PRESIDENT'S MESSAGE

As you know, among the many crises that have presented themselves to the Arboretum these last two years, the most pressing has been the relationship between the University of Washington and the City of Seattle regarding future management of the Arboretum, in particular, a re-negotiation of the original agreement. Many people have tried to help solve this dilemma. Senate Resolution No. 1972-44, adopted February 19, 1972, resolved to bring together the City of Seattle, the University of Washington, and other interested groups in order to resolve both the administration and the funding of the Arboretum.

In June, the Arboretum Foundation-sponsored symposium, "The Urban Arboretum in Time of Crisis," furnished background for decisions for both the City and the University by providing the expertise of other Arboretum Directors who were invited to participate.

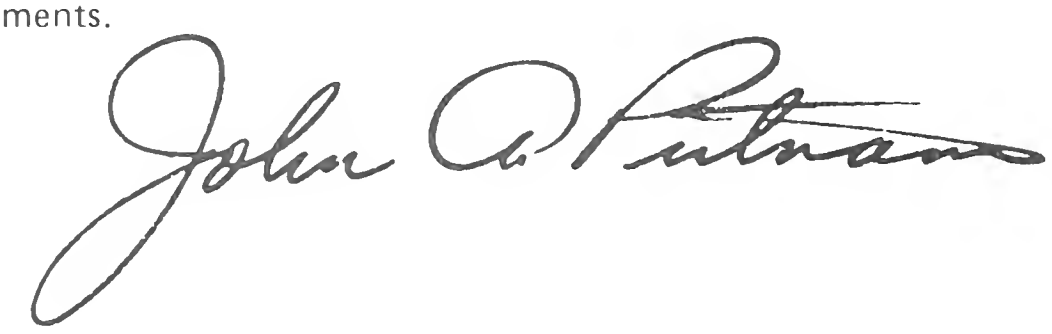
Later Legislative Budget Committee hearings in Port Angeles and in Tacoma gave the University, the City and interested groups an opportunity to voice ideas for the future of the Arboretum.

Additionally, the American Association of Botanical Gardens and Arboreta at their annual meeting here in Seattle in September, 1972, passed a resolution requesting:

> . . . the Legislative Budget Committee, the State of Washington, and the City of Seattle earnestly attempt to resolve and clarify the financial and administrative structure of the Arboretum so that the institution will be able to continue to prosper and develop in a manner benefiting its prestigious position.

This was followed by a letter from Fred B. Widmoyer, Secretary-Treasurer of the AABGA offering any assistance that his organization could give in helping resolve this dilemma.

More recently, at the third Legislative Budget Committee hearing in Bellingham, October 27, 1972, further discussions between the interested parties were held. We are happy to announce that the University and the City are initiating negotiations for a new agreement and that the future of our Arboretum appears assured. Details of the arrangement remain to be resolved. We shall keep you informed of all subsequent developments.



THE ARBORETUM BULLETIN

Vol. XXXV No. 3
Seattle, Wa., Fall, 1972

The ARBORETUM BULLETIN is a journal of general horticultural information published quarterly, as a bonus of membership, by the University of Washington ARBORETUM FOUNDATION, a non-profit organization to further the development of the University of Washington Arboretum. Information regarding membership in the Foundation may be obtained by writing to the ARBORETUM FOUNDATION, University of Washington, 98195 or by calling EA 5-4510. Articles on botany and horticulturally related subjects written by professional and amatuer botanists, horticulturists, educators and gardeners are welcomed. No part of this BULLETIN may be reprinted without the authority of the ARBORETUM FOUNDATION.

THE UNIVERSITY OF WASHINGTON

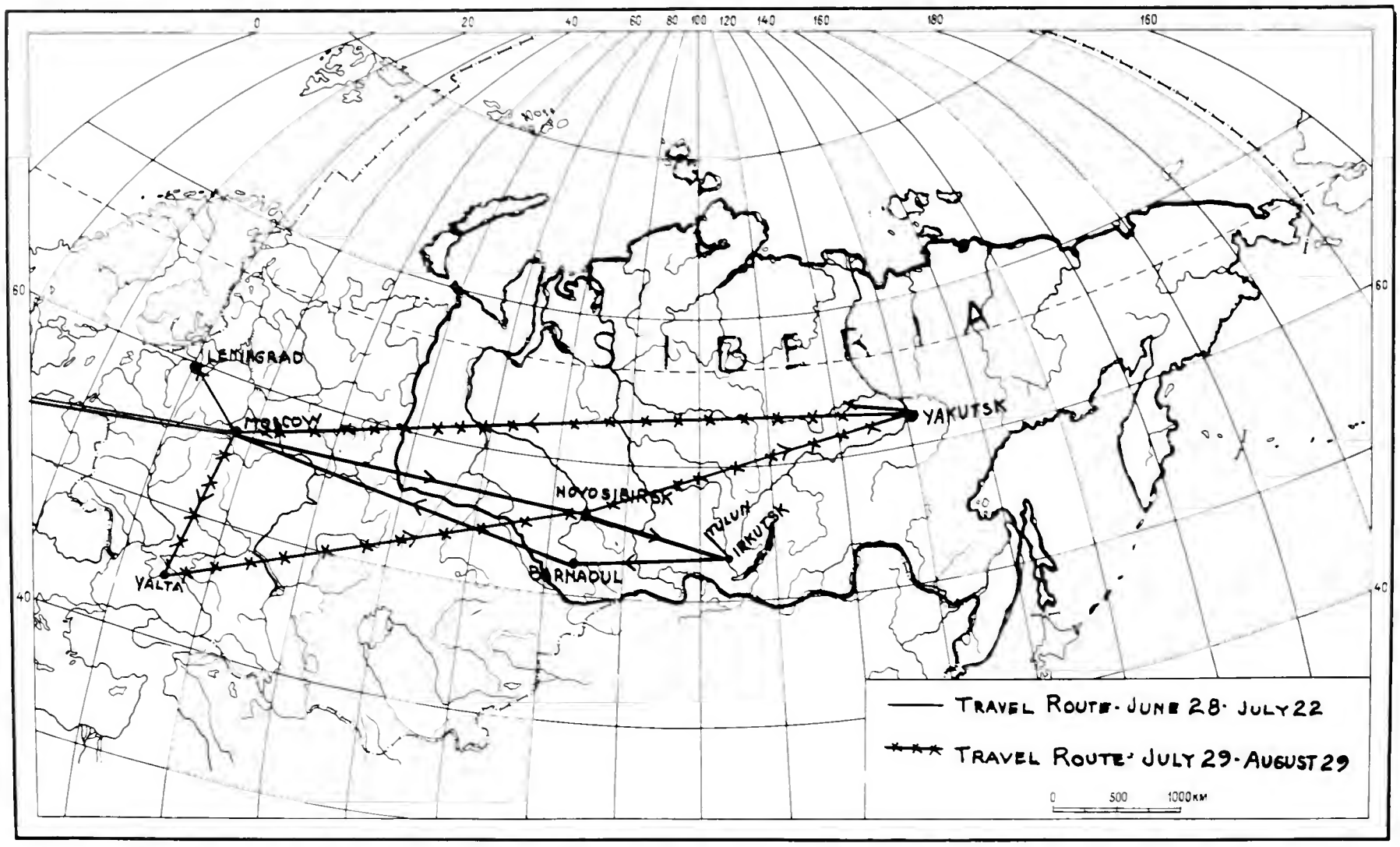
Arboretum bulletin

VOLUME XXXV, NUMBER 3

Fall, 1972

TABLE OF CONTENTS

COVER PHOTO: *Franklinia alatamaha*, University of Washington Arboretum. (See p. 25) Photo by:



Plant Collector in Siberia

*JOHN L. CREECH**

Siberia, with its awesome vastness, has always intrigued Russians and foreigners alike. It has also drawn plant collectors and among the first explorations of the U.S. Department of Agriculture were those to Siberia by N. E. Hansen in 1897, 1906 and 1909. He was searching for hardy fruits and alfalfas, particularly the yellow flowered *Medicago falcata*. Frank N. Meyer journeyed through Central Asia and Siberia during his seemingly endless years of plant collecting for the USDA prior to the First World War. Other explorations sponsored by the USDA included Central Asia and, to a lesser degree, Siberia during the 1930's. After World War II, the plant exchanges with the Russians almost ceased.

In 1956, Longwood Gardens, Kennett Square, Pennsylvania, and the USDA's Agricultural Research Service drew up an agreement to conduct a sustained program of ornamental exploration to areas not normally accessible. In 1959, ARS began a plant exchange program with its counterpart in the USSR, the All-Union Vavilov Institute of Plant Industry, Leningrad. Both programs progressed remarkably well, and in 1963 the first exploration to the USSR since before WW II was conducted by Scott and Creech under joint auspices of these two programs. This was an ornamental and fruit collecting expedition to Central Asia and European Russia. Other USDA explorations followed in short order — Keller and Jones (1965) and Skrdla and Brooks (1967). In 1971, I was able to undertake a second exploration to the USSR under the Longwood program and with direct field assistant from the Vavilov Institute. This was the fourth of the current expeditions to the USSR and the 13th of the series of ornamental explorations supported by the Longwood program.

---

*Chief, New Crops Research Branch, Plant Science Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland 20705
Photos by: John L. Creech

Although my main purpose for visiting the USSR was to collect Siberian plants and visit horticultural institutions in Siberia which were assembling Asiatic plants, it is worthwhile to mention some of the European Soviet institutions that are most likely to be visited by the usual traveler.

In Miscow several institutions feature trees, shrubs and herbaceous plants that will interest the horticultural visitor. In most such places, emphasis is on the native plants of the USSR, and nowadays it is fashionable to collect and display Siberian species. The Main Botanic Garden of the Academy of Sciences, the University of Moscow Botanic Garden, the Shreder Botanical Garden of the Timirazov Agricultural Institute, and the Forestry Institute at Pushkin are all open to the public. The Main Botanic Garden includes display beds of horticultural varieties of annuals and perennials, large collections of trees and shrubs arranged on a systematic basis, and greenhouses with exotic species. One feature that is rather unique is a 13 hectare display of the development of crop plants in the USSR. It shows the types grown during each century with the appropriate additions as new parts of the world were discovered. Progenitor types and advanced varieties of food plants are grown side by side. In one place the visitor can examine just about every form of the cabbage that is cultivated. This garden is designed so that with a small map the visitor can take a self-guided tour.

The University of Moscow Botanic Garden features 40 hectares of native plants arranged on a geographical basis; and one can visit an alpine flora, a steppe collection, plants from the Far East, the Caucasus region, or the Crimea. Much of this garden is based on domestic explorations by the staff of the Garden. It is easy to locate because it adjoins the mammoth building that houses the University, which is a stop for all tourists in Moscow. It is unlikely that many of them get to the Garden, however.

The Shreder Botanic Garden is considerably smaller, less than 12 hectares, and perhaps the least likely to be encountered. The small herbaceous garden is devoted to economic plants mainly used for teaching purposes, but nearby is the "dendrarium" with a rather interesting collection of trees and shrubs. It was established by a Dane, Shreder, about 100 years

Summertime in the Siberian taiga is a delightful scene of birches interspersed open parks of annual and perrenial. Here is the home of the Turks-Cap lily (*L. martagon*).

Acer tegmentosum, **growing in the Shreder Botanic Garden, is especially attractive because of its striped bark and long racemes of bright yellow fruit.**

ago. By 1892 he had assembled about 3300 species which gradually declined until they numbered only 188 by 1935. But it is on the increase, and there are now some 500 species represented. There is a good collection of *Cornus*, in which I found a hybrid of *Cornus alba* crossed with an unknown parent. The hybrid is said to have pink flowers. I collected cuttings for trial in the U.S. There are numerous maple species, but the most attractive is the striped bark species, *Acer tegmentosum*, which was heavy with bright yellow fruits. *Prunus maackii*, with its rich red exfoliating bark, had developed into large groves and is one of the more interesting trees for use as a street tree. I saw it used on several occasions around Moscow and in Siberia, even under permafrost conditions where temperatures around -60°F are not unusual in winter.

