glen. Among the members of the Ponticum Series are *R. maximum*, *R. caucasicum* and *R. smirnowii*. *R. maximum* is our east coast Rosebay Rhododendron. It flowers about the end of June and on until almost the end of July. It is a large, vigorous shrub with pink-to-white flowers which become partially hidden by the new shoots, an undesirable trait. A noticeable feature is the encircling growth of bracts at the tips

of branchlets, both on flower and leaf buds.

R. caucasicum and *R. smirnowii* are both native to the Caucasus Mts. in central Europe. The former is a fairly low, compact, hardy plant with white, pink or yellowish trusses in early June. (In the Arboretum they are pink-ish). This species sometimes has a thin indumentum beneath the leaves.

The lavender-rose, frilly flowers of *R. smirnowii* may be "over" by June. Dark green, handsome foliage, undercoated with white or fawn indumentum and silvery-grey, tomentose new shoots make it not only an attractive plant but also valuable because of its hardiness and tolerance of most situations.

Not far beyond, and flowering from the end of May to mid-June, is *R. brachycarpum*, another hardy species from Korea and Japan. The bright green leaves, with a noticeable yellow mid-rib and yellow buds, sometimes have a thin, white or tan indumentum. Small but firm, round trusses are a combination of creamy-white, flushed pink, with green or yellow-brown speckles in the throats of the florets. It is shy to flower until mature and by then may be touchy to transplant.

On your left, beyond the large maple, (*Acer macrophyllum*), is a group of small-leaved rhododendrons which includes *R. hirsutum* (meaning "hairy"). This inhabitant of the southern European Alps is decorated with pretty little two-inch trusses of rose-pink flowers in June. With its close relative, *R. ferrugineum*, it is often called the Alpine Rose.

Just beyond the group of huge *R. sutchuenense*, var. *Geraldii*, (fig. 1) look up the bank behind a large *R. decorum* and you may see the large, white or pink, fragrant flowers of *R. diaprepes* during June. This a young plant of a lesser-known species of the Fortunei Series and the name appro-

*This was a "must" from Mrs. (Hugh) Baird following her excellent article "A Guide to Early Blooming Rhododendron Species in the University of Washington Arboretum" Spring 1968.

priately enough, means "distinguished." It has the beautiful large leaves seen so often in the subseries Fortunei, so should be protected from the wind.

Even less well known is *R. hemsleyanum*, a close relative, which is situated on the same slope, but around the next curve. Half-hidden by a *R. rubiginosum*'s small foliage, but surely visible, will be its large white florets, perhaps ten in a truss. You will get a closer look at its interesting foliage farther along on our walk.

In the immediate foreground of this bed and the one just ahead, are forms of *R. trichostomum*, an attractive small plant with tiny spheres of daphne-like flowers, pink and white, during late May and early June. This species may grow from two to four feet and is quite suitable for a well-prepared rock garden. (fig. 2)

Now, proceed to the "look-out," descend the steps and as you are going (carefully) along the stepped path, you will see *R. minus* on your left. Its name belies the fact that, though its leaves are not large, its

stature may reach twelve feet in height and breadth. Through most of June this southeastern U.S. native displays its bright lavender-pink flowers. It is both heat and cold resistant. (Eastern Washington gardeners, please take note.)

If you look down the steep rock steps, you will see, at the foot, several large plants of *R. auriculatum*. In July, its long, pointed buds burst open into a truss of three to five-inch, white, very fragrant florets. It is a handsome plant in foliage and form; even the new leaf shoots are attractive with their narrow, bright-red bracts. It prefers partial shade. Its name, meaning "eared," refers to the lobes of the leaf bases. Another specimen of the species hides behind the clump of maples across the foot of the path from these.

Just along the path, on the left, may be seen at close hand, another plant of *R. hemsleyanum* with its interesting oblong

Rhododendron sutchuenense var. *Geraldii*
Fig. 1—Photo by: Whitie Marten



ovate leaves, deeply and "squarely" auricled at the base.

At your right is one of the best-known, yet most maligned, species of rhododendrons, though the true species is extremely rare. *R. ponticum* was the parent of many hardy hybrids and, of more importance still, was the understock for grafted plants which, until recently, were not propagatable any other way. This native of Asia Minor is good for planting in drifts, as a wind-break, or as a woods "filler." It is quite tolerant of soil and exposure in our area. Poor color forms should be discarded as there are many good ones in the pale magenta, lavender and violet-blue hues, some with white or green flares in the throat. A white form is supposed to exist.

If there is some bloom in the *R. carolinianum* group just beyond, it probably is a second flowering. This is a sister-species of *R. minus* and is very like it in hardiness and habitat as well as characteristics.

As you come out into an open grassy space, there are three plants of *R. cinnabarinum* on your left. They may be in the last stages of flowering but because of the interesting flower form and color, it will be mentioned. Perhaps its lovely blue new leaf growth will be visible. This slender native of the Himalayas is one of the scaly-leaved rhododendrons (lepidotes) and, although slow to bloom, its pendant clusters of tubular, luminous cinnabar-red flowers are a pleasure to behold. It is variable in color, however, and some forms have apricot or yellow trusses. Its rather small, rounded, waxy, blue-green leaves are also attractive.

If you turn down the slope beyond the *R. cinnabarinums*, you may continue up past the Prentice Memorial, and up to the wooden steps, but I urge you to take a short detour. Take the service road, head north, but turn off it, "right oblique," onto the grass path which leads to the *Kalmias*. Just past these, on your right, is a specimen of *R. catawbiense*, the Catawba Rhododendron of our southeastern mountains. In its habitat, its symmetrical rounded trusses are

a lilac-magenta, but better color forms have been found and propagated, including a good white. Extremely hardy, its hybrids form the legions of "iron-clads" which are used so extensively in the colder area here and abroad. Even an inclement exposure does not daunt this neat, medium-sized member of the Ponticum Series.

Farther along, on your left, planted with some large plants of *R. discolor*, is another *R. hemsleyanum*. Now, these *R. discolors* may not be true to type, but they are certain impressive. They are not what one would call "straggly," but are tree-like. The foliage is a lighter shade of green below, than above, and the numerous trusses of large florets, white to pale-pink, suffused yellow in the throat, have a gardenia-like fragrance.

Now, let us retrace our steps to the Prentice Memorial path and walk toward the flight of wooden steps. Just beyond the cedar, (*Thuja plicata*) which has a holly growing beneath it, is a group of *R. micranthum*. This is a hardy small-leaved shrub attaining approximately five feet, or a bit more, and usually flowers from mid-June, through July, and tapers off in early August. The arrangements of its tiny, white flowers cause it to resemble a small spirea or Labrador Tea (*Ledum groenlandicum*). It is the only species in the Micrathum Series.

On the right side of the foot of the steps, you may see the black-red, waxy bells which form the loose trusses of *R. didymum*. This species is a low-growing member of the Neriiflorum Series and has medium-small leaves whose undersides are covered with a greyish indumentum.

Ascend the steps and take the path to your left and past the Griersonianum bed. The north end of it ends with a group of smaller species and hybrids and a foreground of Epimedium. Among the rhododendrons are *R. venator*, about three feet in height, with narrow leaves of a bright green which makes a good foil for its scarlet, bell-shaped flowers which begin to appear in late May in a single-tiered, flat-

topped truss. In its best forms, it is a good well-branched garden plant which may reach eight feet.

There is also a plant of *R. sanguineoides* here but it has no flower buds so will not show its bright red bells this year.

Down the grass slope below the group of *R. riparium*, are some plants of *R. keleticum* which may still be flowering in June. Its bright magenta blooms, large for the size of the shrub, are held proudly above the tiny aromatic leaves. In a more sunny location, this species will be a compact mound usually not more than twelve inches high.

