PRESIDENT'S MESSAGE

Enclosed with this bulletin is a copy of a letter I have sent to the Mayor of the City of Seattle and each member of the City Council.

It pleads for a clear policy statement of objectives regarding the future development of the Arboretum and the necessary legal action to implement a program toward those objectives.

I urge that you write the Mayor and the Council members to express your position.

If the Arboretum is to survive and develop, we must have leadership from the City’s policy makers.

Sincerely,

N. Stewart Rogers
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COVER PHOTO
Fruits of Akebia quinata  
Photo: B. O. Mulligan
This R. arboreum, 12 feet tall, near the head of Rhododendron Glen was almost entirely defoliated and dead from the November, 1955 freeze. Frost hardiness research will benefit all northwest gardeners.

As anyone who has gardened in western Washington for more than a few years knows, there is always the danger of a severe winter, one in which temperatures drop suddenly and deeply to the detriment of many half-hardy ornamentals. The devastating freeze of November, 1955, is perhaps the prime example of this unfortunate tendency in our weather and although that particular freeze was "unusual" we certainly can expect similar incidents in the future.

What is needed is a method of screening plants for their frost or cold tolerance. Such a screening procedure could not only warn us of what species might never be expected to survive in the northwest but could select hardier individuals from species long thought to be borderline and even test the ability of potential new ornamentals to cope with our climate. This would avoid the trauma and expense of growing plants for several years only to find that nature does the selecting for us.

The following article is abstracted from a research proposal presented to the Arboretum Foundation in this fall to initiate just this type of screening. The Foundation board approved of the project, and preliminary testing on a few selected species began in September. As it develops into a major program it is hoped that Foundation members will become involved not only in planning future projects but also in doing some of the laboratory work.

Western Washington is one of the outstanding centers for ornamental horticulture in North America. The Seattle region is widely known for the number of species growing in gardens here, especially rock garden plants and broad-leafed evergreen shrubs while its rhododendrons and other Ericaceae are particularly noteworthy.

The mild maritime climate of the Puget Sound lowlands has contributed importantly to the diversity of species in Seattle gardens. Winters are wet and relatively warm, and temperatures fluctuate within a relatively narrow range, since moist air moving inland from the Pacific acts as a thermal blanket preventing extreme heat losses. Although
summers are dry, rates of evapotranspiration are moderated by cool temperatures, low wind velocities, and the prevalence of high overcast conditions that reduce incoming solar radiation.

Seattle’s climate is, in fact, similar to that of southern England. Accordingly, it is not surprising that western Washington has benefited for more than fifty years from the experience of British gardeners who supported plant exploration on a lavish scale from the late eighteenth century until the first World War. Plants introduced from Australia, New Zealand, Chile, Japan, and above all, China and the Himalayas form the backbone of English gardening and the contributions of explorers such as David Douglas, the Forsters, the Bartrams, George Forrest, and Kingdon-Ward are widely recognized. Less generally appreciated is the work of the curators, propagators, and gardeners who received and grew the collected material in England. Enormous numbers of plants were named and classified by Sir J. D. Hooker and his successors at Kew and grown by professional seedsmen such as the Veitches, gardeners employed by the Rothschilds, and other wealthy supporters of horticulture. In their hands poorly adapted or unattractive materials were winnowed out and promising forms selected, grown to maturity, and made available to the gardening public.

The University of Washington Arboretum from its outset has had many characteristics of an English garden. Thousands of the plants in its collections were obtained directly from England as a part of its seed and plant materials exchange program. Many other plants were obtained from northwest seed houses and nurseries and from Seattle gardeners; a substantial proportion of those plants had come to the region directly or indirectly from England. More recently, a great deal of other material has been obtained through exchanges with other United States and Canadian arboreta, such as the National Arboretum, Washington D.C. and Longwood Gardens in Pennsylvania, some of which have sponsored exploration which led to important new collections of living material in China, Japan, Europe, and the United States. This work continues, and attractive new plants which can be grown in western Washington are made available to gardeners every year.

It is clear, however, that excessive dependence on English work and that of other arboreta in plant exploration, screening, and improvement is no longer appropriate. Responsibility for the development of new materials for western Washington should pass to the hands of local gardeners. A more ambitious arboretum introduction program should include: 1. acquisition of collections which encompass a broad range of variability in key species instead of only one or two ecotypes, as is often the case at present; 2. observation, selection, and breeding to obtain new materials especially well adapted to our region; 3. application of modern techniques for rapid, efficient determination of hardiness and other aspects of adaptation; 4. basic studies on the physiology of hardiness, especially in broad-leaved evergreen ornamental shrubs and trees.