The Forestry Institute at Pushkin is a special attraction because it serves as the source of street trees and shrubs for the City of Moscow. As such, it contains a 90 hectare nursery and propagation center with over 5 million trees and shrubs produced annually. There is considerable attention to mechanization and one of the most extensive mist propagation facilities I have seen. Under high canopies of plastic film, the spray nozzles are mounted some 8-10 feet above the propagation beds and cuttings are rooted in a combination of soil and sawdust, with sort of a mulch of shavings over the surface of the bed. Among the commonly planted trees and shrubs are *Ptelea trifoliata*, our native hoptree, *Acer platanoides, Fraxinus orientalis, Sorbus,* and *Populus*. All are regarded as being particularly smog resistant and capable of withstanding the city environment. A good yellow leaved form of *Corylus avellana* is propagated under mist and used frequently as a park plant.

At all these institutions, I was offered seeds, cuttings and plants, and literature on Soviet horticulture. This was true of all the locations that I visited. But the visitor should be cautioned that it is rather difficult to get living plant material out of the USSR in good condition because of the delays encountered due to "red tape." I was particularly fortunate in that my shipments were of an official nature and could be sent by diplomatic pouch. Otherwise, I fear they too would have been delayed to a disastrous degree.

I also visited the wonderful Nikitsky Botanic Garden, Yalta, and several fine institutions in and around Leningrad, but perhaps the remaining space should be devoted to Siberia.

Siberia is a 4,800,000 square mile region with broad horizontal vegetational belts (exclusive of the Far East) consisting of the tundra to

the north, a vast middle region of taiga (the swampy conifer-birch forests occupying 1,900,000 square miles and covering the greater part of Siberia), and the steppe that extends along the southern border into Central Asia. The area is traversed from south to north by three great, but meandering, rivers – the Ob, the Yenesy, and the Lena. Because of the somewhat restricted mountain ranges, Siberia has a floristic pattern in which latitudinal influences are far greater than altitudinal ones. Most areas of Siberia are "closed" to some degree although cities like Irkutsk, Novosibirsk, and others along the trans-Siberian railway are being opened to foreigners. It is still difficult for the average person to wander far from the arranged itinerary.

My journey to Siberia took me to Academgorodok, the Soviet "think tank" near Novosibirsk; a small agricultural station at Tulun, some 300 miles from Irkutsk; Barnaul, a city in the Altai with an excellent Mountain Fruit and Ornamental Station; and Yakutsk, the major city of the Siberian plateau from which I traveled to a small Yakuti settlement to collect native trees and shrubs. The purpose was to collect as many samples of trees, shrubs, and ornamental plants as possible for evaluation in the United States.

Siberia, in general, is not the exciting collecting ground I have experienced elsewhere – for example, Japan and Taiwan – but there were a sufficient number of surprises for me to make the journey well worthwhile.

At the small experiment station near Tulun, in a region of dark, heavy soils, the wooded areas in some places are largely mixtures of pine and larch. The forest floor is hummocked with sphagnum mounds and in this bog-like condition vacciniums, spireas, alders, and small birches flourish. To my surprise a rhododendron also occurs in considerable quantity. This is *Rhododendron ledebourii* Pjorak, a close relative of *R. dauricum*, from which it differs by its more evergreen habit in winter. I gathered plants and cuttings of this species and these should soon be available for distribution. This park-like locality is also the home of *Lilium martagon* and some excellent forms of the white birch, *Betula pendula*, which the Soviet botanists have divided into several geographic forms – the one where I collected being *B. verrucosa*.

Two institutions of the Siberian meadow steppe region are particularly important centers of research on native Siberian plants. At Novosibirsk the old garden has been moved to a new 1500 hectare site at Academgorodoc. The garden is organized into a series of separate sections, one in which native plants have been assembled on a taxonomic basis, a medicinal plant garden of excellent quality, a garden of forage and pasture grass species, a fruit tree garden, a collection of trees and shrubs on a very informal park-like arrangement, and a large collection of ornamentals – particularly bulbs, ground covers, and cut-flower species. *Phlox paniculata* hybrids from their own breeding programs are displayed in large beds. Over 100 species of perennials have been selected as winterhardy for use in Siberian gardens. Even the small annual grass, *Hordeum jubatum*, is cultivated as a border plant.

The Altai Fruit and Decorative Plant Station

Betula verrucosa **forms a graceful weeping tree in the taiga parks of Siberia.**

is located in the foothills of the Altai Mountain near Barnaul. It features trees, shrubs and herbaceous plants of both Siberia and adjacent China. The garden includes 1500 species on a plot of about 10 hectares. Here I collected a new form of *Salix ledebouriana*, called 'Kuraika', an excellent pendulous hedge plant with grey foliage. It is both cold and drought resistant. Among the many herbaceous plants that grow well in this severely dry, cold climate are *Allium, Astilbe, Campanula, Gentiana, Paeonia, Trollius*, and several species of *Lilium*. The shrubby species include *Corylus, Malus, Sambucus, Syringa, Spirea*, and *Philadelphus*. It was here that I collected *Rhododendron adamsii*, a dwarf compart species with white to pink flowers, several species of *Actinidia*, the unusual large leaved plant, *Echinopanax elatum*, and *Microbiota decussata*, a curious juvenile-leaved conifer. Barnaul is, incidently, not open to tourists — probably because it is too close to the Chinese border.

Finally, the area of Siberia of which the city of Yakutsk is the hub of importance because of the fiercely cold winters (-70°F), the cool foggy summers, and the efforts by the Russians to grow ornamentals under these conditions. Even here, a small botanic garden is thriving. At this time it consists of only 10-12 hectares containing some 120 species in demonstration plots. About 30 native species are useful decorative plants. *Pinus sibirica, Larix sibirica, Betula verrucosa*, and several spruce species frequent the permafrost bogs. They do not grow tall because the ground is frozen solid from about three feet below the surface. But this solid base helps contain moisture during the growing season, and it is said that without the permafrost, Siberia would be a vast arctic desert.

I traveled by landrover some 200 miles into the taiga to a small Yakuti village where about 3500 people live and are employed much of their time hunting fur-bearing animals. Here *Potentilla fruticosa* grows rampantly through the meadows. Dwarf birch, juniper, several vacciniums, and loniceras are mixed in the sparce undergrowth of the larch-birch forests. One rose species, *Rosa acicularis*, is also common. All of these species were in fruit and I gathered seed from selected plants in forest and meadow sites. I was pleased to find that *Rosa rugosa* and *Cotoneaster lucida* are cultivated as hedge plants in this severe region and the types which have been selected for cultivation here might find special use in our cold, dry regions.

From Yakutsk I flew back to Moscow in late August, collected a number of cuttings in the Moscow institutions mentioned earlier, and received a large shipment of plants and cuttings of species I had marked earlier in Yalta, and then returned to the United States. A number of these collections are entirely new to us; others are local selections of previously known ornamentals. Of equal importance to the collections are the contacts firmly established with several botanical and horticultural centers for future exchanges of plants. ▲

In winter, the Central Siberian Botanic Garden, Novosibirsk, is deep in its blanket of snow. Fruit trees (apple and peach) are pegged to the ground and grow in a prostrate fashion to take advantage of the protection of the snow.

What's New In Pollination?

B. J. D. MEEUSE *

Part One

1. **HONEYGUIDES**. In a discussion of recent developments in floral ecology, poetic justice is served best by starting out with honeyguides. After all, it was the study of these "signposts for insects" (special color patches or patterns on the petals, indicating the hidden nectar of flowers) which gave the original impetus to Sprengel's work (1793), now rightly regarded as the beginning of modern anthecology. It is likely that Sprengel, who "humanized" pollinating insects more than a little, attributed to them a color sense very much like our own. The ability of honeybees and many other insects to see ultraviolet (UV) as a color was recognized only after Karl von Frisch's classical work (See von Frisch, 1967). Thanks mostly to the efforts of Daumer (1958), Kugler (1963, 1966) and Eisner (1969) we now know that the petals of many flowers which to us seem to be quite uniform in color, such as those of chicory, evening primrose and marsh marigold, show differences in UV-reflection between tip and base, so that a pattern arises to which insects pay heed. Usually, the center of the flower (i.e., the base of the petals) displays an enormous UV-absorption and thus a UV-reflection close to zero. Kugler believed that in at least 95% of the cases this was due to the presence of phenolic compounds, especially to those ill-defined ones known as "tannins" (the same compounds that give tea its astringent taste). Since tannins give a characteristic dark reaction with iron chloride, a simple way to demonstrate the presence of UV-honeyguides according to Kugler is to treat flower petals with this reagent (fig. 1A); after previous extraction of the petals with alcohol, in which tannins dissolve, the iron salt no longer produces the pattern (fig. 1B).

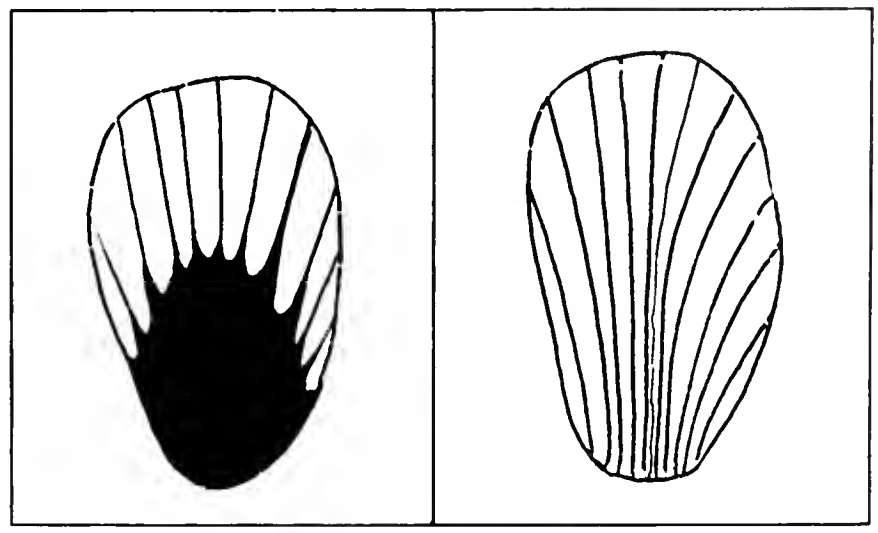


Figure 1A **Figure 1B**

Fig. 1. Ultraviolet reflection of the petals of marsh marigold (*Caltha palustris*) before and after extraction with alcohol.

Very recently, however (1972), W. R. Thompson and associates, working with flowers of black-eyed susan (*Rudbeckia hirta*) were able to provide the much more precise information that the UV-absorbing properties of the petal-bases are due to flavonole compounds. Yellow to us, but chemically related to that important class of red, blue or purple flower pigments known collectively as the anthocyanins, flavonoles obviously have played an important role in floral speciation, and in the co-evolution of flowers and UV-sensitive insects.

Daumer has brilliantly demonstrated that the behavior of honeybees is indeed guided by UV-honeyguides. After having detached the petals of *Helianthus rigidus*, he reconstituted the flowers, either in the natural way, with the UV-absorbing parts of the petals in the center, or with the petals turned around so that the UV-absorbing parts were peripheral (fig. 2). The petals were trimmed with scissors in such a way that to the human observer there was no appreciable difference between the two flower types. However, when honeybees which had been trained to find nourishment in the center of the natural model were given a choice

---

*B.J.D. Meeuse, Professor of Botany at the University of Washington, is author of *The Story of Pollination.* Ronald Press, 1961.