Let us return now to the Arboretum Drive and turn left (north). In a bed just across the Drive from the Leguminosae sign is a group of *R. serrulatum*, the Hammocksweet Azalea. Beginning in mid-July, they bear clove-scented, white flowers which, though small, are long-tubed and sometimes have a pink or reddish flush and yellow blotch. It is a fairly hardy species, indigenous to the swampy woods of our

southeastern coastal plains.

Beyond this bed is a beautiful Western Hemlock (*Tsuga heterophylla*) and just north of it is a bed of azaleas "backgrounded" by rhododendrons. Among these are four plants of *R. serotinum* and a *R. diaprepes*, which are in the same Series and subseries as *R. discolor* and have many characteristics in common. *R. serotinum*, however, is supposedly, the latest to flower (its name means "late," i.e. "autumnal"). It is a large-leaved, rangy plant with white trusses flushed rose on the outer corolla and spotted red on the inside.

Another tour to discover late-blooming species takes us down Loderi Valley. Take the more northerly of the two roads (you will see the sign), and just below the stone bench, on your right, during the latter part of July and early August, *R. ungerii* may be in flower. This is a handsome foliage shrub with its long leaves coated on the

Rhododendron trichostomum

Fig. 2—Photo by: Whitie Marten



underside with a thick, woolly, white indumentum and tomentose new shoots. The flowers, sometimes twenty to a truss, are white or pale pink. Unfortunately, this native of the Caucasus Mts. is not as well known here as some of its fellows in the Ponticum Series, but it is a desirable garden plant and very hardy, though should not be placed where its leaves can be tattered by strong winds.

R. brachycarpum is also planted in this bed and on beyond the large Douglas Firs (*Pseudotsuga menziesii*) is one plant of *R. bakeri*. If this one is not flowering, look on the north side of this bed, along the ridge road between Loderi Valley and Woodland Garden. There are several plants of it there. This is the Cumberland Azalea, native to the plateau of that name in Kentucky, Tennessee, north Georgia and Alabama. In June, and perhaps early July, the tubular orange-to-vermillion-red flowers appear. Some forms may be salmon, apricot or straw yellow. It varies in height from two to nine feet and the deep green leaves are glaucous on the undersides.

Turn right and up the slope beyond the lone *R. bakeri*, brush by the drooping hemlock branches and walk down the service road. On your way toward the columnar Lawson Cypresses, look down into the bed on your left. In it are *R. arborescens*, its variety *R. a. 'Richardsonii'*, and *R. viscosum*. The first of these, the Sweet Azalea, flowers in June with long-tubed white florets similar to *R. serrulatum*, but larger, and heliotrope-scented. It is a hardy species and quite variable. The variety '*Richardsonii*' is lower-growing and has larger flowers. Select your *R. arborescens* while it is in bloom so you can see the difference in size of flowers and glossiness of leaves.

R. viscosum is the Swamp Azalea of Maine and points south to Tennessee and South Carolina. It is hardy, upright, and tall, perhaps to fifteen feet and its white flowers, in June and July, have a spicy fragrance. Lower and dwarf forms exist, one of which, *R. v. var. montanum*, is stoloniferous. This is another azalea whose super-

ior forms should be selected and it is surprising that it is not more widely used in our "damp" northwest.

Turn right at the columnar cypresses (*Chamaecyparis lawsoniana* '*Kilmacurragh*'), and on your left, under a spreading Yoshino Cherry, is a group of *R. amagianum*. This is a Japanese native, the Mt. Amagi Azalea, with very beautiful foliage similar to *R. schlippenbachii*. It grows in an upright fashion to about fifteen feet and its orange-red flowers appear in June. It is hard to understand why this species is so little used in the Seattle area.

To see *R. prunifolium*, we will retrace our steps, pass the cypresses and go down the Valley to Azalea Way. Here, turn to your right, (north), and in a large bed "guarded" by a Golden Cypress (*Chamaecyparis lawsoniana* '*Stewartii*') you will find examples of *R. bakeri*, *R. prunifolium*, and *R. serrulatum*. The Plum Leaf Azalea is native to a small area in Georgia and Alabama. It is the latest-flowering of the Arboretum's azaleas. The orange-red florets open in August on plants which may reach fifteen feet in height.

If you will continue north along the Way you will come upon *R. alabamense*. Or you may start a separate little tour from the north entrance of the Way. Before you reach the gravel path there is a large "clump" of cedar and a flowering cherry and between them is a group of the Alabama Azalea. If the season is late enough you will be able to see the small, white, narrow-tubed flowers, yellow-blotched, and smell their distinctive lemon or jasmine-like fragrance. This is a fairly low plant, perhaps to three feet, stoloniferous, its leaves glaucous on the under sides. In its native habitat, it has so interbred with its neighbor, *R. canescens*, that one rarely finds the true species these days.

At the gravel path, walk up the slope toward the picnic tables and, if you go as far as the trail to Woodland Garden, there will be, on your right, a large azalea bed containing more plants of *R. arborescens*, *R. a. 'Richardsonii'*, and *R. viscosum*.

Continue to Woodland Garden. Across the path from the *Hammamelis*, under a Douglas Fir, are some plants of *R. nipponicum*, (our cover photograph). This is the only species in its subseries and its home is on northern Honshu, Japan. Upright and of medium height, perhaps six feet, the Nippon Azalea hides its creamy-white bells amongst its foliage in summer, but in the fall it shows off proudly its flaming foliage and cinnamon-brown bark which peels off, leaving handsomely polished brown stems. It is thought by some to have a resemblance to *Menziesia*.

So far, I have made no reference to *R. occidentale*, the "Oregon," "Western" or "Pacific" Azalea, one of the "loners" I mentioned at the outset. But it is planted in many locations in the Arboretum, and I am sure you will be able to identify it, although it will be in the last stages of flowering by June. It becomes a tall plant with sweetly scented trusses varying from creamy-white to bronze pink with yellow or orange blotch. Often the outer corolla is flushed

with pink or rosy red. It is indigenous to California, from San Diego, north, and into southern Oregon. In the hotter areas it may be found beside streams. It does well here but, strangely enough, is not happy on the east coast.

You may still be able to see examples of our native *R. macrophyllum* (fig. 3) flowering along Lake Washington Boulevard in June. It is variable in color (usually a bluish or mauve-pink) and size of bloom, and in leaf color and is happiest in a woodland location where its roots can grow in a thin layer of humus over gravel. It is found in many small disconnected areas in western Washington, Oregon, northern California, British Columbia, including Vancouver Island, sometimes in the higher altitudes. It is safer to take cuttings of good forms than to buy them in mid-summer from the streets and highways. I have seen them in their natural state, sometimes fif-

(Continued on page 22)

Rhododendron macrophyllum
Fig. 3—Photo by: William Eng



Botanical Keys

REINHARD F. STETTLER*

Last time that you went to see a doctor because of an acute backache he asked you a series of questions pertaining to your problem. He probably began with a question on how the pain came about, continued with several questions on the localization of the pain and then questioned you further while examining you for particular symptoms associated with the pain. These verbal and physical questions were in no way a random chat. Without bestowing undue glory on your doctor, it is safe to say that he asked you a finite number of quite precise questions in quite a precise sequence which culminated in a satisfied nod, a Latin name (and a bill). He followed a diagnostic key in much the same manner as you would key out an unknown plant, with the only exception that he had to have his key memorized or he would lose your confidence.

Since botanical keys are widely used by both amateur and professional botanists, and in both camps with varied success, a few reflections on their purpose, contents, and use, may be in order. Being a geneticist, I can approach this topic with that degree of nonchalance characteristic of specialists discussing a subject outside their field of competence.

What is the purpose of a key?