Plant Acquisitions in the Arboretum: 1936-1974

A certain amount of this work has been, of course, under way for a number of years. Plant introduction and screening work at the University of Washington Arboretum is carried out as a part of its normal curatorial and propagation program. Roughly 500 new acquisitions are received a year, mostly from cooperating arboreta, but because of budget limitations, work with these new materials has been largely observational in character. Seeds and cuttings are catalogued, established as potted plants in the greenhouse propagation unit, lined out in protected beds, and finally established in the nursery or, if there are indications that the material is tender, in the lathhouse. As plants mature they are subsequently moved to permanent display beds where notes on survival, growth, and reproductive behavior are taken as opportunity and staff permit.

Recent Climatic Change

The need for identification of marginally hardy ornamental shrubs and trees and selection of less tender cultivars is made increasingly clear by much recent evidence of appreciable general cooling in the northern hemisphere over the past 25 years. Estimates of a drop in mean annual temperature of about 0.5°C since the late 1940’s have been made by many climatologists (Hughes, 1974). In addition, the growing season seems to have become appreciably shorter. In southern England, for example, the frost-free season has decreased by two weeks since 1950 (Lamb, 1965).
These recent changes should be viewed in the context of the considerable body of knowledge that has accumulated about climatic fluctuations since the retreat of the continental glaciers, about 11,000 years ago. The climate of central England is particularly well known, having been reported in considerable detail by Manley (1959) and Lamb et al. (1966). Estimates of winter temperatures and summer wetness are available from historical records for the period 1100 A.D. to 1960 A.D. (Lamb, 1965). Other estimates, from botanical data such as tree rings and pollen deposits, have been compiled from 8500 B.C. to the present. Detailed instruments records in central England are available during 1680-1959 (Manley, 1959). These English data are particularly valuable since climatic fluctuations in the North Atlantic area have been shown to be indicative of variations over much of the world (Kutzbach and Bryson, 1974).

About 300 B.C. there is evidence of an advance of the glaciers (glacial maximum) but by the beginning of the Christian era the climate was much as it is at present. A long period of hot dry summers and cold winters then ensued, culminating in the 8th century when the warm weather permitted much traffic over the Alpine passes. In 800-801, however, the Black Sea was frozen and ice occurred on the Nile in 829. During the 10th century the climate became somewhat milder and rainier. The Vikings colonized Greenland at this time but were forced by increasingly cold weather to abandon it at the end of the 14th century.

The period 1500 to 1900 has been termed a Little Ice Age (Sellers, 1965). About 1750, expansion of northern hemisphere glaciers reached a maximum that was greater than at any time since the end of the Quaternary Ice Age. After about 100 years of very cold winters, a warming trend became evident in the 1850’s. By 1950, mean annual temperatures had risen 1.5°C, but since then, as already noted, mean temperature has dropped 0.5°C to its present level.

How should the gardeners of western Washington react to this evidence of climatic uncertainty? Clearly, the following courses of action would seem prudent:

1. Adoption of a skeptical attitude toward those who predict an Ice Age or similar calamity before the turn of the century. The history of the past 2500 years has been one of fluctuations of amplitude about 1.5°C about a mean represented by our present climate. On the other hand, an additional drop of 0.5°C over the next 25 years is a distinct possibility.

2. Tender species, varieties and forms presently grown in our area should be identified. Lists of such plants can alert growers to potential problems.

3. An immediate search should be initiated to discover relatively hardy types within marginally hardy taxa. In most cases far more genetic variability exists in these taxa than is available in western Washington. This is because the plants that were introduced to the Seattle area seldom represent the entire geographical (and hence climatic) range of the taxon.

4. Increased efforts should be made to explain methods of protecting tender plants to the gardening public. Many of these (such as those which take advantage of existing topography and buildings) are simple, effective, and inexpensive.

5. Basic research on hardiness mechanisms in ornamental plants should be increased.

The Arboretum Program for Research in Hardiness

Increased faculty interest in the University of Washington Arboretum makes the initiation of a more comprehensive program in hardiness especially attractive at this time. The appointment of an Advisory Committee on the University Arboretum has led to active faculty participation in Arboretum planning and formulation of policy. A new facility for research and education in ornamental horticulture at Union Bay is now being planned by a team of consultants working in close collaboration with members of the Advisory Committee. The possibility of participation in a significant program of continuing research in frost hardiness, drought resistance and other aspects of adaptation of ornamental plants to their environment has excited the interests of plant physiologists, taxonomists, geneticists, ecologists, and horticulturists.