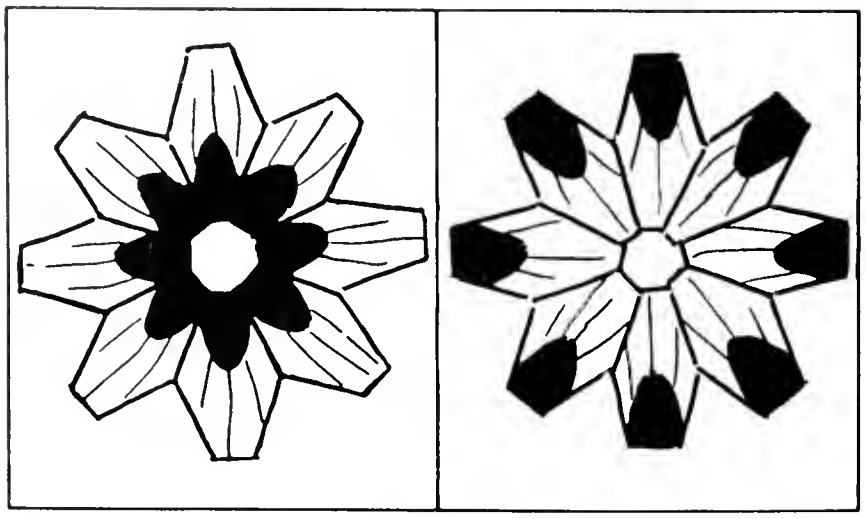


Fig. 2. Experimental "flowers" composed of real petals of *Helianthus rigidus* re-arranged around a hole. Left: UV-honeyguides in natural position, near center of flower. Right: UV-honeyguides near margin. To the human observer, incapable of discerning the UV-honeyguides, the two models appear to be identical. After Daumer.

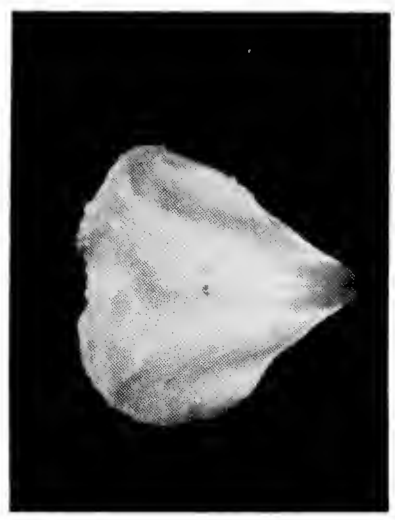


Figure 3

Figure 4

Fig. 3. Petal of evening primrose (*Oenothera biennis*), photographed in ordinary light. To human observers, petals of this plant are homogeneously yellow in color.

Fig. 4. Petal of evening primrose (*Oenothera biennis*), photographed in UV light. Base of petal strongly absorbs UV, creating honey guide effect (for insects).

between the type types, they showed a ten to one preference for the natural model in their visits. This preference disappeared when the models were covered with UV-absorbing light-filters. The flowers of *Coreopsis bicolor* do not reflect UV at all and are probably seen as yellow with a black heart by bees and humans alike. Training-experiments similar to those we just described for *Helianthus rigidus* can be done with honeybees and *Coreopsis*, and the results are essentially the same. Clearly then, the behavior of the bees is the same, whether the honeyguides to which they respond can be seen only by them, or by them and man both. In other experiments, Daumer has demonstrated that honeybees display a very characteristic, inborn reaction when they march from the periphery to the center of a natural flower or flower-model. Crossing the demarcation-line between the UV-reflecting and the UV-absorbing part of the petal (a line invisible to us!), they come to a sudden halt, thrust their head forward, and frequently stick out their proboscis at the same time; thus, they are quite ready to start feeding. Again, the same behavior is displayed in *Coreopsis bicolor*, where man, too, can see the demarcation-line. Obviously, then, bees react to UV-honeyguides and other honeyguides in exactly the same fashion.

In 1954, Miss Lex has shown that honeyguides which stand out visually in a flower may also possess an odor which is different from that of the rest of the flower. An example is the pink-flowered form of the common bindweed, *Convolvulus arvensis*, which has five white honeyguides resembling the spokes of a wheel. In the white-flowered variety, these spokes are of course invisible to us and probably also to insects, but it must be assumed that they can still guide insects by their smell. To the best of my knowledge, no further work has been done on this fascinating subject.

2. **UNUSUAL REWARDS FOR FLOWER-VISITORS.** Stefan Vogel has shown that there are at least 500 species of flowers in South America and South Africa (e.g., *Calceolaria*, some of the baby-blue-eyes (*Sisyrinchium*), the orchid (*Oncidium*) which offer visiting bees a thin oil instead of nectar; this oil is used for making a special sort of beebread for the insect larvae.

Fascinating feeding habits are displayed by at least 14 species of the butterfly genus *Heliconius*, found in Central and South America. These animals collect large pollen masses on the underside of their proboscis, mix them with a clear secretion from the proboscis tip (nectar?) and agitate them for a few hours. The amino-acids of the pollen, which include the energy-rich compound proline, go into solution with extreme rapidity and provide the butterflies with a food potent enough to permit the production of sex cells over an extended period; the females may live, and deposit eggs for six months.

Still mysterious is the habit of certain male Euglossine bees in Central and South America

to visit fragrant orchid flowers and to scrape the perfume off the surfaces of the petals in the form of minute particles which are then stored in the large cavities which they have in their posterior legs. Later on, the males congregate in open spots in the forest, e.g., on logs, and it is conceivable that the odor is then used to influence females sexually. However, if that is so, it is not clear why the females are not attracted by the primary producers of the smell, i.e., by the orchid flowers themselves in the first place! Sexual instincts, manifesting themselves in territorial behavior, are very definitely harnessed in the case of certain male *Centris* bees responsible for the pollination of the orchid *Oncidium planilabre* in Ecuador. It is well-known that in some species of *Oncidium* the flowers look very much like insects. The individual flowers in a spray are, moreover, attached by means of very slender stalks, so that the slightest breeze will cause them to dance. When this happens within the territory of a *Centris*-male, the bee will attack the orchid and strike it headlong; a pollinarium will be attached to the front of its head. If the breeze continues, the bee strikes flower after flower, and in these later attacks there is an excellent chance that a pollinarium will be forced into the stigma of the receiving orchid flower.

3. **UNUSUAL POLLINATORS**. Stoutamire (1968) and Thien (1970) have recently demonstrated that mosquitoes are very efficient pollinators of certain orchids such as *Habenaria* in northern bogs.

4. **BIOLOGICALLY ACTIVE COMPOUNDS IN ORCHID FRAGRANCES, AND THE PROBLEM OF ORCHID SPECIATION.** Orchids comprise more than ten percent of all species of flowering plants. This means that there are close to 30,000 orchid species. Generally speaking, any of these will be pollinated by only one, or a very few insect species; e.g., the Panamanian orchid (*Gongora tricolor*) is visited only by *Euglossa cyanura* males. In tropical America, the pollinators often are Euglossine bees: small to medium-sized insects, brilliantly metallic blue-green or golden and sparsely hairy. It has been demonstrated that fragrance is a main factor (probably *the* main factor) in attracting these bees to flowers; therefore, it should be possible to explain the pollinator-specificity of a given orchid species on the basis of the particular mixture of odor-compounds present in its flowers. With the aid of refined modern methods, Dodson and collaborators have so far analyzed the fragrances of 150 orchid species from 25 genera (largely euglossine-pollinated). Fifty chemical compounds have been implicated, of which sixteen have been identified with certainty and ten tentatively. Most species produce from seven to ten compounds, but some make as many as eighteen or as few as three. A very common compound in Central American orchid flowers is 1.8-cineole, which was present in sixty percent of the species sampled; it accounts for about ninety percent of the mixture of odor compounds in *Stanhopea cirrhata*. In field tests with blotter papers saturated with individual odor compounds or with mixtures, it was found that 1.8-cineole would, over a five day period, attract 433 male euglossine bees representing thirty-five species; methyl salicylate attracted 113 individuals belonging to six species. The most effective general attractant was 1.8-cineole, except in Western Mexico where eugenol was equally effective in general and more effective with particular kinds of bees. Nature achieves selectivity by *mixing* various odor compounds; a combination of two or more attractants often fails to draw species that would unerringly visit one of the attractants offered in pure form. In areas where numerous bee species are present, the differential production of odoriferious compounds by different orchid species may thus limit the number of bee species attracted. Once this has been achieved, differences in size and shape of the orchid flower, i.e., "mechanical isolation", may act as a second sieve, leading to complete pollinator-specificity. In principle, then, speciation in orchids can get a start by minor genetic changes which affect the synthesis of fragrance components. A mutation which would lead to production of additional odor components, or (conversely) would result in the failure to produce a component present in the original type, might conceivably be responsible for the creation of a "new" type of orchid flower attracting a different species of bee while

discriminating against the pollinator of the parental form. Thus, a new orchid population could develop that would not interbreed with the original stock. Ultimately, this might lead to the emergence of a new species even without the benefit of geographical isolation. A similar reasoning can, of course, be applied to those orchids that attract hawkmoths or flies by their smell.

In still another and completely different way, Euglossine bees are important to orchids and other plants. Especially in tropical America, the population densities of many plant species have been reduced to a very low level as the result of human activities, competition, and the action of herbivores and seed-eaters. Clearly, when only a few widely scattered individuals are left of a certain plant species, cross-pollination becomes a problem. From the point of view of species-survival, it is therefore gratifying that female Euglossine bees forage over long distances and visit the same plant individuals repeatedly along a "routine" feeding-route; even in a tropical rain forest, traveling at a rate of almost twenty km per hour, they may return to their nests from as far away as twenty-three kilometers, often with full pollen loads. Reliable outcrossing is thus made possible over distances far greater than one would expect if only such pollinating agents as the wind or small bees were taken into account. (Janzen, 1971).

5. **RECENT FINDINGS (DEVELOPMENTS) IN FIG POLLINATION.** Smell must also have played an important part in the original establishment of pollination relationships between figs (*Ficus*) and the tiny female wasps that use some of the flowers in their "syconia" (inflorescenes) as incubators, transforming them into galls. Pollen is not transported passively on the glossy and smooth outside of these wasps as was tacitly assumed in the past, but is actively collected and then transferred to special pockets at the underside of the female's abdomen or in the cephalothorax, from which it is later, mysteriously but conveniently, extruded again during the act of egg-laying (Ramirez, 1969; Galil & Snitzer-Pasternak, 1970; Galil & Eisikowitch, 1971). This puts the case of the figs in a class with that of yucca and yucca moth, heretofore always claimed to represent one of the most "improbable" pollination-situations. (The moths in question, *Tegeticula yuccasella* (Riley) on *Yucca filamentosa L.* (Riley, 1892) and *T. maculata* (Riley) on *Yucca whipplei Torr.* (Powell & Mackie, 1966) seem to display "foresight" when with their highly specialized mouthparts they transfer pollen balls to the stigmas of the flowers; the seeds which develop as the result of this "senseless" act will later serve as food for the larvae hatching from eggs deposited by the moth in the flower's ovary.)

6. **TIMING EVENTS IN FLOWERS.** In some species of flowers, opening and closing are controlled by environmental factors that may change at very short notice. For example, in crocuses, tulips, winter aconite and certain flax species, the temperature is decisive; a rise of only 0.2°C suffices to cause opening in crocuses. However, as indicated by some striking common names (4 o'clock plant; Jack-go-to-bed-at-noon), there are many flower species which open and close at a very specific hour of the day, regardless of the weather. Nectar production and pollen liberation may also be tied to special hours. The ecological and evolutionary significance of this situation can be understood immediately when one links it with the fabulous time-sense of bees and many other insects, a gift which makes it possible for these animals to visit the flowers exactly at the time which is the most beneficial for both plant and insect. Undoubtedly, the pronounced rhythmicity of clock-flowers is closely connected with their built-in "biological clocks." As illustrated by *Cestrum nocturnum*, the famous 'dama de noche' of Spanish-speaking countries, such flowers may even in the lab be very rigid in their behavior, refusing to respond to an imposed change in the external conditions. Normally, the *Cestrum*-flowers open and become very fragrant in the evening and close again in the daytime; the individual flowers remain active for at least a week. They stubbornly retain their periodicity even in constant darkness or constant light! However, in many instances it is possible to "set" the biological clock, e.g., by reversing day and night one can force buds of the queen-of-the-night cactus (*Cereus grandiflorus*) to open in the morning

instead of in the evening. In 1959, Arnold found a similar situation in certain evening primrose species where each flower lasts for one day only. The buds that opened on the first, as well as those that unfolded on the second day after the day/night reversal, stuck to their original time schedule and would still open at 6 p.m. Only those that opened on the third day after the switch (or later) followed the new regime and opened at 6 a.m. This shows that in evening primrose a flower-bud may be sluggish in resetting its biological clock, or perhaps more correctly: its course of action has been set irrevocably two days before actual opening.