Botanical keys are supposed to help us in the grouping and identification of plants. Synoptic keys (from the Greek *syn-*, together, and *opsis*, a view) usually are tabulations of single, or grouped, characters that segregate a category of plants (e.g., a family) into different groups (e.g., gen-

era). Their purpose is to give the reader, in one single glance, an overview of the major characters that distinguish the various groups within a category. Since they are very simple constructs and generally entirely self-explanatory, we may dismiss them from further consideration in our discussion.

It is the *diagnostic keys* (from the Greek *dia-*, between, and *gignoskein*, to know), also called *analytic keys*, that occasionally cause a problem. The problem is that you have a dismantled plant in your left hand, and a plant key in your right hand, and you still don't know what it is that you took apart. This problem reflects the purpose of a diagnostic key, namely to provide a set of references that serve in associating an unknown plant with a recognized group to which it actually belongs. To facilitate this task, diagnostic keys typically present a series of contrasting statements culminating in the name of the particular group.

It may be well to remember that in plant identification, as in any other grouping of objects, there are two different principles at work; i.e., an *inclusion* principle, and an *exclusion* principle. By including a plant in a particular group we exclude it from others. Accordingly, we can commit two distinct errors: we may include a plant in a group although it does not belong to it, or we may exclude a plant from a group although it belongs to it. Usually, by committing one error we get the other one free. You may think that it is an unnecessary exercise in logic to distinguish those two errors. Yet, in hunting mushrooms you have subconsciously followed the same distinction, knowing well that it would be less problematical to erroneously exclude from

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your bag an edible mushroom than to erroneously include a poisonous one. In other words, not only did you distinguish the two errors but you made a deliberate effort to minimize one at the expense of the other.

What material goes into a key?

A botanist confronted with the task of devising a key has to make three major decisions. First of all, he has to decide which specific taxa (e.g., genera, species) he wants to have included. This decision defines the range of application as well as the resolution of the key. Each key resolves a category of plants into a finite number of groups. In one case this may involve all the grass genera of the United States; in another it may be restricted to the conifer species of the Olympic Peninsula. Clearly, the first key would be more voluminous than the second, and there would be no communality between the two.

The second decision relates to what descriptive items should be used to resolve the original category into the desirable groups. Since keys are devised to permit a quick, but reliable, identification, the two guiding principles in this decision are: efficiency and accuracy. The fewer characters, and the more discriminating they are, the better is the key. Thus, it is not surprising that many keys rely on floral characters, because these are relatively constant within groups, but distinct between groups. Yet, there is a limit to the usefulness of keys that are based on flowering material. It may take an oak 40 years before it qualifies for such a key—a long period to remain nameless. Today, many floras have at least two parallel keys, one for flowering material, and another for vegetative material; there may be even additional ones for fruits, or for winter twigs.

Traditionally, the choice of characters to be used in a key was left to a botanist's intuition. Thus, it reflected his degree of familiarity with the material at hand, his perception—and his bias. In our more quantitatively oriented world of today, however, some of these qualitative judgments are

viewed with suspicion. Computers are just as accessible to taxonomists as they are to engineers. They allow the handling of many more data from many more characters from many more plants. Special mathematical analyses have been developed to detect among many characters those that discriminate most reliably between two or several groups. Chemical tools have been added to the instrumentarium of systematists; often they have a higher resolving power than morphological examination. As in human blood-typing, they may reveal distinct differences among groups of plants that appear homogeneous at the morphological level. Thus, new keys are generated to take advantage of such modern tools. They need not lead to a major re-shuffling of previously recognized groups; often, they merely make the old classification more defensible. In fact, new keys may well turn out to be a testimony for the insight and judgment of an early botanist.

The third decision in constructing a key relates to the question:

How is the material presented?

Most modern keys are *dichotomous*, that is, they are organized in a sequence of two, and always two, contrasting statements. At each dichotomy they provide the reader with a choice of two contradictory propositions; the acceptance of one means the rejection of the other. The gradual elimination of the non-applicable alternatives eventually leads to the identification of the plant.

Two different formats are used in arranging the sequence of contrasting statements: the *indented*, or yoked, format, as opposed to the *bracketed*, or parallel, format.

Indented keys, as the name suggests, are characterized by the indentation of successive contrasting statements, each subordinate pair of statements (couplet) being indented by a fixed distance from the previous pair, but each member of a pair having the same indentation. An example is given in Fig. 1.

Key to the fruits displayed in Grocery XY on June 28, 1968.

- 1a Fruit undergoing drastic change when dropped to the floor
 - 2a Fruits in clusters, attached to branched stemGRAPES
 - 2b Fruits single
 - 3a Fruit red
 - 4a Fruit surface rough with many small seedsSTRAWBERRY
 - 4b Fruit surface smooth, shiny
 - 5a Fruit more than 25 mm in diam BEEFSTEAK TOMATO
 - 5b Fruit less than 25 mm in diamCHERRY TOMATO
 - 3b Fruit not red
 - 6a Fruit skin pubescentPEACH
 - 6b Fruit skin smoothNECTARINE
- 1b Fruit not undergoing drastic change when dropped to the floor
 - 7a Fruit damaging the floor COCONUT
 - 7b Fruit not damaging the floor
 - 8a Fruit yellow, with large brown spots
 - 9a Fruit more or less isodiametric.....APPLE (*Golden Delicious*)
 - 9b Fruit elongate BANANA
 - 8b Fruit not yellow, no brown spots
 - 10 a Fruit brown, woody shellWALNUT
 - 10b "Fruit" red, without woody shell, in bunchesRADISHES (misplaced)

Fig. 1 Example of an indented key.

Trying to identify a banana, you would start with the first statement (1a), perform the critical test, choose the second alternative (1b), inspect the floor and settle for 7b, proceed to 8a and be satisfied with it (never mind the brown spots), then reject 9a, and finally end up with the correct diagnosis (9b). In so doing you would

notice that the two contrasting statements in each couplet have the same number, but different letters (1a, 1b) and are worded in the same manner. There is some variation on the numbering theme: some keys have letters instead of numbers, others have numbers without letters, as shown below:

A	1
B	2
BB	2
C	3
CC	3
AA	1

The major advantage of indented keys is that their hierarchical arrangement gives a peculiar visual pattern that imprints itself quickly on the user. After a few identification runs he will have memorized the early distinctions and will make shortcuts to the critical contrasts. The major disadvantages are the waste of space caused by the shortening of lines in consecutive couplets; and the fact that in long keys the two members of a couplet may be on dif-

ferent pages, thus making it difficult for the user to find the contrasting statement.

Bracketed keys, on the other hand, present the two statements of a couplet on two consecutive lines so that they are easily compared. At the end of each line there is either a name, in which case the search has come to a halt, or a number, which refers to another number at the beginning of a lower line, where the search continues. Our fruit key in bracketed format would appear as in Fig. 2.

1.	Fruit undergoing drastic change when dropped to the floor	2
[1.]	Fruit not undergoing drastic change when dropped to the floor	[7]
2.	Fruits in clusters, attached to a branched stem	GRAPES
2.	Fruits single	3
3.	Fruit red	4
3.	Fruit not red	6
4.	Fruit surface rough with many small seeds	STRAWBERRY
4.	Fruit surface smooth, shiny	5
5.	Fruit more than 25 mm in diam.	BEEFSTEAK TOMATO
5.	Fruit less than 25 mm in diam.	CHERRY TOMATO
6.	Fruit skin pubescent	PEACH
6.	Fruit skin smooth	NECTARINE
7.	Fruit damaging the floor	COCONUT
[7.]	Fruit not damaging the floor	[8]
[8.]	Fruit yellow, with large brown spots	[9]
8.	Fruit not yellow, no brown spots	10
9.	Fruit more or less isodiametric	APPLE (<i>Golden Delicious</i>)
[9.]	Fruit elongate	BANANA
10.	Fruit brown, woody shell	WALNUT
10.	"Fruit" red, without woody shell, in bunches	RADISHES (misplaced)

Fig. 2 Example of a bracketed key.