Because new research facilities are not yet available, we propose to develop the program of hardiness studies in stages. At the outset we will emphasize the evaluation of certain well known techniques for assessing hardiness. This will enable us to initiate studies on a number of woody ornamental taxa which are readily grown in somewhat warmer areas but which are marginally hardy in Seattle. The list of taxa on which we want
to work includes representatives of the following genera: Drimys, Eucalyptus, Pieris, Embothrium, Eucryphia, Gaultheria, Pernettya, Rhododendron, Nothofagus, Camellia, Ternstroemia, Clethra, Buddleia, Vitex, Hydrangea, Symlocos and certain conifers such as Taiwania, Glyptostrobus, and related genera.

This list will be considerably broadened in the future. We are especially interested in representatives of southern hemisphere taxa which have not been sufficiently tested in western Washington. Materials to be studied in the first stage of our program will be those presently in the collections or rather easily obtained in our normal exchange programs with other arboreta.

Later stages of the program will include fundamental work on mechanisms of cold resistance and their inheritance, particularly in broad-leaved evergreen plants and an effort to broaden our collections by increasing the geographical range of the species. This may include collection trips to insure a widened source of material. We will be especially interested in the implications of this work for the introduction of new materials, particularly from the southern hemisphere and mountainous regions of the tropics. Since these more fundamental studies will be of more than regional interest, we intend to develop cooperative programs of research with other arboreta, botanical gardens, and museums. Moreover, we will look to agencies such as the National Science Foundation for support of these more basic studies.

We are fortunate to have been able to interest Professor Hubertus Kohn, of Western Washington State College's Department of Biology, in our program of frost hardiness studies. Dr. Kohn is a plant physiologist whose studies of frost hardiness have won wide recognition in Europe and the United States. Upon his arrival in Bellingham in 1966, he embarked on experimental studies of frost hardiness in conifers native to western Washington. For his studies Prof. Kohn used trees growing at relatively high elevations on Mount Baker. He found that Mountain Hemlock and Pacific Silver Fir, when thoroughly hardened off in mid-winter (he visited his trees on skis at bi-weekly intervals), were able to withstand temperatures as low as -56°C (-69°F). On the other hand, Douglas fir trees growing at 2600 ft. were hardy only to about -33°C (-27°F).

Because of Prof. Kohn's interest in conifers, we have broadened the list of plants we will study to include Taiwania cryptomerioides, a marginally hardy tree which we have been able to grow in the Arboretum lathhouse and nursery. It turns out that hardiness research in conifers is of considerable scientific as well as horticultural importance. Professor Kohn has found that frost hardiness in conifers native in the Bellingham region is apparently not well correlated with resistance to high temperatures. Although this may not seem too surprising, it is not entirely consistent with results obtained with most angiosperms (flowering plants). If Prof. Kohn's anomalous results are confirmed in other conifers he may be forced to conclude that there are basic differences in hardness mechanisms in these major divisions of the plant kingdom. It is hardly necessary to point out that a large number of native and exotic species of conifers are available at the Arboretum for such tests. Tropical species would also be of great interest in these studies.

Proposed Plan of Work

The opportunity to work cooperatively with Professor Kohn made it possible to initiate work in his laboratory in early October, 1975. Test material is carried from Seattle to Bellingham every month where it is evaluated by the methods set out below. The investigators and volunteers will maintain close contact with Professor Kohn, visiting him in his laboratory to become familiar with his techniques and consulting with him on the acquisition of the equipment that will be required for continuing hardness testing on a regular basis in Seattle.

Equipment will be purchased in late 1975 or early 1976 and set up in the Botany Department of the University of Washington or in the Arboretum, if space allows. The hardness testing program will be moved to the Union Bay Plant Science laboratories when permanent facilities become available there.

At the University of Washington it is customary to employ graduate students as research assistants in most programs such as this one. Under the supervision of a faculty member these students carry out much of the daily work of the project, including preparation of the study material, operation of equipment, and recording and analyzing data. In this program, however, we hope to employ qualified volunteer representatives of the gardening public to carry out much of the required work. This goal is in line with the
desire of University of Washington Arboretum faculty members to inform gardeners of research objectives, methods, and results through active participation in programs in ornamental horticulture. It should be emphasized, however, that the University's primary mission is the education of its registered undergraduate and graduate students. Accordingly, in case a qualified graduate student should express interest in research in ornamental horticulture, he or she would be encouraged to work in this or other Arboretum related research programs.

Methodology

Throughout the year the frost tolerance of plants of temperate zones fluctuates, exhibiting a minimum generally during spring and early summer, a maximum at about mid-winter. The degree of frost hardness at any one time depends not only on physiological factors but on environmental ones as well.