In our Seattle laboratory, working with certain arum lilies such as *Arum* and *Sauromatum* (the voodoo lily), we have gained some more insight in the timing-processes of flowers whose opening is controlled by the light/dark regime. The behavior of the inflorescences of these aroids in nature is clearly synchronized: the striking heat-development in the so-called appendix, during and after the unfolding, always reaches a sharp peak late in the afternoon in *Arum*, and around noon in *Sauromatum*. In stark contrast, the opening of inflorescences kept in constant light is non-synchronized (and also retarded). Constant darkness prevents opening altogether. Reversal of day and night leads to normal synchronized flowering and heat-development. But the peaks are shifted 12 hours. Clearly, a certain alteration of light and dark periods are essential. However, it is also essential that a certain minimum dark requirement be fulfilled. This can be shown (e.g.) by keeping developing *Sauromatum*-inflorescences in constant light until ripe for flowering and then giving them a single dark period of *at least* six hours; the peak in heat-production by the appendix is reached forty-two hours after the beginning of this "dark-shot". The important conclusion to be drawn from these experiments is that there is a striking parallel between the processes determining the opening of certain flowers (or inflorescences) and those responsible for the induction of flower-buds in short-day plants. For example, in cocklebur, a typical short-day (or long-night!) plant, a critical dark period of eight and one-half hours must be exceeded for flowering to occur six to fourteen days later. Very similar experiments can be done with four o'clock plants; the moment of their flower-opening is determined by the moment of nightfall, so that only near the equator will they always open at 4 o'clock. Moreover, in this case, too, the nightly dark period must exceed a certain length.

(To be continued.)

A silken curtain veils the skies,
And half conceals from pensive eyes
The bronzing tokens of the fall;
A calmness broods upon the hills,
And summer's parting dream distils
A charm of silence over all.

Tertius and Henry Van Dyke

ARBORETUM REPORT

JULY 1971 - JUNE 1972

BRIAN O. MULLIGAN

I. **Improvements and Maintenance**

Under the former heading should be noted the work done by several students from the Department of Landscape Architecture at the University at the lower (west) end of Woodland Garden around the pool. Unneeded shrubs were removed and more rocks brought in and placed, to the general improvement of the site.

In the rather swampy area below and north of E. Foster's Island road, in the grove of native alders, we constructed a trail leading around the head of the lagoon or water channel to the west bank. This included building a bridge over the small creek. The material used for the trail was the chips derived from cutting up the brush accumulated during the winter. The trail makes it possible to traverse this area even during the winter months with reasonable comfort and ease.

The final section of the old nursery fence north of Woodland Garden was replaced with new posts and barbed wire. Additionally, a long strip of the grass walk in the center of Azalea Way was cultivated at the end of March; sand, lime and fertilizer were added; and grass was sown early in April. Additional seeding was necessary in May, but we hope that we shall in due course have a better grass cover here than previously. Other sections will have to be done by degrees where the grass has worn away.

Spraying grograms have been continued against the most important pests: on elms, oaks, junipers, spruces in mid March; the white pines in May for an infestation of a web worm (a new problem); and for control of broad

Grove of native red alders (*Alnus rubra*) near lagoon at N. end of Arboretum, just after construction of new path through them. Photo by: B. O. Mulligan

leaved weeds and blackberries in summer. We now have to borrow a qualified spray operator from the University grounds crew for this purpose, since both our own men were transferred there in July, 1971.

Casoron was applied both in fall (200 lbs.) and again this spring (100 lbs.) for control of horsetail (*Equisetum* spp.) and quack grass (*Agropyron repens*) along Azalea Way and elsewhere.

Nearly half a ton of fertilizer was spread in February in areas on both sides of Arboretum Drive E., from the magnolias to Madison Street.

Young trees on both sides of the Boulevard and along the east fence area were pruned during the winter. A number of inferior types of lilacs were removed from the collection, and this spring we have eliminated plants killed by cold last winter (some *Ceanothus, Eucalyptus* and evergreen azaleas, *Nandina* in the Japanese garden, certain Mexican pines including most plants of *P. patula*). Others less severely damaged were cut back as necessary (some evergreen *Berberis*, the Chinese *Ilex cornuta*, some Pyracantha species, other *Eucalyptus* species).

II. New Plantings

No planting was done between 11/22 and 12/20/71 and between 1/24 and 2/10/72, owing to weather conditions or lifting plants for other places. No large groups were planted; the plantings consisted chiefly in the filling of vacant places. The following areas were improved:

Azalea Way

Heathers on the east bank between Woodland Garden and Loderi Valley (46 plants of three kinds). Various azaleas, both evergreen and deciduous, in November, chiefly filling gaps in beds between the picnic tables and Woodland Garden (48 plants of 26 kinds).

Woodland Garden

Three more Japanese maples (named clones of 1966 Searles gift, planted at east end in front of a group of sourwoods (*Oxydendrum*).

Sorbus collection

Four more species and one hybrid added, the latter ('Wilfrid Fox') imported from England in 1966. Also here, at north end of area, two plants of a Chinese spruce, (*Picea likiangensis*), with others of the same genus.

Area around lagoon, and below E. Foster's Island Road

Alders (Alnus): five species, 11 plants. Seeds from Korea, Japan, etc.

Willows (Salix): five species of hybrids, 6 plants. From Belgium, Czechoslovakia, Wisconsin, etc.

Elders (Sambucus): four species, 5 plants. Seeds from Korea, Poland, etc.

Ailanthus: 3 plants on W. side of lagoon below bridge.

Rhododendrons: (in spring, N.W. of picnic tables here; 9 plants added to existing group.

Viburnum: three forms of *V. plicatum*, one plant of each; two of *V. sargentii*, type from Japan and 'Susquehanna' from U.S. Nat. Arb.

South of Lookout

Along service road: New bed of specimen hollies (7 plants), including *Ilex aquifolium* 8-10 feet tall, and five selected camellias, among them 'Citation', 'San Jacinto' and 'Silver Anniversary'.

Ash collection (Fraxinus)

In meadow W. of Azalea Way, in March, five species, 6 plants, from various sources; 1 from Japan.

Rhododendron Glen

Collection of rhododendrons and other Ericaceae plants from the estate of late Mrs. S. Anderson, 13 plants. Others remain in lath house.

Japanese Garden

Chiefly to replace winter losses. Azaleas, 14; other shrubs including *Viburnum Davidii, Pittosporum tobira* and bamboos; 9 plants in all.

Summary of plants — 1971-72:

Trees:	*Total:*
86, of 66 kinds	569, of 271 kinds
Conifers:	This compares with:
19, of 14 kinds	In 1970-71: 617 plants
Shrubs and vines:	1969-70: 658 plants
464, 191 kinds	

III. Acquisitions

A. Plant Material

1. Seeds*

184 packets received up to 6/1/72 (in previous year 333 packets). Donors included: Christchurch Botanic Garden, New Zealand; Botanic Garden, Canberra, Australia; Tohoku University Botanic Garden, Japan; Botanic Garden, Izmir, Turkey; University of Grenoble, France (15 species collected in Nepal); Arboretum at Horsholm, Denmark (seeds collected in Rocky Mountains, in Colorado and Utah); Arboretum Belmonte, Wageningen, Holland (5 species of *Acer*); Principal Botanic Garden, Moscow; Morton Arboretum, Lisle, Ill.; Arboretum of University of California at Davis; U. S. Forest Service, Bishop, Calif. (*Pinus* species); Mrs. T. O'Brube, Seattle, seeds collected in New Zealand.

2. Plants and Scions

142 lots received in same period (355 in 1970-71). Imported material included a small collection of rare species from Hillier & Sons, Winchester, England; three new magnolias from Treseder Nursery, Cornwall, England; and nine uncommon items from the Royal Botanic Garden, Edinburgh, Scotland.

Two collections of rhododendrons were aquired; one from the estate of the late Mrs. Stephen Anderson, formerly of Bellevue, Wash., (16 kinds, plus 13 other plants of the *Ericaceae* family). The other, purchased from the former L. E. Brandt nursery near Tacoma, Washington, (12 plants, chiefly hybrids). We continue to receive young plants from both the U.S.D.A. Plant Introduction Station at Glenn Dale, Md., and the U. S. National Arboretum at Washington, D. C., but in smaller numbers than formerly. From the latter we received in March plants of the true Spanish fir (*Abies pinsapo*) raised from Spanish seeds, two dwarf forms of Japanese box and three new hybrid magnolias raised at the Arboretum. Numerous other single or small lots of plants came to us from many sources, for all of which we are grateful since they add to the range of our plant collections and also give us opportunity to test novelties, e.g., the new hybrid shrub *Sycoparrotia*, from the Botanic Garden at Grueningen, Switzerland.

*Note: Total of seeds and plants received 1971-72 slightly less than total number of seeds received 1970-71.

B. Library

Thirty-two new titles have been added during this year, compared with 44 and 68 in the previous two years respectively. Among them must be mentioned *Wild Flowers of the World*, by Dr. Brian D. Morley and Mrs. B. Everard (Putnam's, N. Y., 1970); *Handbuch der Nadelgeholze*, by Gerd Krussmann, published in 18 parts by Parety, Berlin (1970); *Moss Flora of the Pacific Northwest*, by Hattori Botanical Laboratory, by Elva Lawson (Japan, 1971); *Wild Flowers of the United States*, vol. 5 by H. W. Rickett, New York Botanic Garden (McGraw Hill Co., 1971), a gift from the Isaacson Corp., Seattle; *Flora of New Zealand*, vol. 11, by L. B. Moore and E. Edgar (Wellington, N.Z., 1970); *The Endemic Flora of Tasmania*, pt. 111, by Prof. W. Curtis and M. Stones (Ariel Press, London, England, 1971); *Insect Pests of Ornamental Trees and Shrubs of the U. of W. Arboretum*, by Sharon J. Collman (Master's thesis, Seattle, 1971), and *Pinetum Woburnese*, Catalogue of Coniferous Plants . . . at Woburn Abbey (London, 1839). Gift of the Bloedel Foundation.

As is our practice, the more valuable books are being stored in the Rare Books Department of the University library and only those retained here which we are likely to use frequently.

C. Gifts and Donations

(7/1/71-6/1/72)

This has been an exceptional year for gifts to the Arboretum from many groups and individuals, undoubtedly due to our well publicized budget problems. The total amount received for maintenance alone

in eleven months has been $13,835. Of this, the Unit Council contributed $10,398, $6,422 for manpower, $1,200 for hiring a dump truck for nine months and $1,530 for mounting descriptive signs on Waterfront Trail. Seattle Garden Club has recently given us $3,600 for two men on Azalea Way this summer, which will certainly be of real assistance to that area. The Friends of the Arboretum contributed a new 60-inch Jacobsen power mower at a cost of nearly $2,300. The following Arboretum Units, clubs or individuals gave us $100 or more for maintenance during this period: Units #4, 8, 21, 22, 32, 33, 45; West Seattle Garden Club; Miss Annie McFee and Mrs. R. D. Pinkham.

The Foundation funded a new heating unit in a storeroom at a cost of $585. Many other checks were received without specific designations as to their use; these totalled $3,907. Major contributors here were Units #1, 17, 18, 19, 39, 48, 61; Mrs. W. Wyckoff, Mrs. A. R. Kruckeberg, Mrs. C. Lawrence, Mrs. Warren Dewar, the Joshua Green Foundation, and Lake Forest Garden Club.

Gifts for the library totalled $811.00, from three Arboretum Units (#8, 41 and 6) and two private donors. Part of the substantial contribution ($350.00) from Unit #36 (Helen Janeck) to celebrate its 25th anniversary was used to purchase an original botanical drawing by the Belgian artist Raphael Ghislain. With a donation from Dr. and Mrs. T. L. Marks, we acquired a copy of *The Moss Flora of the Pacific Northwest*, by Elva Lawton (1971), the definitive work on this subject; this was given as a memorial to the late Mrs. A. S. Young.