For easier reference to our earlier example, the appropriate numbers on the pathway to the banana have been bracketed. You will notice that they are actually the same numbers, in the same sequence, as the ones used in the indented key. Bracketed keys are less wasteful of space, and they make it easy for the user to contrast the two alternatives at any forking point. However, their arrangement is somewhat cryptic, and the user has to be thoroughly familiar with the key before he can make any shortcuts.

A few hints on how to use a key

As everyone else, I like to give advice. However, before I give it I may point out that it is based on a narrow range of experience, resulting from numerous attempts at getting dendrology students, stuck in a key, unstuck. Since most forestry students are poor botanists, their problems are probably typical. At the risk of flogging a dead horse I offer the following suggestions:

- 1) Be familiar with the application range of a key. A key to the local flora will be of limited use in an arboretum, and vice versa.
- 2) Get acquainted with the technical terms used in a key. Many keys have a glossary, some even have detailed illustra-

tions to pinpoint the contrasting characters referred to.

- 3) Always read both statements in a pair of contrasts before you make a decision. Be alert to the possibility that there may be more than two alternatives listed for a given character; many older keys are not truly dichotomous but have triplets or quadruplets instead of couplets.
- 4) After having keyed out a specimen always test it against the species description. You will find characters described that were not used.
- 5) If your specimen lacks one or two characters called for in the key, test it against the remaining alternatives both in the key and in the species description.
- 6) Be assured that, except for the key presented in Figs. 1 and 2, no key is perfect.

Finally, I may point to three keys that have impressed me because of their practicality and, in the first two cases, because of their excellent illustrations.

Winter Twigs: A Wintertime Key to Deciduous Trees and Shrubs of Northwestern Oregon and Western Washington,

(Continued on page 19)

The Guide Program

MARJORIE CLAUSING

Have you ever had a nasturium cocktail, tasted boiled chickweed or been served a piece of sorrell pie? Well, these would have been among the delicacies offered you last fall if you had been a guide-in-training at the University of Washington Arboretum. Women who are to serve as guides on Nature Walks study native plant material and at one training session last November devoted to "Natives: Poisonous or Edible?" they were served an entire luncheon from "God's super-market." Wild and native materials were prepared and served by Mrs. Tom Ciarlo who is a member of the Arboretum Foundation Unit #7, the Micological Society, and to whom collecting and preparing these specialties is a hobby.

The guide program is one of the newer programs at the arboretum, and it is sponsored by the Arboretum Foundation and the Unit Council. It was started when requests for guided tours were becoming so numerous that it was difficult for Mr. Witt and Mr. Mulligan to personally conduct them all with all their other educational and administrative duties. In November, 1961, a volunteer guide service was initiated and organized under the supervision of Mr. Joe Witt with Mrs. Rex Palmer as its first chairman. Twenty-six women participated in the first series of "Nature Walk" training classes held in the spring and fall of 1962 in the Arboretum club house and on the grounds. Most of these students were women who were already well versed in plant material and who had taken the classes "Botanically Speaking" given earlier at the Arboretum.

Early that year, the guide program ex-

panded to include guides whose particular interest was the new Japanese Garden which had opened to the public in June, 1960. In January, 1962, Mrs. Kenneth Sorrells was appointed chairman of the Japanese Garden Guides and training classes were held that same spring for thirty volunteers. Those guides were kept very busy that first summer giving out-of-town visitors (here for the Seattle's World Fair) a wonderful, informative "side trip" to one of the most authentic Japanese Gardens outside Japan itself!

The guide service continued to grow with Mrs. Leon Phillips, Mrs. Carl Crumb, Mrs. Cliffird Barnes, and Mrs. Walter Williams as some of the able "gardeners" (chairmen) who nurtured it along its way. It grew until last year from May 15, 1967, to May 15, 1968, one hundred twenty-four different groups totaling approximately 1700 persons were taken on tours by these volunteer guides. (These, of course, do not include any of the many hours conducted by Mr. Witt and other members of the professional staff.)

Additional training sessions have been held in both areas until now there are fifty trained volunteer guides ready to assist when needed with tours at the arboretum. Thirty-one guides are especially interested in taking people on "nature walks"—on the native plant walk, the waterfront trail, and into other arboretum areas. These girls are our Native Walk Guides under the present able chairmanship of Mrs. John Allen. Most of the tours conducted by this group are on the native plant walk which is a short tour mapped out at the north end of the arboretum where twenty-four examples of trees and shrubs native to the lower elevations of the Pacific North West have been tagged just where they grew. The guides point out identifying characteristics, tell the uses and other pertinent facts, and often include

Mrs. (H. P.) Clausing, present General Chairman of the Guide Program, has been indefatigable in her endeavors to promote this very popular program.

stories and Indian lore about the plants. The tour usually takes about forty minutes to an hour, depending upon the interest of the group and the loquacity of the guide.

Mrs. Tom McKenna now heads the group of 23 women trained as Japanese Garden guides and who take people for tours there during the season it is open to the public, usually from late March through October. The garden is located on the west side of Lake Washington Boulevard East of the lower end of Azalea Way in the Arboretum. It is a "stroll" garden, the type developed in Japan in the 16th and early 17th Centuries in Japan. It comprises here three acres, but it represents a whole countryside. Guides may point out the "karesansui" or dry garden, the turtle island, the grove of "sakura" or flowering cherry trees; they may explain the meaning and significance of some of the eleven hand-hewn stone lanterns or tell the story of the moon-viewing stand and the golden Japanese carp; they can identify some of the plant material even to the Japanese names of some such as "kaede" for maple or "matsu" for pine. Some of our newest guides are charming maidens of Japanese heritage who will come attired in their colorful kimonos upon request and add color and atmosphere as well as information to the tour.

At present, a new group is being added to the guide family. Last fall, twenty-five high school girls began training and will continue classes next spring to complete the course so they can act as guides for younger groups such as Camp Fire, Blue Birds, and Girl Scouts.

The guide program operates on a request-appointment basis. Tours are set up at the day and time a group requests and a guide who also finds that day and time convenient is assigned by the chairman to accompany them. Some guides prefer adult tours, some prefer school classes, and others enjoy youth groups. Some of the guides have given wheel-chair tours, have taken handicapped, blind, and children from spe-

cial schools. Preferences are considered when a guide is asked to go.

Guide training usually consists of twelve hours of instruction in class room and field activity and ornamental plant material, pond life, conservation, and ecology. For Japanese Garden guides, it includes study of the plant material, symbolism and artifacts of Japanese Gardens, as well as the history and construction of the garden itself. Both groups are informed about the arboretum in general, its operation, aims, and policies.

Usually the guides have fall and spring "round-up" meetings each year which include some training in new areas. This is a time too when the guides exchange stories and interesting anecdotes. One guide told a second grade class that she was going to take them on "the native walk." One little boy said, waving his hand wildly for attention, "Oh, I know what a native is. That's a black man with a long spear!" The guide made haste to explain of course that these were plants and why they were referred to as "native."

Guides have observed that children (and sometimes adults as well) call all cones—"pine cones." The three large conifers; namely, Douglas Fir (*Pseudotsuga Menziesii*), Western Red Cedar (*Thuja plicata*), and Western Hemlock (*Tsuga heterophylla*) growing side by side across from the arboretum offices make an excellent place to show the difference in cones and get across the idea that only pine trees produce pine cones! After all, as one guide tells the children, "Dogs don't have kittens!"