For memorials we received $611.00 during the year from some 36 donors.

IV. Plant Material Distributed

In order to reduce the number of plants in the Arboretum nursery, a special effort was made to find appropriate places outside the Arboretum where they might legitimately be utilized. As a result we were able in November to dig 30 plants (of 26 kinds) for the Ferndale School District's "Vista Tree Library", in Whatcom Co., Washington for which they were most grateful. In the same month we assembled a further 84 plants (of 36 kinds) for the grounds at the State's Echo Glen school near Preston, Washington, to which we have been supplying young trees both for experimental as well as ornamental purposes since the spring of 1967. Maples, mountain ashes, lindens and spruces were well represented. Mr. Witt inspected and reported on the plantings June 2, 1972: "Despite the very severe winter, the majority of the trees planted before 1971 were in good condition . . . Conifers seem to thrive there, and most pines, spruces, false cypresses, etc., were in strong growth." The rainfall in 1971 exceeded 95 ins. Frosts occur earlier and later than in Seattle, and snow falls more frequently, so that we should in due course learn more about the hardiness of these species.

Dr. R. L. Ticknor, Director of the North Willamette Experiment Station, Aurora, Ore., selected a small number (18) from our nursery lists, to add to the very extensive collection of street or ornamental trees which are grown there. These he collected in December; they included six kinds of oaks.

A considerable number of plants of all kinds, probably 200-250, also went to the University of Washington campus or nursery, although some which were marked for removal still remain here. A collection of 65 camellias was also moved in the spring from our lath house to a new site adjacent to Bloedel Hall on the campus.

Approximately twenty-eight other lots of plant material were sent out on request during last fall or this spring; to the University of California at Davis (scions of Japanese cherries), the Morris Arboretum at Philadelphia; the U. S. National Arboretum at Washington, D. C.; the Morton Arboretum, Lisle, Ill.; the University of British Columbia at Vancouver, B. C.; and North Dakota State University at Fargo, all miscellaneous surplus young plants.

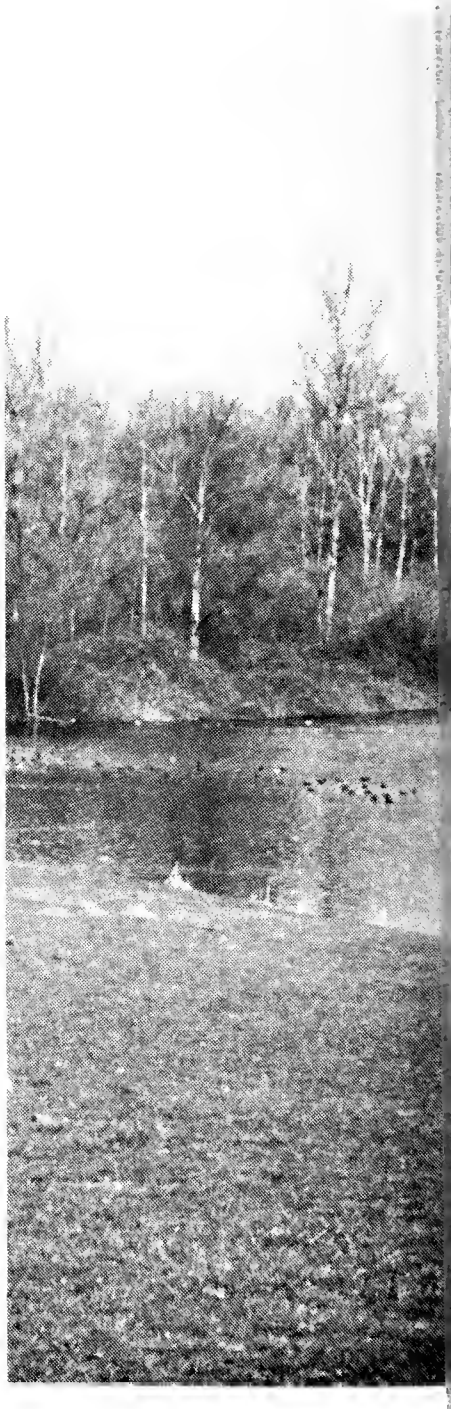
Since January 1, 1972, thirteen lots of scions for propagation have been sent out, chiefly to other institutions and correspondents in the U.S.A., but three went to Europe. In

(Continued on p. 18)

Prunus incisa (r.), *P. subhirtella* **'Pendula'** (c.) and *P. Sargentii* (rear, l).
in full bloom in Arboretum.

Trunks of *Paulownia, Salix* sp. and *Alnus rubra* beside
lagoon north of Arboretum entrance.

View N. across lagoon at N

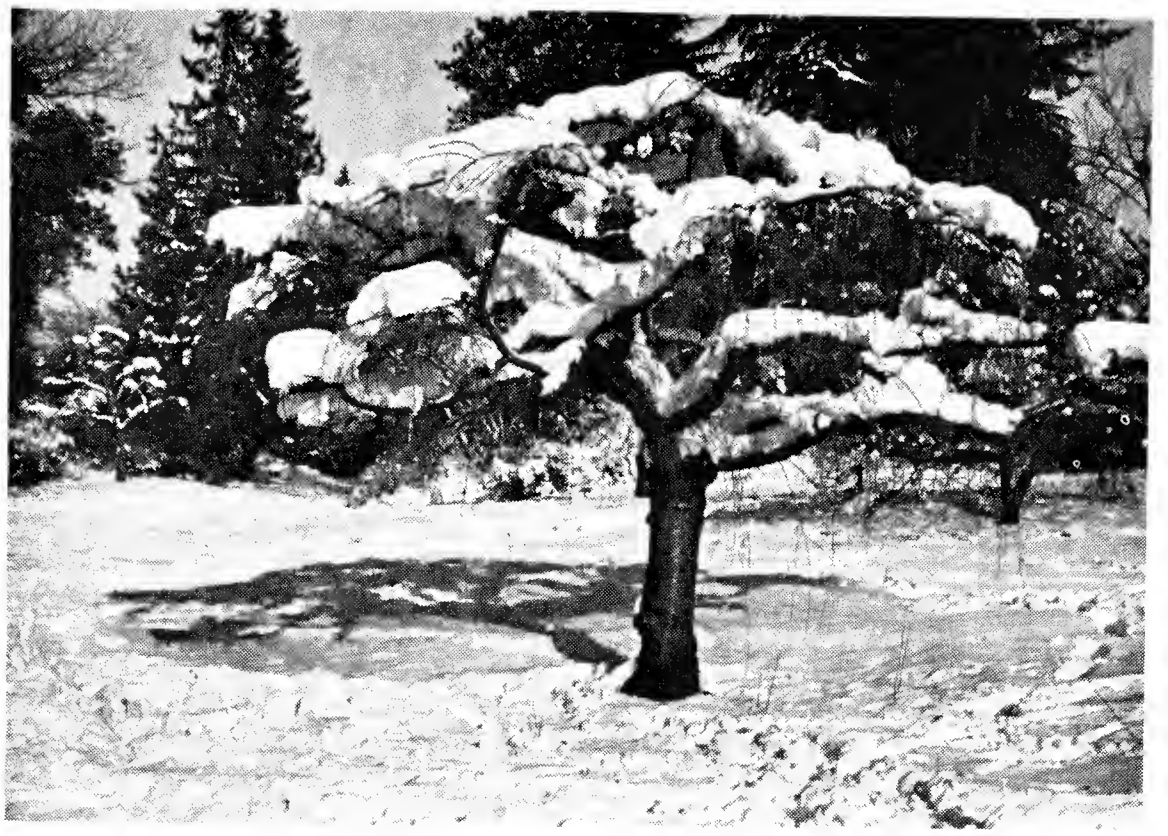


Photos by:
B. O. Mulligan

boretum

gnettes

'972 -



Prunus subhirtella **'Pendula' on Azalea Way after heavy snowfall.**

of Arboretum from parking area off E. Foster's Island Road.

March, the Morton Arboretum requested cuttings of a large number of junipers; we were able to send 11 species and five cultivars.

The annual international seed exchange list was reduced in size this past season, multilithed instead of printed, and sent out to fewer institutions, in order to lessen the amount of work involved as well as the cost both in materials and labor. At the end of May this year, we had assembled and mailed 1705 packets to 130 botanical gardens or arboreta throughout the world. This compares with 2,850 to 182 places in 1971, and 3,244 to 214 institutions in 1970—quite a considerable reduction in both categories. Again we are greatly indebted to the loyal and reliable team of workers from Unit #25 which performs this important work for us each year over a period of several months. Without such help it could not be accomplished.

V. Educational Affairs, Community Services and Visitors

Because of the uncertain staff situation created by the cut in the budget, certain public service programs were cut rather severely during the past year. No lectures or tours were scheduled after June 30, 1971, except for out-of-area groups or those making arrangements prior to that date. As a result, only 13 tours were conducted (31 in 1971; 20, 1970) and 12 talks or lectures (19 in 1971; 19, 1970).

Extension classes were scheduled for Saturdays, leaving workdays free for other activities. As in the past years, the College of Forest Resources managed them. The following were taught by Arboretum personnel:

Arboretum in Depth; Fall tours: Mr. Witt, 6 hours (29 students)

Winter Propagation: Mr. van Klaveren, 6 hours (26 students)

Grafting Ornamentals: Mr. van Klaveren, 12 hours (17 students)

Arboretum in Depth Spring tours: Mr. Witt, 8 hours (35 students)

Summer Propagation: Mr. van Klaveren, 12 hours (15 students)

Additional classes included:

Bonsai, beginning and intermediate (Mrs. H. Raphael, 46 students). Fall and Spring Weed Identification and Control (Chico Narro, 10 students). Spring Birds of the Arboretum (Mrs. Zella Schultz, 43 students). Fall and Spring Garden Nutrition (Dr. S. P. Gessel, 41 students). Winter Nature Photography (Donald Riecks, 11 students). Spring Pruning (E. Narro, 38 students).

The staff also were called upon to give lectures and demonstrations to various University classes. Mr. Witt lectured to classes in Forest Resources (on dendrology), Geography (plant geography), and Landscape Architecture (horticulture), while Mr. van Klaveren gave propagation demonstrations to dendrology classes from the College of Forest Resources.

Articles written by the staff during the year include: "Maples in the Northwestern U.S.A.," by the Director for the *Year Book, 1970*, of the International Dendrology Society; "Remarkable and Reliable Pieris" and "The Madrona — Pride of the Pacific" by J. A. Witt for *Plants and Gardens* (Summer, 1971), published by the Brooklyn Botanic Garden. Mr. Witt also reviewed *Wild Flowers of the United States, Vol. 5, The Northwestern States* in *Pacific Search* (April, 1972), and continued his regular monthly articles "Plant of the Month" in the publication of the Washington State Nurserymen's Association *Balls and Burlap*.

Members of the staff have served on various committees. Mr. Mulligan was a member of the University of Washington Landscape committee and of the Allied Arts of Seattle Street Tree committee. Mr. Witt is President of the American Association of Botanical Gardens and Arboreta for 1971-72, a member of the Horticultural Advisory committee for Operation Triangle in Seattle, and of the Ornamental Horticulture Advisory committee for Edmonds Community College.

Members of the staff also attended several important meetings during the year. Mr. Witt went to Chicago in September for the annual meeting of the American Association of Botanical Gardens and Arboreta and was duly elected President for the ensuing year. In May 1972, he represented this Arboretum at the centenary celebrations of the Arnold Arboretum at Boston, Mass., and in mid June attended a Regional Workshop at Portland, Ore., on the

Effect of Air Pollution on Plants. Mr. van Klaveren travelled to Santa Barbara, Calif. in October for the meeting of the Western Chapter, International Plant Propagators' Society.

Requests for research material included seeds of a number of *Vaccinium* species for Texas, of our native *Acer macrophyllum* for the Institute of Tree Biology at the University of Edinburgh, Scotland, and male flowers of 31 species of certain conifers, in 11 genera, for work at the Department of Botany, Washington State University, Pullman, Washington. The value of our plant collections is beginning to be appreciated elsewhere.