Guides attempt to instill in the children the need for conservation and a sense of responsibility for keeping our arboretum and other public lands clean and usable. Japanese Garden guides feel that the Japanese Garden is an especially important cultural asset to our city. One citizen who made arrangements for her young group to have a tour explained that her group was a regular mini-league of nations—it was com-

(Continued on page 19)

Highway Landscape Developments

R. M. BLANCHARD*

West of the Cascades, to date, we have completed 48.11 miles of highway landscaping. In the Seattle area we have completed 18.60 miles of highway landscaping. Between the south city limits and north city limits of the City of Seattle, on Interstate 5, we have expended nearly two million dollars in highway landscaping funds. This includes contracts completed and presently in force.

The types of plant materials which we have used on the highways in Washington have varied considerably when we look at the first landscaping projects on the Seattle Freeway which we accomplished in the early 1960's, and compare that to some of the work we presently have under contract in the south end. In the early landscaping projects we used many more varieties of plant material than we do now in relatively the same amount of area. This has been brought about by a revision to our approach to highway landscape design. Originally the landscape plans prepared were considered for the softening effect and screening of the properties adjacent to the freeway facility, and because of the relatively static nature of the traffic other than freeway traffic, interest was developed by varying the plant material varieties. We have since changed this concept to that of a simpler arrangement of greater masses of a lesser number of plant materials which will complement the rate of travel on the mainline as well as provide masses of trees, shrubs and ground covers which are in scale with the facility to which they are adjacent.

As far as the types of plant materials which we have utilized on our freeway landscaping projects, English Ivy has been one of our most widely used ground cover plants. South of the central business dis-

trict, we have used primarily different varieties of *Cotoneaster* for ground covers which we have planted six feet on center, which should give us a relatively complete evergreen ground cover in three to five years. We have used several pines but due to the recent concern over infestations of European pine shoot moth we have curtailed, and in some areas stopped using pines of any type. We are aware of the fact that the infestation of the European pine shoot moth is not going to be corrected by our elimination of the use of pines. But, due to the fact that we, the Highway Department, have probably more neighbors than any single land owner in the Seattle area, it is important that we eliminate any possible source of contamination of adjacent pines located on private property. The pines which we presently have on the freeway are being sprayed for control of the moth. Due to the cost of this spray control program and the need for eliminating this potential contaminant from our right of way we have elected to curtail the plantings of pines. The dominant evergreen tree used south of the central business district on the Seattle freeway has been the *Cedrus Deodara*. To the north we have used plantings of Douglas fir and the native hemlock, all these being beyond the Northgate area.

For large deciduous trees which will reflect the scale of the freeway, we have relied primarily on the *Platanus*, *Zelkova*, *Acer platanoides* and *A. saccharum*, *Quercus*, *Liriodendron tulipifera*, and *Liquidambar*. We have also incorporated in our design many intermediate or small trees which will provide accent within the project. Examples of this would be the use of *Acer circinatum*, *Cornus florida* and *C. Nuttallii*, *Malus*, and *Cercis canadensis*.

Shrubs which we have used on the freeway include several of the evergreen varieties as well as some deciduous types.

*Landscape Engineer for Washington State Highway Department

Prunus Laurocerasus 'Zabeliana' has been used extensively as an intermediate shrub for planting in and near bed areas containing the large trees. Also extensive plantings of the *Prunus* have been placed in the Pedestrian-Parks which are for use by city residents, on highway right-of-way outside the protective chain link fencing. Other shrubs used on the freeway landscapes have been hybrid varieties of rhododendrons, *Cytisus praecox*, *Viburnum tomentosum*, and some limited plantings of *Azalea*, *Juniperus*, *Erica*, *Calluna*, *Ceanothus*, and *Arctostaphylos Uva-ursi*.

Our two most widely used vines have been *Hedera Helix* as a ground cover and *Parthenocissus tricuspidata* as a climbing vine for softening the tremendous retaining walls constructed adjacent to the freeway. Nearly one-half million *Hedera Helix* plants were planted in the downtown area of the Seattle Freeway. The *Parthenocissus* was planted in "Planting Pockets" at the base of the retaining walls and then mechanically attached to the wall until such time that the plant develops enough natural attachment for self support. The reason this mechanical attachment is necessary is that the retaining walls are so near the traveled roadway that they are constantly buffeted by winds created by the movement of the vehicles on the roadway.

On the Seattle freeway we have planted approximately 15,000 trees, 600,000 *Hedera Helix* plants, 33,000 hybrid brooms and over 2,000 rhododendrons.

One of our major problems has been that of supply of plant material within the prescribed time limits of the project. We have extended the duration of projects now for a period of two years in which to allow the contractor adequate time for securing the plant material and/or growing it on to the size specified prior to placement on the project. Because of the fact that plant material is alive we have had several problems when "growing" and/or "horticultural practices" were not such that the plant attained the anticipated and specified size when time came for placement on the

project. This of course we have no control over and must deal with on an individual project by project basis in allowing additional time or assessing penalties for failure to comply with the provisions of the contract. We have attempted to make known to the nursery industry the type of plant material which we will be using on the highway projects, but due to the somewhat erratic Federal Aid funding of highway beautification projects we have not felt that it would be desirable to release anticipated quantities of material required. Many nurserymen would grow, on speculation, material which they anticipate would be used on freeway projects, but due to the uncertainty of funding, the projects could be delayed or deleted thereby leaving the nurserymen with tremendous surpluses of materials not normally grown for the general nursery market. We have been in discussion with the Washington State Nurserymen's Association and we are hoping to resolve some of the problems we have encountered on the supply of nursery grown plant material.

A constant problem with our large landscape contracts has been the inexperienced labor utilized by contractors to plant the projects. In most cases the contractors have been unable to attract experienced plantmen to accomplish the contract planting. Under such conditions the inspector is often required to supervise the planting of nearly every shrub which increases the administrative cost for landscape planting contracts. It would appear that the labor market in the Puget Sound area, and the lack of horticultural instruction has contributed to and compounded this problem.

Because of the present economic situation here in the Puget Sound area, few are attracted to the business end of a shovel so that this problem will no doubt be with us in the future.

Along with the problem of pine shoot moth we have lost some material and experienced damage on other material from the urban air pollution. This has been

most significant in the downtown area where many plants are sheltered from the driving winter rains which wash down the foliage and in areas where air drainage is very poor. It is our opinion that in such areas where plant material is needed we should attempt to rely primarily on deciduous plant materials which will not experience a build-up of pollutants on their leaves year after year.

The problem of subsoil as a growing medium has been encountered on every project to date. Although we used a topsoil backfill we primarily "pocket plant" our trees, shrubs, and ground covers. Because of the nature of glacial till we have found it necessary to provide drains or mounding for a large percentage of the plants.

A problem recently encountered with which you are undoubtedly familiar is that of nomenclature. We have used as a reference *Standardized Plant Names*. The nursery industry does not conform to this reference. As a result on a recent project we specified *Cotoneaster glaucophylla* and the contractor supplied or is intending to supply what the nursery industry grows as *Cotoneaster glaucophylla*, which is actually *Cotoneaster buxifolia formavellaea*. Although the nursery industry is obviously in error, the problem has still arisen and in the future it is likely that it may crop up again. We would certainly welcome an investigation into this problem to see if other agencies are experiencing a similar difficulty and whether or not the problem would warrant some attention by a qualified person or group who would develop a reference list for use nationally by all federal and state agencies. The nurserymen here in the State of Washington have acknowledged that this problem exists and are to contact the American Association of Nurserymen to see if they have any suggestions on how to protect against recurrence of this problem.