The Arboretum entered some 15 trusses in the Seattle Rhododendron Society's Early Competition and was awarded the Josephine Nelson Trophy for the best *Fortunei* series hybrid, *R.* 'Avalanche'. In May a small exhibit primarily of foliage plants was set up for the Society's annual show at Bellevue.

The number of telephone inquiries for information remains very constant. In the year ending May 31, 1972, we answered 3,433; in the previous year it was 3,460, and in 1969-70, 3,229. The peak months are usually April-June, and again in September, when calls will average well over 300 per month.

The number of visitors to the Japanese garden in the year ending May 31, 1972, rose to 81,979. For the previous year it was 75,412, and in 1969-70, 61,726. This speaks well for its continuing popularity.

On October 15, 1971, a party of about thirty members of the International Dendrology Society from some eight countries visited the Arboretum, at the start of a tour which took them through western Oregon and California. The Arboretum Foundation kindly hosted them at a luncheon.

In May 1972, we had the pleasure of receiving Mrs. M. Hilton, Dr. T. S. Elias and Mr.

View N. over lagoon W. of E. Foster's Island Road. Native alsder, maple and ash trees visible. *Liquidambar orientalis* **on ridge in distance.** Photo by: B. O. Mulligan

D. Brown from the New York Botanical Garden, here to show films on their successful training program for youths and their children's gardens.

VI. Staff Position and Problems

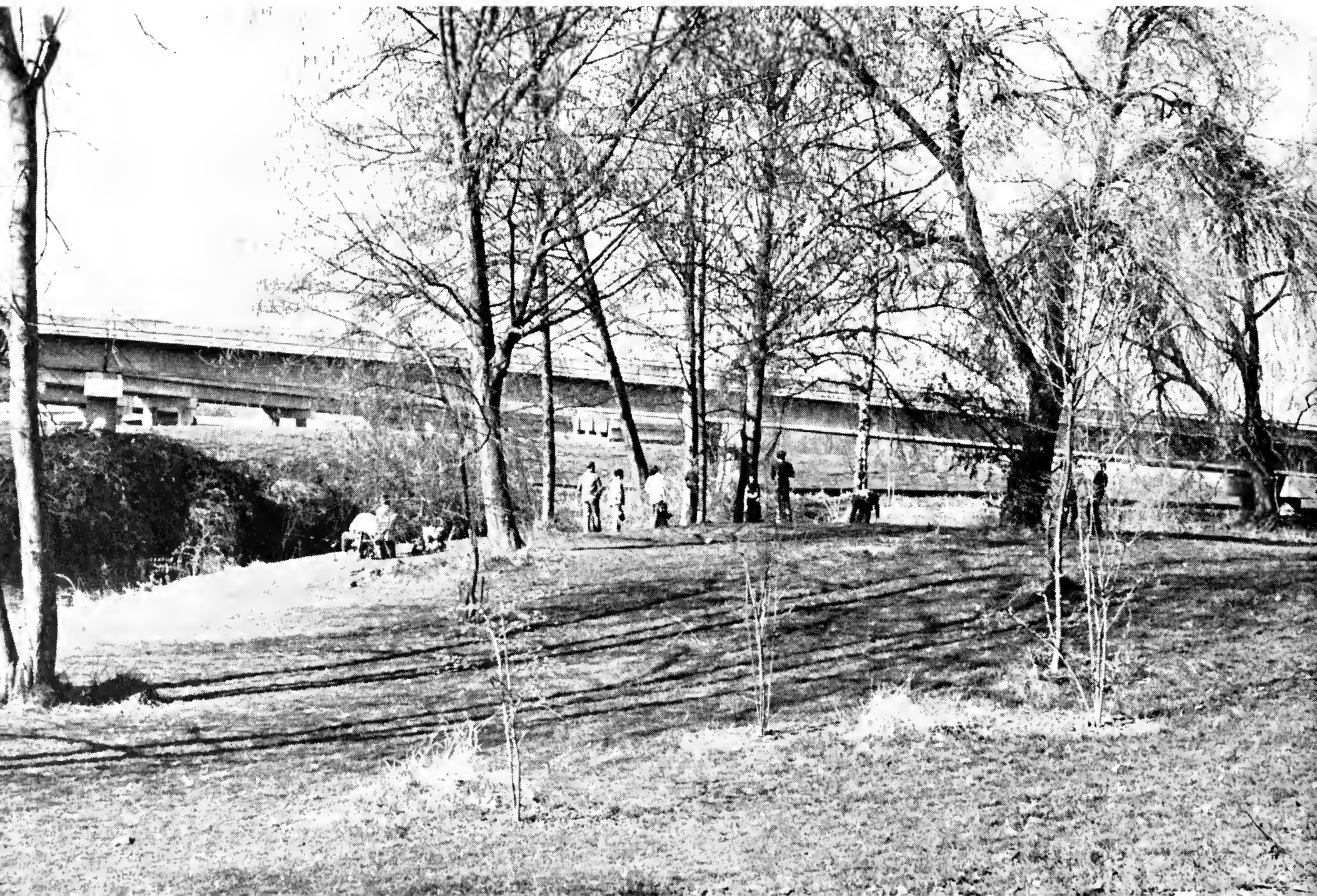
In June 1971, we had a staff of 16 full-time persons on the University payroll of $11,104.00, plus the Japanese gardener and janitor on a part time rate ($710.00 for both in June). (On an annual basis, $136,591.00.)

On the same budget in May 1972, we have seven full time employees, with a payroll of $5,500, plus the Japanese gardener and janitor ($650.00). (On an annual basis, $64,822.00.) This is a cut of 48% in the budget compared with a year ago.

Out of the eight men lost to us in 1971, three went to the University grounds crew in July and one in November, one man was terminated in August (our invaluable botanical recorder/guide) and three more were laid off in October-November.

A generous grant of over $4,000.00 by the Unit Council in September allowed us to maintain a gardener and equipment operator until the end of the year. Three of our lost men were fortunately rehired under the Federal EEA program in November and December, so that the situation at the end of the year was not as bad as we had feared. Additional funds from the same source enabled us to re-employ our botanical recorder in January and, in February, to hire a gardener and three groundsmen, all new to the Arboretum. We expect them to be with us until August 15, 1972, unless the program is extended. In March, a further grant of $2,341.00 from the Unit Council enabled us to hire another groundsman for spring and summer work (until 7/31/72). In May, the Seattle Garden Club also agreed to fund two groundsmen for three months on Azalea Way, in the amount of $3,600.00, so that as a result of the EEA program and these gifts, we now have more temporary help than usual at this season. This should result in a very definite improvement in the appearance of many areas of the Arboretum.

Students and fishermen in area near lagoon at N. end of Arboretum, among alders and willows. Newly planted Viburnum spp. in foreground. Photo by: B. O. Mulligan



The present permanent staff consists of the Director (until 6/30/72), Assistant Director and secretary in the office; propagator in the greenhouses; foreman and three men in the Arboretum (one of these in the Japanese garden only, for eight months); and the janitor, part time. If we lose our EEA employees in mid August the burden of work falling on this small staff will be intolerable, and the Arboretum obviously will suffer very severely in all departments.

VII. Weather and Effects

The summer of 1971 was notable for the amount of warm and sunny weather experienced from mid July until the end of August. In 51 days from July 11 through August 30, there were only two days when the temperature did not reach 70°F. In July, we had twelve days with from 80°F. – 92°F. and total sunshine was 296 hours. August was even warmer, with 15 days from 80°F. – 95°F., and a sunshine record of 337 hours at the Seattle-Tacoma Airport. The effect of this was undoubtedly shown in the profuse flowering of some of our plant groups this spring, such as the Japanese cherries, the crab apples and azaleas, which have never been better.

Winter began to show its teeth at the end of December. On Christmas Day the *maximum* temperature was only 37°F. and for the next four days it did not rise above 38°F., with a minimum of 21°F. on the 27th and 29th. Fortunately, the strong north wind changed to east and lessened in vigor or we would have suffered much more damage to broad leaved evergreen plants. This cold weather continued into January, and towards the end of the month produced the heaviest snowfall here since probably January 1950, reaching a depth of 11 inches at the airport. On January 27 and 28, we registered *minimum* temperatures of 8° and 9°F. respectively; they varied between 16° and 23°F. for the next eight days. The depth of snow protected our smaller evergreen plants, or those that were held down by its weight, including the *Cistus*. Larger shrubs such as camellias, rhododendrons and hollies suffered in varying degrees according to their hardiness, but comparatively few of these have been killed or seriously damaged. Burned foliage or killed or injured flower buds was more common, e.g., *Magnolia Campbellii*. Other genera which suffered severly have already been mentioned. A more detailed list will be published later in the *Arboretum Bulletin.*

The rainfall in the three months, February through April, amounted to 17.56 inches, 6.43 inches above the normal. No wonder we had problems with planting operations at that time, especially following the heavy January snowfall.

VIII. FINALE

In conclusion, since this will be my last report as Director of the Arboretum, I want to express how much we owe to so many people who either work in it or for it or actively support it in a great variety of ways.

First of course, the entire staff which is responsible for all the work accomplished through the year – in the office, the greenhouses and lath houses, the Arboretum itself. To keep 200 acres of land in reasonably good order and care for some 5,000 kinds of plants with such a small crew is no easy taks, as everyone who works there must realize. It may be invidious to mention names, but my secretary, Mrs. Betty Wittenberg, Assistant Director J. A. Witt, the foreman for the past nine years, Richard Hart, and our propagator, Richard van Klaveren, certainly deserve the greatest credit for keeping the machine operating smoothly in all its parts.

Next I must thank Dean J. S. Bethel, Associate Dean S. P. Gessel, Dr. David Thomas and the other faculty and staff members in the College of Forest Resources who have enabled us to keep the Arboretum operating under very trying circumstances, as well as providing a place where problems can be taken for solution or more difficult questions answered. The Physical Plant Department on the campus has been another source of positive help in trouble, for maintenance of buildings, repair of equipment, the proper functioning of the watering system in the Japanese garden, and other similar matters.

Then there are all our very numerous good friends outside the University area: the Arboretum Foundation and its Unit Council,

(Continued on p. 27)

HORTICULTURE IS . . .

HELEN MOODIE *

Horticulture is – biological survival, scientific research, urban development and human aesthetics." This was the theme of the Twenty Seventh Congress of the American Horticultural Society held in Seattle, September 6-10, 1972. Held in conjunction with meetings of The American Association of Botanical Gardens and Arboreta and the Garden Writers Association of America, it brought to Seattle a knowledgeable group of directors, educators, writers, researchers and plantsmen as well as amateur horticulturists.

The Arboretum's Joe Witt was an active participant in the Congress. Besides presenting a pre-Congress AABGA slide lecture on Northwest Natives, as President of that organization he presided over its annual dinner Thursday, September 7. Mr. Witt, Brian Mulligan and the Arboretum staff hosted a two-hour tour of the Arboretum followed by a luncheon given by the Arboretum Foundation Unit Council at the Museum of History and Industry. During lunch, Elizabeth Moses, Chairman of Unit Council, gave the Arboreta directors a clear picture of the quantity and scope of the volunteer work performed by our members.

At the opening luncheon of the American Horticultural Society, Wednesday, September 6, one of the first items of business concerned the Arboretum. We were told that the board of the AHS had proposed a recommendation to Gov. Evans and the Washington State Legislature to support the University and the Arboretum. It was gratifying to feel the goodwill of people toward us. After a welcome from Gov. Evans, Dr. David Leach, president of AHS led the plenary session. In the year ahead, top priority will be given to strengthening the national youth organization. Additionally, grants have been given to environmental education programs and for developing a listing of plants able to endure pollution.

Dr. Henry T. Skinner, Director of the U.S. National Arboretum, opened the Pacific Northwest Horticultural Exhibit at the Pacific Science Center. He spoke of northwest botanical exploration and explained the climatic and soil conditions which permitted us to grow such a wealth of material. The exhibit, which had representation from 165 families and 1,000 genera, showed the great amount of time and effort which had gone into its organization.

The keynote speaker for dinner Wednesday evening was Dr. Rene Dubos, Professor Emeritus of Rockefeller University. Speaking on "Man Made Ecosystems" he reflected a feeling of optimism. Man's manipulation of nature, he said, on the whole is a successful intervention. The moors of Scotland, the plains of France, the rocks of Greece were all originally forested. What we have long thought to be natural landscapes are not.

This feeling of being aware of our ecological problems but not daunted by them was also illustrated by a lecture session Saturday morning, "Planting Our Man-Affected Environment". Los Angeles, with 25 years of bad pollution, has had a natural selection of those trees, shrubs, and flowers most resistant to pollution. Other sub-tropical cities can benefit from this knowledge. Dr. H. M. Cathey, Ornamental Plant Laboratory, U.S.D.A. is distributing Plant Survey Sheets in a nationwide effort to find the plants best suited for our urban areas. Anyone interested in reporting on specific plants or planting sites is requested to do so. Air pollution alone is not solely responsi-

---

*Helen Moodie (Mrs. Joseph), Unit Council 2nd Vice-Chairman, in charge of Education, represented the Arboretum Foundation at the AHS Congress. In this report she shares her enjoyment of that event with the readers of the *Bulletin*.

ble for affected plants. Salt from snow-covered streets, animals, even street lighting can be pollutants.

A meeting of the AHS Education Committee proved extremely interesting. It was proposed that exhibit materials and an educational workshop be set up for the next Congress. The committee intended to request a listing in the new Directory of those institutions having educational programs. This would benefit all those desiring help in setting up special projects. Much good can be accomplished with therapeutic gardening, sheltered workshops, environmental and innovative education.

So much was presented to us by such knowledgeable people; so many private gardens opened to visitors by such hospitable owners; so many rare and delightful plants to buy or just appreciate (exhibit, container gardens, and bonsai); I would like to have been three people to have seen and done everything.

THE LONG ROAD TRAVELLED

The Arboretum Foundation announces the December publication of the Henry Schmitz manuscript titled *THE LONG ROAD TRAVELLED: An Account of Forestry at the University of Washington.* Of special interest to Foundation members and other Arboretum friends is the chapter recording the history and development of the University of Washington Arboretum from Edmond S. Meany's first dreams of such a facility through successive efforts of Forestry Deans Miller, Winkenwerder and Marckworth, as well as that of countless citizens of the community.

The eight and one-half by eleven, hard-back book concerns much material which should be part of the public record. For this reason the Foundation has underwritten the cost of publishing this book as a public service. With approximately fifty illustrations, it will be a handsome addition to any library, and like the previous Foundation publication, *The Handbook of Rhododendrons*, it will become a collector's item. It will be available in time for Christmas gift giving.

ARBORETUM CLASSES

Winter, 1973

WINTER PROPAGATION — Mr. Richard van Klaveren, Arboretum propagator, will teach techniques for propagating woody plants, including cutting and seeding. Arboretum greenhouse; class limited to 10. Saturdays, Jan. 13 and 27; 9:30-12:00. 2 sessions, $10.

GRAFTING ORNAMENTALS — Mr. van Klaveren will instruct in techniques for grafting woody plants. Materials will be furnished. Arboretum greenhouse; class limited to 10. Saturdays, Feb. 3 and 24; 9:30-12:00. 2 sessions, $10.

GARDENING UNDER GLASS — Mr. James Nishitani, botanist, will lead this workshop on growing plants in all sizes and types of glass-enclosed structures, from terrarium to greenhouse. Botany greenhouse, UW campus; class limited to 20. Saturdays, Feb. 10, 17, March 3, 17; 10-12 noon. 4 sessions, $10.

SOIL MANAGEMENT FOR URBAN GARDENERS — Mr. Reid Kenady, senior scientist, will coordinate this lecture series concerning soil improvement methods, composting, nutrition and irrigation. 201 Winkenwerder, UW campus; class limited to 30. Mondays, Feb. 5-26; 7-9 PM. 4 sessions, $10.

TO REGISTER:

Send check, made payable to the University of Washington, to Arboretum Courses, Anderson Hall (AR-10), University of Washington, Seattle, 98195.

FOR FURTHER INFORMATION: call 543-2730.

Have you purchased your copy of the Symposium booklet from the Arboretum office? Other botanical directors and leaders think our Arboretum is a very special place. Their thoughtful contributions on Arboretum management should be read by every member of our Foundation.

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (July 1, 1972 through September 30, 1972): *Sustaining* — Dr. & Mrs. Roger Coe Eddy, Mrs. Paul Sayre, Steve Winston. *Annual* — Mrs. Vernon M. Ayers, Mrs. Vaughn Beals, Mrs. Christopher Blagg, Mrs. Richard Bonsteel, Mrs. W. L. Boss, Mrs. B. W. Bundy, Mrs. John H. Carney, Mrs. John Carr, Mrs. Ray Christie, Mrs. Ruth E. Counter, Susan C. Cuningham, Mrs. Walter E. Davis, Jr., Mrs. Benjamin Downs, Mrs. Gordon W. Duncan, Mrs. Donn Etherington, Mrs. Ned Flohr, Milton Gaschk, Dennis R. Gillingham, Mrs. Arthur K. Harris, Mrs. Frank H. Jefferson, Mrs. Peter Jobs, Mrs. Irwin K. Johnson, Mrs. David Kaiser, Randal Knight, Mr. & Mrs. Harvey D. Kolln, Mrs. Richard Langford, Mrs. James B. Lewis, Mrs. O. Yale Lewis, Jr., Mrs. Barbara M. Miller, Mrs. Winsor V. Morrison, Mrs. Robert A. Mowrey, Mrs. T. L. Mulliken, Hochiro Nagishi, Mrs. Jul Nickerson, Mrs. Reno Odin, Mrs. Thomas O'Hare, Mrs. John H. Olson, Mrs. Michael J. O'Neill, Mrs. William Ostling, Mrs. C. Homer Pope, Mr. & Mrs. Frank W. Potter, Mrs. Robert E. Reynolds, Mrs. Blaine Sanderson, Mr. & Mrs. John A. Sellin, Mrs. Dallas K. Sherman, Mrs. George H. Stoner, Mrs. Robert E. Vallat, Mr. & Mrs. William D. Vaughn, Mrs. Donald L. Vine, Frances Walthall, Mrs. W. W. Washburn, Mrs. Janet H. Weaver, Mrs. Charles E. Webber, Mrs. K. G. Wise, Mrs. Frederick W. Ziegler.

We are also grateful to the following members who have increased their dues to: *Supporting* — Mrs. Stuart Frazier. *Contributing* — Mrs. Elmer Nordstrom, Mrs. E. J. Ordal, Dr. & Mrs. Giacomo Pirzio-Biroli. *Sustaining* — Mrs. Oliver E. Cobb, Mrs. William F. Thompson.

ARBORETUM SPOTLIGHT

Franklinia Alatamaha

Franklinia alatamaha is a small tree originally collected in Georgia along the banks of the Alatamaha River in 1770 by John Bartram, an early American naturalist, who obtained a few plants for his garden near Philadelphia. Unfortunately, the tree has not been found wild again since 1790, so that it is known only in cultivation and all plants existing today are descendants of Bartram's trees.

Named for his friend, Benjamin Franklin, the tree, sometimes known as *Gordonia alatamaha*, grows in a pyramidal rather than open pattern attaining a height of approximately twenty feet. The bark is smooth and thin. The deciduous leaves, four to six inches long, are alternate, simple, slightly serrated, bright green and shiny above and pubescent below. The single, showy white flowers, two and one-half to three inches across are cup-shaped and greatly resemble a camellia, to which it is related, both being in the Theaceae or Tea Family. The roundish, crenulated petals surround a mass of yellow stamens, the entire flower being very short stemmed.

The *Franklinia alatamaha* is grown chiefly for its late September or October bloom, and when in the proper location, for the rich orange-red autumn color of its foliage. It grows either in acid or alkaline soils, but seems to prefer the latter. The tree may be propagated from seed sown immediately after it ripens or from cuttings of either hardwood or softwood.

The Arboretum has several plants of this lovely tree. A small one on the east side of Azalea Way was planted in 1962 and has had few blossoms to date. In the Camellia section is another younger tree, as well as a more mature specimen twenty-five to thirty years old. The latter, approximately fifteen feet high, is to be found near the hydrangeas on the west side of Arboretum Drive close to the road. This year the bloom has been especially beautiful, and well worth a ride along the upper road to view this somewhat rare species endemic to the southeastern part of America.

Doris Butler

The warm sun is failing, the bleak wind is wailing,
The bare boughs are sighing, the pale flowers are dying;
And the year
On the earth her death-bed, in a shroud of leaves dead,
Is lying.

— Percy Bysshe Shelley

View W. across lagoon from below N. gate of Broadmoor. ***Carpinus turczaninovii*** **on left and right.** Photo by: B. O. Mulligan

View N. over area W. of E. Foster's Island Road through alders and willows towards lagoon. ***Salix magnifica*** **in lower left corner, just planted.** Photo by: B. O. Mulligan

ARBORETUM REPORT

(Continued from p. 21)

the Friends of the Arboretum, the Seattle, Lake Washington, and many other local garden clubs, including the Snoqualmie District Federation; individual plant societies such as the Seattle chapter of the American Rhododendron Society which have a particular interest in our plant collections.

We are especially grateful this year for the extra work days organized in October, March, April and May by the Unit Council, through Mrs. Frank E. Blake, which made such a drastic impression on our weed population in a short time this spring. We are grateful also to other Units or groups which work on specific areas at different times, such as the rock garden, Woodland Garden or the Japanese garden. These additional helpers make a real contribution to the appearance of the Arboretum when our own crew is so small. The services of other Units who bind slides for us, sort catalogues, rearrange the library books, and that of the individuals who perform miscellaneous tasks for us in the office is gratefully appreciated. We would be hard put to accomplish these chores without such willing workers.

At this time of change in the administration, and perhaps also in the directions and policies of an Arboretum of this type and extent, it is clearly impossible to foresee how it may fare and develop during the next ten, twenty or fifty years. I would hope, personally speaking, that before long there may be much greater financial support for such a useful and popular institution not only from the city of Seattle but also from the adjacent counties whose schools now make regular use of its facilities and plant collections; that the functional type of buildings which have been planned with considerable thought over a period of years may finally be constructed on the proposed site, and that other areas outside the city may gradually be developed as adjunct or supplementary arboreta for specific groups of plants or particular research or experimental work. There is a wealth of material in our present Arboretum, as we all know, but for a number of reasons little of it is used at present for practical purposes. Let us hope indeed that this situation will be remedied in the not far distant future.

Dr. R.A. Howard, Director of the century-old Arnold Arboretum of Harvard University, in Boston, Mass., has recently sounded a warning about the future of that famous institution with possible additional public uses of its 260 acres for swimming pools, bicycle paths, and skating rinks — "a conspicuous oasis of green", as he rightly terms it, within the city. If he is concerned in Boston, so should we be also in Seattle; it is well that a Committee of the State Legislative Council is to investigate the financial problems of the Arboretum this year. We need all the public support we can obtain from various sources if it is to remain one of the major collections of woody plants on this continent. ▲

AUTUMN

The morns are meeker than they were,
The nuts are getting brown;
The berry's cheek is plumper,
The rose is out of town.

The maple wears a gayer scarf,
The field a scarlet gown.
Lest I should be old-fashioned,
I'll put a trinket on.

Emily Dickinson

SOME OF OUR FAVORITES
Won't You Send Us Yours?

BOG PALS

Labrador Tea *(Ledum Groenlandicum)*
Bog Kalmia *(Kalmia polifolia)*

*MAE GUY**

We first discovered Labrador Tea *(Ledum groenlandicum)* in a swamp under some power lines on the Novelty Hill Road beyond Redmond. Long, stringy plants with narrow leaves, they were too long and rangy to dig up from around the stumps at the edge of the woods. The swamp was completely filled with the dry bushes, also hard to dig. They apparently could stand a good deal of drought as the swamp dried in summer, nevertheless the plants were able to produce masses of dainty white plumes of flowers in June. Seedlings of various size grew on surrounding rotting logs and stumps and were easier to collect. We also found they were easy to grow and did not demand swamp conditions or too much moisture if grown near rotting stumps or logs.