The maintenance of our areas which have been landscaped have been of real concern to all. The maintenance budgets

have not, in the past, incorporated adequate money to accomplish the necessary landscape maintenance. Our maintenance people have now begun to gear up and budget for this new responsibility. It is likely that considerable time will be required to adequately train personnel who can accomplish this landscape maintenance work, thereby building in a period of lag before all landscape maintenance can be brought up to standards.

All of our highway projects including landscape contracts are administered by highway engineers and technicians, due to an established policy and the lack of landscape personnel. The landscape architects consult with and advise the engineers and technicians on landscape projects whenever possible but we still have experienced difficulty because of the change in personnel and the lack of training in this work. The biggest problem encountered has been when judgment is required on intent of specifications or when a variation from the specifications is necessary due to variable conditions such as soil and weather. The engineers are excellent in making decisions on precise measurements or materials that can be analyzed for strength and weighed, but plant materials do not always fit such precision as steel beams and concrete aggregate. Many of the problems experienced on earlier projects have been reduced with closer liaison and training sessions with the project engineers and inspectors.

Another problem which we have encountered is that of attracting several bidders for each job. In the past we have never experienced more than five bidders and usually only two bidders on a project. Through discussions with the contractors and other allied fields it has been determined that the scope and dollar value of our projects is generally beyond the financial and physical capabilities of the majority of landscape contractors in the Pacific Northwest. In an effort to remedy this problem we are investigating the possibility of cutting down the size of the projects in order to attract more bidders.

Special Spring Plant Sale at Southcenter 1969

Now that the weather is giving us all a break and you can see those bare spots in the landscape, 1500 members of the Arboretum Foundation Unit Council are thinking about YOU. On the 9th of May from 5 to 9 P.M. and on May 10th from 9 A.M. to 5 P.M. the Unit Council is having a Special Spring Plant Sale at Southcenter, to assist in raising funds for the new Floral Hall to be built on the University of Washington Arboretum grounds.

AS YOU STROLL THROUGH YOUR GARDEN
TAKE A NOTEBOOK AND START YOUR WANT LIST.

For this sale no plant list will be published but you will find all of the usual plants plus some special summer bloomers which we have not been able to offer before. New departments are Fuchsias, Geraniums and Decorative Planters. . . . These join Trees and Shrubs, Rhododendrons and Azaleas, Cyclamen and Iris, Ferns, Groundcovers and Rockery plants, Perennials, Heathers, Herbs, Native plants, Vines and Houseplants. . . . Landscape Advisors will be present to help you with their expert knowledge.

The Pre-Order Department is a service which can save you time and disappointment! We are prepared to search out rarities and extra-choice plants. To be sure of getting the plants that you want, mail or phone your order—by SATURDAY, MAY 3rd, with your NAME and PHONE NUMBER to one of the persons listed below. . . . Your treasure will be ready to be picked up when you arrive at the

Special Spring Plant Sale at Southcenter 1969

Friday, May 9—5:00 to 9:00 P.M.—Sat., May 10—9:00 A.M. to 5:00 P.M.

— PRE-ORDER CHAIRMEN —

MRS. PHILIP G. JOHNSON
2840 40th Ave. West
Seattle, Wa. 98199
AT 3-1765

MRS. JOHN ALLEN
4044 94th Ave. S.E.
Mercer Island, Wa. 98040
AD 2-3768

The Arboretum Bulletin

Vol. XXXII, No. 1 Seattle, Wash. Spring 1969

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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.

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- Life\$500.00
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University of Washington Arboretum
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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.

Name

Address

All memberships are non-assessable.

Cold Weather in the Arboretum

DECEMBER 1968 – JANUARY 1969

During Nov. 1968 there was only one night (Nov. 5) when the minimum temperature went down to 32°F., although it was 33°F. on the 15th. Maximum temperatures reached 60°F. on the 19th and 20th, and except for three days (15th, 16th, 30th) did not drop below 47°F.

The first half of December gradually became colder, with a minimum of 32°F. on the 5th, 11th and 12th. On the 18th we experienced mixed snow and rain, with a maximum temperature of 38°F. More snow fell December 21-22, particularly the latter day. On December 27, however, the wind changed about noon from S.W. to N. The temperature that night fell abruptly to 18°F. having been 24°F. during the afternoon.

The following temperature and wind figures for the next three days tell their own story:

Date	Max.	Min.	Wind Dir.	Speed
Dec. 28	21°F.	13°F.	N.W.-N.	8-14 knots
Dec. 29	18°F.	10°F.	N.-N.E.	8-11 knots
Dec. 30	23°F.	7°F.	N.E.	6-13 knots

Snow fell on both the 30th and 31st; on the morning of the 31st it amounted to nine inches in Seattle. The temperature started rising again and reached 39°F. that day. The minimum of 7°F. on the 30th was the lowest recorded here since the cold weather of January and early February, 1950.

That was the first cold period of the winter. The second came rather more than two weeks later, although there was snow on January 6, 7, 11 and 12, and mixed snow and rain from the 13th through the 16th. On the 15th the maximum temperature was 41°F.; it did not pass 40°F. again until January 31.

January	Max. temp.	Min. temp.
21	33°F.	25°F.
22	30°F.	14°F.
23	30°F.	13°F.
24	30°F.	27°F.
25	31°F.	24°F.
26	28°F.	26°F.
27	24°F.	16°F.
28	24°F.	16°F.
29	29°F.	23°F.
30	36°F.	27°F.

We thus had eight consecutive days when the maximum temperature was below 32°F., and another day at 33°F. The lowest minima were not as cold as December 28-30, but nevertheless a succession of low temperatures such

as these, together with the drying power of cold winds, are most damaging to broad-leaved evergreen plants. The fact that there was snow on the ground for a large part of January helped to protect smaller plants, although it is evident that many of these had suffered severely at the end of December. On January 28 the snow was 12-14 inches deep, dry and powdery.

Only preliminary examination of affected plants has been made up to the end of February, but amongst those most obviously and severely damaged are the *Eucalyptus*, of which only three or four out of fifteen species may retain their main stems, the *Ceanothus*, *Cistus*, *Hebe* species, large leaved types of rhododendrons (*Grande* and *Falconeri* series), some *Arctostaphylos*, most evergreen *Viburnum* species, *Escallonia*, *Azara*, several *Berberis*, *Drimys*, *Pittosporum*, a number of evergreen azaleas, rosemary, while three *Acacia* species against the south walls of the office or greenhouses are probably dead. We hope to publish full details in the summer issue of the *Bulletin*. In the meantime it would be well only to prune off the dead branches and leave such plants undisturbed in the hope that new growths will start in the spring. B.O.M.

Botanical Keys

(Continued from page 11)

by Helen M. Gilkey and Patricia L. Packard. Oregon State Univ. Press, Corvallis. 1962.

Fruit Key and Twig Key to Trees and Shrubs. Fruit Key to Northeastern Trees;

Twig Key to the Deciduous Woody Plants of Eastern North America, by William M. Harlow. Dover Publications, Inc., New York. 1959.

North American Trees, by Richard J. Preston, Jr. M.I.T. Press, Cambridge, Mass. 1966.

Authoritative, but highly technical, keys to the vascular plants of the Pacific Northwest can be found in:

Vascular Plants of the Pacific Northwest, by C. L. Hitchcock, A. Cronquist, M. Ownbey, and J. W. Thompson. Parts I-V, University of Washington Press, Seattle. 1955.

The Guide Program

(Continued from page 13)

prised of children from many different cultures. She was hoping to give the group some experience representative of each of these cultures and she chose the Japanese Garden at the arboretum as representative of the Japanese culture.

There is no charge for these conducted tours; the guides are unpaid volunteers but they will tell you that their compensation comes from the knowledge they have acquired in the training classes, a sense of satisfaction in a service rendered, and just in the sheer joy of seeing our wonderful arboretum and helping others to see and enjoy it too.

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (November 21, 1968 through March 1, 1969): *Sustaining*—Mrs. John H. Butler, John Franco's Hidden Harbor. *Annual*—Mrs. E. T. Arrieta, Mrs. Philip Bacon, Mrs. Roger A. Anderson, Mrs. Albert C. Bartlett, Mike Bassett, Mrs. R. C. Bell, Mrs. Roy L. Collins, Mrs. Richard A. Crooks, Jr., Mrs. H. E. Dickerman, Mrs. Cyril H. Dye, Mrs. James Foster, Mrs. Judy Goldfine, Mrs. Roland D. Hayden, Mrs. John D. Heath, Dan N. Hendricks, Jr., Mrs. George H. Hood, Mrs. James L. Jacobs, Linley J. Janzen, Mrs. Karl L. Krause, Mrs. W. R. Leighty, Mrs. Philip B.

Lundstrom, Joseph W. Marshall, Mrs. Edwin J. Merritt, Dr. John B. R. Parker, Mrs. Lee W. Pearl, Mrs. Albert L. Pederson, Mrs. LeRoy Peterson, Mrs. Lyle Schager, Mrs. Marjorie G. Schmidt, Mrs. Rex R. Smith, Mrs. M. Gail Stewart, Mrs. Walter Stoll, Mrs. Alex Sumeri, Mrs. David L. Turpin, W. P. Van Stockum, Mrs. Dallas H. Zeiger.

We are also most grateful to the following members who have increased their dues to: *Life*—Mr. & Mrs. W. Walter Williams. *Contributing*—Mr. & Mrs. Glen Hunt, Mrs. Rex Palmer, Mrs. Florence L. Putney. *Sustaining*—Mrs. Gene B. Williams.

Some of Our Favorites ☆

☆ *Won't You Send Us Yours?*

Vaccinium Ovatum

To choose a favorite plant I looked for one to enjoy spring, summer, fall and winter. One of the sterling native plants which meets all these qualifications is *Vaccinium ovatum*, our native evergreen huckleberry.

The spring season offers bright coppery-bronze new shoots, a foil for the neighboring rhododendrons, salal, and Oregon grape. In late spring and early summer clusters of tiny waxy pale pink bells bunch along the stems and near the ends of branches, making it easy to strip the next stage—those sweet tangy black berries. The berries swell with the fall rains and are best in late September and October. However our friends flock to our SeaAcres home on Hood Canal from August through November to pick the delicious fruit for pies, muffins, jam and syrups. We have two kinds of berries; the common black one which Indians called “shot ollalie” or shot berry; the other bush mingles indiscriminately and the berry tastes the same though it seems to ripen slightly later. It is a much larger blue berry, or perhaps black underneath with a whitish blush covering the bloom which makes them appear blue. They are sometimes called variety *saporosum* though the bushes seem identical. Through the dark days of winter the faithful vaccinium continues to give us greenery for the house and berries for the hungry birds.

Vaccinium ovatum grows from Santa Barbara to British Columbia and varies from two to three feet in height in the sun up to eight to ten feet in the shade. John Grant in “Trees and Shrubs for Pacific Northwest Gardens” carries it in each of his “twelve best” lists for sun, partial shade, and deep shade, and also in his

“twelve best all-round” list. You can't do much better than that!

The vaccinium prefers rocky, gravelly soil but here in Seattle it thrives just as well in the finest humus. It never gets watered at SeaAcres, but in town the plants are soaked along with all the other moisture-needing shrubs. And the fat, black shoe-button berries just ooze juice when our dog, Andy, and I stroll through the garden and stop to sample them. The bushes are just the right height for a little two foot dog to daintily nip off the berries.

Archibald Menzies, on Vancouver's expedition that lovely spring day in May 1792, rowed and explored every little cove and bay along Hood Canal. I love to pretend he landed by our tiny stream at SeaAcres for water and there discovered and plucked a few sprigs of *Vaccinium ovatum* for his plant cases. He must have been impressed with his find, its neat habit of growth, the dark glossy green leathery ovate pointed leaves, the hairy stems and twiggy branches, and the dainty pink bells. His journal tells of his pleasure at seeing it for the first time.

The evergreen huckleberry has a good garden constitution. It is readily transplanted from the wild if you force yourself to look for the smallest plants. Leave the large ones. They take years to recover from transplanting if they live at all. We have successfully dug many small plants six inches to one foot tall, and they are all doing well scattered among the deciduous azaleas filling that void in winter.

One day nurserymen will carry them when they become harder to find in the wild like so many others of our choice natives. Thousands of pounds are slashed and sent east each year for florist's filler, and collectors and bulldozers cannot continue to strip the countryside indefinitely. They are one of our best indispensable native plants.

Spring, summer, fall, winter, *Vaccinium ovatum* pleasures me.

JEANNE GARDINER

BOOK REVIEWS

Wild Flowers of North Carolina and Surrounding Areas. By William S. Justice and C. Ritchie Bell; University of North Carolina Press, \$7.75

Surgeon-photographer-field botanist Dr. Justice and professor of botany, Dr. Bell, have prepared a delightful small book with a very large amount of field information. It has beautiful photographs, in color, of 400 flowering plants of the region, a short but adequate glossary, and a business-like format. For those who require more technical information, each plant is keyed by number to the appropriate-detailed entry in the *Manual of the Vascular Flora of the Carolinas*, of which Dr. Bell is a co-author.

It is a great pleasure to find so many of our treasured northwest ornamentals are native to a south-eastern state. One hopes they, as well as the many which we do not grow here, will be protected, so that, for many years to come, they may be enjoyed in their natural habitat.

M.W.B.

Ornamental Shrubs For Canada. Lawrence C. Sherk and Arthur R. Buckley. Research Branch Canada Department of Agriculture, Publication 1286, Ottawa, Ontario, 1968. 187 pp. Two end maps. Price \$3.00

I have always been a great admirer of the various publications in the natural sciences put out by the Canadian Government. My own library includes a fine volume on mushrooms and another on birds of western Canada that have no counterparts in the United States. This handbook is in the tradition of its excellent predecessors and has much to recommend it to U.S. readers.

The format is very similar to that of Dr. Donald Wyman's *Shrubs and Vines for American Gardens*. There is an introductory section dealing with uses, buying, culture including planting, pruning (which is nicely done), diseases and insect pests and their control. I feel that in this latter section there is too much emphasis on the use of DDT and other chlorinated hydrocarbons—chemicals which now seem best avoided because of their long-lasting effect on animal life beyond the insects they are supposed to kill. There are a series of most useful lists of shrubs for various purposes; as colorful fruits and colored foliage, lists of plants for various soils, for planting near the seashore and other similar compilations including a comprehensive series on shrubs of various heights.

The main body of the book is a listing of recommended plants arranged alphabetically by genus, starting with *Abelia* and ending with *Zenobia*. Most genera are covered in a few lines with some of the more important such as *Rhododendron*, *Rosa*, or *Syringa* given more complete treatment. Each species has its height, zone (about which more below), common name given and a line briefly describing it and often with a mention of some characteristic such as unusual color, cultural requirements, or hardiness note.

A word about the Plant Hardiness zones mentioned above. The two end maps show the climatic zones of Canada, dividing them in nine zones from Zone Oa, the tundra of the far north, to Zone 9a, the mildest parts of western British Columbia. These maps are very similar to the plant Hardiness zone map for the U.S. published by the U.S. Dept. of Agriculture, but are more accurately detailed. For instance, in the U.S. map, the Olympic mountains are indicated as Zone 7b or 8b when they surely can be no more than Zone 2. The Canadian is, I believe, more carefully done.