A member of the Health family, Labrador Tea is widely distributed across Canada and the United States. Eastern Indian tribes used it for making a tea and this practice was copied by early explorers and settlers. (When we tried it, it tasted like poison but perhaps we did not follow the right "receipt".) The plant has thin, twisting stems, often three or four feet high, and leathery, narrow leaves, dark green, with rusty, woolly hairs on the under surface. Flowers are in a showy head of small, white blossoms, a real sight to see when visiting the swamp in June.

It is frequently mentioned in books that the dainty Bog Kalmia *(Kalmia polifolia)* accompanies Labrador Tea. We finally succeeded in finding it when we were taken on a collecting trip to a private lake between Preston and Fall City. The placid little lake was ringed round the edge with Labrador Tea. Clara Fisher's bright eyes soon spotted a small group of plants with the same reedy stalks and narrow leaves as the Labrador Tea, but the leaves were a brighter, shinier green, strongly rolled over and showing a velvety whitness beneath rather than the brownish wool of the Tea. Kalmia also is a member of the Heath family.

I was fortunate to gather a beautiful clump of the Kalmia from a partly submerged log and with reasonable watering, it has been happy enough in my garden in a large papier mache pot to grow and produce the beautiful, dainty Kalmia blooms. They are like the cultivated Kalmias, only smaller, and have the characteristic star shape with anthers bent back and held by their tips in pits in the petals. These are released by visiting insects and spray the disturber with pollen.

This lovely plant has its sinister aspect in that the pollen gathered by the bees makes poisoned honey. A recent episode of this occurred locally when several people became ill from eating honey which the King County Health Department traced to bees that had been feeding on Bog Kalmia in the Sultan Basin area.

Both of these plants make bog exploration and collecting fascinating, especially in June. We would very much like information on locating more such bogs!

*Mae Guy (Mrs. Percy F.) is a newly elected Director of the Arboretum Foundation and is also Program Chairman for Unit 24, the Edith Banghart group.

Book Reviews

CAMELLIAS; THE HUNTINGTON GARDENS. Published by The Hunington Library, San Marino, California, 1971. 40 pp., illus., full color photographs. $2.00

This very attractive booklet, published by the Huntington Library, is admirable for its handsome photographic illustrations, as well as for its use as a guide to the Huntington Gardens (map, p. 15) and it also includes a brief history of the camellia plant and some of its cultivars. There is an excellent annotated bibliography for the reader who may want to make a more detailed study of the *Camellia* genus.

The book relates that England inadvertently imported the first flowering camellias in the 18th century. British sea captains thought they were buying the tea plant, *Camellia sinensis,* to secure it for home cultivation. However, the high price of tea made the Chinese eager to retain their monopoly of its culture, and they substituted flowering Camellias for the supposed *C. sinensis*. By 1739, red camellias were blossoming in the greenhouses of Lord Petre at Thorndon Hall in Essex.

The Camellia was named by Linnaeus in honor of a Jesuit priest from Moravia, George Joseph Kamel, who did botanical research in the Marianas and the Philippines (d. 1706). The Camellia family has a long history, dating from the time of Confucius, when legend tells us Confucius initiated the custom of tea drinking to persuade his followers to boil their water. But the blossoming varieties were early appreciated for their beauty, and *C. reticulata* was cultivated as a sacred flower over 900 years ago in the temple gardens of China.

In 1797 America first secured camellias in Boston, New York and Philadelphia, and they were advertised for sale by a Sacramento nurseryman three years after the start of the gold rush.

The camellias of the Huntington Gardens were started about 1908, and now there are some 1,200 varieties, planted in a twelve-acre garden area. They flower from early fall, *C. sasanqua* coming first, and end in late March with *C. reticulata*. The Huntington Gardens, in addition to their beauty, function as a testing ground for Southern California camellia culture, as well as seeking also to discover uses for the plant in landscaping.

Camellias are cultivated in three ways: from seeds, by cuttings, and by grafting. The booklet gives practical hints and directions for both new and old Camellia aficionados. Facts about pruning and disbudding are included, and appear to be immediately applicable to our own Pacific Northwest camellias.

Its beauty alone makes this book an almost irresistable purchase, and its information and practicality confirm the wisdom of its purchase and more than justify the investment of $2.00 in a 40 page publication.

BERNICE F. SMITH
Assoc. Director,
Weter Memorial Library
Seattle Pacific College

PLANT JEWELS OF THE HIGH COUNTRY. By Helen E. Payne, Pine Cone Publishers, Medford, Oregon, 1972. 145 pages, 111 color illustrations. $15.00

According to the publisher, this is the first book written and published in the United States on sedums and sempervivums. *Plant Jewels of the High Country* is written from a gardener's viewpoint and refers to 187 hardy sempervivums and 78 sedums, including species, subspecies, varieties and hybrids.

In the first chapter of the book, the author relates her life interets and how she became involved in these *plant jewels*. The advice on culture, propagation, pests and diseases and garden uses of these fascinating plants, including a roof garden, will be helpful to the beginning gardener as well as the gardener who still has the inclination to find space for just one more plant. plant.

Flowers of most sedums and sempervivums are in varying shades of pinks and yellows, occasionally white, but it would be helpful when planning a color scheme or a mass planting, if the author had described the color of each sedum and sempervivum which is listed in the book.

There is a bibliography, a list of seven public collections of sedums and sempervivums and four recommended specialists, including the commercial nursery which Helen Payne and her husband operate near Dallas, Oregon. Her interests include the University of Washington Arboretum Foundation which she joined in October, 1971.

The author recalls happy collecting trips and her first finds of Northwest native sedums, but just as this reviewer was mentally conjuring up visions of hordes of readers ravishing the high country rock outcroppings and talus slopes of the dainty sedums, the author cautions collectors to obtain permission before collecting and *to not rob the high country of its beauty.*

Only a very few of the color photographs give a correct rendition of the colors of the plants. The inclusion of many seriously misleading off-color pictures is unfortunate, but this does not dim my view that for the gardener who is interested in sedums and sempervivums, this is an enjoyable and informative book.

JOY SPURR

PLANTS AND GARDENS — Herbs and Their Ornamental Uses. Brooklyn Botanic Garden, Vol. 28, No. 1, Brooklyn, N.Y., 1972. $1.50

The two words that set this herb book apart are *International* and *Contemporary*. Herb gardens from New Zealand to England to Mt. Vernon are interestingly described by knowledgeable authors. Contemporary herb subjects such as city garden herbs, vegetable plantings with herbs, and regional differences in herb culture are covered.

In addition unusual herb garden combinations are written up beamed at colors, textures, scents, beauty, locations, and purposes. The latter includes an article on an herb garden for children, and one for the blind.

A fine list of eleven herb books with short reviews is at the end of the book. One might note that this is an excellent companion to Brooklyn Botanic Garden's earlier *HANDBOOK ON HERBS* Vol. 14, No. 2 (Handbook 27).

ELIZABETH SICHLER

WILDFLOWERS I, The Cascades. By Elizabeth L. Horn. The Touchstone Press, Beaverton, Oregon, 1972. 160 pages illustrated. $6.95.

Wildflowers I is an introduction to common plants that may be conspicuous to the passing traveler or hiker. Identification is simple and direct with the emphasis on habitat and environment in the Cascade Mountains from Mount Rainier to Lassen Peak.

The author has arranged the plants by zone: (1) Coniferous Forests. Deeply Shaded Woodlands; (2) Dry Openings in Coniferous Forests; (3) Moist Areas Below Timberline; (4) Timberline and Alpine Areas. There is a short treatise on vegetation of the Cascade Mountains, alpine adaptations, scientific names and a basic description of the life zones.

The bibliography lists nine books on plants. A short glossary of botanical terms, sketches of typical flower patterns and the shapes, arrangements and types of leaves will assist the non-botanist on identification. On the practical side, Elizabeth Horn has included Indian lore, comments on edible plants and those dangerously toxic and photo tips for the amateur photographer.

The 143 photographs are well done, and it is obvious that the author, who is a biologist and plant ecologist, took time and care on the arrangement and lighting, used the correct exposure and a fine grain film. Good color control in the printing process is a tribute to the printer. The variation in sizes of the photographs is sufficient to relieve monotony and the choice of a dull finish paper with legible print adds up to an attractive book.

In regard to the author's comment that *Pterospora andromedea* is "usually found in association with the ponderosa pines on the eastern side of the Cascades," I have found these in greater abundance in Washington, on the western slopes of the Cascades in Douglas fir forests of the upper Transition and Canadian Zones.

Wildflowers I describes only 180 plants out of thousands which grow in the Cascade Mountains, but it is a book of small size that can be taken into the field by the hiker and should encourage closer observation of one of nature's most colorful treasures, the wildflowers.

JOY SPURR

OCTOBER

October turned my maple's leaves to gold;
The most are gone now; here and
there one lingers
Soon these will slip from out the twig's weak
hold,
Like coins between a dying miser's
fingers.

— Thomas Bailey Aldrich

THE ARBORETUM FOUNDATION
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS BY FUNDS
YEAR ENDED APRIL 30, 1972*

	Consolidated
RECEIPTS:	
Dues	$ 20,030.00
Donations	211,255.01
Unit Council —	
Plant and bulb sale	5,280.90
Other	1,572.18
Interest on savings accounts	13,537.67
Net income from Investment Trust	594.77
Advertising and miscellaneous	2,595.88
TOTAL RECEIPTS	254,866.41
DISBURSEMENTS:	
Salaries and Christmas bonus	12,498.40
Payroll taxes	696.70
Membership expense	2,824.08
Bulletin and publication	8,886.97
Publicity and educational program	1,271.93
Telephone	395.88
Professional services	800.00
Memorial gates	7,596.50
Other operating expenses	1,795.40
Units Council expenses —	
Plant sale costs and expenses	12,774.11
Utilities, supplies, postage and books	868.25
Miscellaneous	1,246.77
Donations to University of Washington Arboretum, including $10,413.50 by Unit Council	16,133.30
TOTAL DISBURSEMENTS	67,778.29
Excess of receipts over disbursements for the year before interfund transfers and purchases of investments	187,088.12
CASH BALANCES, APRIL 30, 1971	227,172.08
Transfers (to) from General Fund	—0—
Purchase of Prudential Mutual Insurance Fund	(17,100.00)
ALLOCATED CASH BALANCE, APRIL 30, 1972	$397,160.20
ENDOWMENT TRUST FUND PRINCIPAL	$ 15,887.71
ALLOCATION OF FUNDS	
General Fund	$ 41,673.19
O. D. Fisher Funds	10,175.06
Endowment Trust Fund Monies	411.63
Floral Hall Fund	104,862.95
Memorial Fund	11,324.83
Japanese Garden Fund	598.60
Educational Program — Library Fund	3,040.26
Tolmie Fund	225,073.68
FUNDS ON HAND APRIL 30, 1972	$397,160.20

*Financial Statement as prepared by Price Waterhouse & Co.

THE ARBORETUM BULLETIN
Published by the
Arboretum Foundation
University of Washington Arboretum
Seattle, Washington 98195

MRS. H. P. CLAUSING
12100 - 87TH N. E.
KIRKLAND, WA 98033

NON-PROFIT ORG.
U. S. POSTAGE PAID
SEATTLE, WASHINGTON
Permit No. 126

ADDRESS CORRECTION REQUESTED

UNIVERSITY OF WASHINGTON

ARBORETUM FOUNDATION

announces

availability of past BULLETINS

at 50¢ per copy

In limited numbers: copies from 1936, 1937, 1938, 1940, 1941, 1942, 1943, 1944, 1945, 1946.

In greater supply with a few exceptions are BULLETINS from 1947 to the present time.

The impending building renovations involving storage space for these BULLETINS make immediate action urgent. This is an excellent opportunity to procure back copies. Orders will be filled on a first come-first served basis.

Please direct your orders to:

ARBORETUM FOUNDATION,

MRS. MARILYNN WOLF, Executive Secretary

EA 5-4510 University of Washington, Seattle, Washington, 98195