There is a photograph on nearly every other page and line drawings of pruning and planting techniques in the first section. Slightly less than half the photographs are in color, and although the reproduction of these is not first class it is good to see so inexpensive a book with this much color.

Ornamental Shrubs for Canada is a book for the average home owner who has a vital interest in gardening, and is not designed for the professional horticulturist or the very advanced amateur. I believe that it will be very well received in Canada and should find an equal reception among gardeners south of the border.

J. A. Witt

Trees. Andreas Feininger; the Viking Press Inc., New York, (1968). Price \$22.50

In the words of the author, who spent nine years on this project, this is "a tree-appreciation book,—not a textbook or manual,—nor still another picture book". Yet in some respects it has very definite features of both textbook and picture book; there are highly informative chapters on the economic and ecological role of trees, wood and wood products, the structure of trees, including "How a Tree Functions", on leaves, both as to form and function, on forests in North America and other pertinent subjects. The botanical material has been checked for accuracy by Dr. Howard Irwin of the New York Botanic Garden. The chapters on ecology and the forests are especially penetrating and valuable and deserve thorough reading and consideration.

As to the illustrations, there are 120 in black-and-white, 40 in color, all taken by the author and of full page size (12½x10 inches). As might be imagined, they are of the highest quality, since they were selected from 5,000 of both types and the black-and-white finally from 700 8x10 inch prints. For those persons interested, details of the camera used, the lens, film and exposure are to be found on pp. 111-112, at the end of the book. The majority was taken with a Rolleiflex and an 80mm. lens.

Generally they are arranged in groups following the subject to which they refer, either four in color or sixteen in black-and-white. Short descriptive notes on each precede them. Bristlecone pines and redwoods are given separate chapters under the respective headings of "The Oldest Living Things" and "The Tallest Living Things." Both are illustrated by color plates, those of the former being particularly notable for their clarity and brilliance; one is effectively used on the dust cover. The author's vivid account of his trip to see these pines in their native home will probably discourage some from attempting it but also warn others how to prepare for it.

Not all the pictures were taken in the United States. Plates 4 and 5 show birches and beeches in the spring in Sweden and Denmark respectively, while a group at the end of the work includes *Platanus* trees in Paris and Geneva, Lombardy poplars in France, ancient oaks in Denmark and beeches along the Baltic coast of the same country. Deciduous trees are definitely preferred over evergreens, no doubt chiefly for their varied branch patterns in winter.

The index includes references in parentheses to picture pages, which are numbered separately, but always under English names; even though Latin names may be mentioned in the text they are regrettably omitted in the index. Oaks, for example, can be found in at least seven different places,

depending upon whether you seek black, California, live, pin, white or others, but never under *Quercus*! A separate index to the Latin names would have been an asset.

The statement on p. 61 that *Pinus strobus* is the only American pine with needles in bundles of five should have been caught before it went to the printer. Forestry students and others who have some knowledge of our native trees will know better, but it may deceive some less well informed.

It would be of interest to learn where plate 1 was photographed and whether it represents a pure stand of Douglas fir; the caption is ambiguous, since it also mentions Sitka spruce, but the site would seem to indicate the former.

Apart from these generally minor criticisms this can be recommended as an informative, attractively arranged and presented book, printed (in West Germany) on a heavy grade of paper using a large clear type. It would be excellent for both junior and senior high school libraries, although the price is regrettably high for this purpose, and indeed for general consumption. Other institutional and city libraries should certainly take note of the work and acquire a copy while still available.

B. O. Mulligan

Public Gardens and Arboretums of the United States
By Martha McMillan Roberts
Holt, Rinehart and Winston—New York

The University of Washington Arboretum is one of the gardens featured in this handsomely illustrated book. Also included are the Woodland Park Rose Garden and Ohme Gardens of Wenatchee, Washington.

There are seventy-one gardens in all, from all parts of the United States. Each is presented on a double page with black and white photographs and a brief resume' of it's history and it's founders. There are also several color plates.

In addition to the various botanical gardens and arboretae, almost every imaginable kind of garden is represented. There is the simple Kitchen Garden of Mt. Vernon, the sumptuous splendor of Longwood Gardens in Pennsylvania, the Fairchild Tropical Garden in Florida, the archaic beauty of Colonial Williamsburg, and the Japanese symbolism of the Asticou Garden in Maine.

This book will be a valuable guide to those who like to 'botanize' when they travel. Surely everyone should, for this is a glorious heritage that belongs to us all. There is an index by states for quick reference.

Esther Berry

A Guide to Late-Flowering Rhododendron Species

(Continued from page 7)

ten feet or more, under towering firs or hemlocks, underplanted with lush salal (*Gaultheria shallon*), with the sun's rays filtering through to touch the papery leaves and crinkly-edged flowers. I felt somewhat the way George Forrest must have felt when he beheld his first grove of *R. barbatum* in the heights of the Himalayas or E. H. Wilson when he came upon *R. calophytum* in northwest Szechuan. I trust we will not let them become extinct from too-greedy "collecting."

Happy "Rhododendron-walking!"

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	keleticum

(I am extremely grateful to Mr. Van Denburgh for the many hours he spent with me, patiently hunting plants which I had not been able to find alone. My sincere thanks to Mr. Witt, also, for advice and corrections. Miss Webb, too, deserves a bow! She has been waiting patiently (?) since last spring for this article!)

Marjorie Baird

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ARBORETUM WEATHER RECORD — 1968

MONTH	RAIN*		TEMPERATURE		SUNSHINE†	
	Inches	17-year Average	Highest	Lowest	Hours	% Possible
January	7.42	(6.35)	58°F.	22°F.	34.8	13
February	5.10	(4.34)	71°F.	26°F.	161.9	54
March	5.33	(3.42)	70°F.	31°F.	153.6	42
April	2.69	(2.53)	78°F.	31°F.	189.9	46
May	2.38	(1.89)	81°F.	39°F.	262.0	56
June	2.26	(1.51)	85°F.	45°F.	243.2	51
July	1.01	(0.73)	95°F.	48°F.	352.3	73
August	4.89	(1.30)	91°F.	49°F.	218.3	50
September	2.01	(1.69)	85°F.	43°F.	204.2	54
October	4.08	(3.70)	71°F.	37°F.	149.3	44
November	5.39	(6.35)	60°F.	32°F.	81.0	29
December	9.04	(6.02)	52°F.	10°F.	49.1	19
TOTAL	51.60	(40.17)			2,099.6	

*Measured at station west of greenhouse in Arboretum.

†Recorded at U. S. Weather Bureau station, Seattle-Tacoma Airport.

Lowest recorded temperature for the year, December 30, 07°F.

Highest recorded temperature for the year, July 2, 95°F.

Greatest 24 hour rainfall, December 3, 1.49 inches.

Number of days with minimum temperature below 32°F., 42.

Number of days with minimum temperature below 20°F., 3.

Number of days with maximum temperature below 32°F., 4.

Number of days with maximum temperature above 90°F., 3.

Last recorded frost in spring, April 17, 31°F.

First recorded frost in fall, Nov. 6, 32°F.

The cold period of December 27 to 31 was very similar to that experienced during December 15 to 18, 1964, although the earlier one was somewhat less protracted.

Below are some comparisons:

1964			1968		
Date	High	Low	Date	High	Low
12/15	32°F.	11°F.	12/27	24°F.	18°F.
12/16	16°F.	13°F.	12/28	21°F.	13°F.
12/17	25°F.	17°F.	12/29	18°F.	10°F.
12/18	36°F.	29°F.	12/30	23°F.	07°F.
			12/31	39°F.	37°F.

—J. A. Witt

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*Published by the
Arboretum Foundation
University of Washington Arboretum
Seattle, Washington 98105*

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