A close relationship between temperature and frost tolerance has been found for numerous plants (Levitt 1956, 1963) but little is known of plants of the coastal Northwest. An investigation of seasonal fluctuations in frost tolerance is under way (initially using Eucalyptus, Nothofagus, Taiwania, and Rhododendron) starting in early October 1975 with tests carried out at about 4 week intervals until spring and early summer of 1976.

Small terminal branches from the specimen are cut and packed in plastic bags. To avoid temperature changes while in transit, bags with samples are transported in styrofoam-insulated containers. Upon arrival in the lab, samples are placed immediately in a freezing compartment, the temperature of which is the same as that of the samples. Rate of cooling during the experiment is about 4°C per hour until the required test temperature is reached. All samples are kept at this temperature until temperature equilibrium throughout all tissues is reached and maintained long enough for ice to form.

At the end of each test period at least 3 samples are removed from the freezing compartment and transferred to a chamber in which thawing takes place at a rate of about 4° to 5°C per hour. The remaining samples in the freezing compartment are then lowered to the next test temperature and the procedure repeated as outlined above. The temperature in the freezing compartment is electronically controlled within a range of ±0.1°C. Samples are frozen at approximately ten test temperatures during each experiment. The total test range must be large enough to insure that all species (varieties) tested are killed at the lowest test temperatures used. After plants have thawed they remain at a temperature of 1-3°C in the dark for 12 hours. Following this, the sample branches are transferred to a temperature of about 12°C for another 24 hours at medium light intensity. Finally, samples will be moved to a room temperature.

Injuries resulting from this treatment are determined largely by visual observation over a period of five to fifteen days in the fall, longer in midwinter. Frost tolerance is defined as the temperature which causes death in 50% of the sample material. While at first glance this may seem a relatively crude determination, past experience has shown the results to be both accurate, reproducible, and well correlated with very precise and elaborate bio-chemical techniques.

The chief limitations to the numbers of species of plants that can be studied simultaneously are freezer space and time required to carry out individual experiments. Since good air circulation is important, only about 50 cut branches can be accomodated at one time in a commercial freezer. And because samples must be removed and brought to room temperature at regular intervals, the observer must be "on call" for nearly twenty-four hours during an experimental run. In studying the frost hardness of ornamentals, we are interested in how tolerance to frost changes from late summer and fall to winter. Accordingly, fresh samples of the study plants are collected and tested every two to three weeks. In practice, this means that if only one investigator is involved, the freezer is in intensive 24-hour use on only five or six occasions over a three month period.

We propose to increase productivity by enlisting volunteer workers whom we hope to recruit from the Arboretum Foundation and perhaps other interested groups. A pair of volunteers would work on a group of four or five species, collecting material at two to three week intervals, freezing it and then thawing it according to instructions provided by Prof. Kohn, and taking the necessary frost injury notes. With six or more pairs of volunteers it might be possible to keep the freezer in nearly continuous use. We hope that

(continued on p. 8)
LEAN DAYS FOR BOTANIC GARDENS

FRED LAPE*

The precarious financial state of many botanic gardens and arboreta in the United States is a strange paradox. Gardening and landscaping flourish. Neglected farms are reforested, their dooryards planted to exotic trees and shrubs. Suburban houses, even trailer courts, are beautified with flower gardens, evergreens, trees and shrubs. City roof gardens are the fashion. Yet, our botanic gardens and arboreta, the original sources of many of the plants, flounder from lack of sufficient support.

In this the affluent United States is far behind many other nations of the world. There is scarcely a large university in western Europe that does not have its own botanic garden, usually well tended, and yearly offering a list of seeds for exchange with similar institutions. In contrast, the large universities of the United States that have their own botanic gardens or arboreta can be numbered on one’s fingers and most of these are in continual stress from lack of sufficient funds for upkeep.

The USSR has 87 botanic gardens or arboreta, even one north of the Arctic Circle, all completely supported. The United States has one, the National Arboretum in Washington, D. C., a large experiment station at Beltsville, Md., and a few plant introduction stations with small arboreta, mostly the plants they are introducing.

Some botanic gardens get support from local governments, those in large cities from their city budgets and a few others from the budget of the county in which they are located. But, so far as I know, none get any sizeable support from their states. Yet, even this support is small in proportion to that given by our neighbor, Canada. The Montreal Botanical Garden, for instance, gets a much larger yearly quota from the city of Montreal than the New York Botanical Garden from New York City. At the same time the Royal Botanical Garden in Hamilton, Ontario, gets support from both the City of Hamilton and the Province of Ontario.

In the past few years several gardens and arboreta have begun to get a little support from their state governments, but by an ironical situation. The crusading of artists the past 10 years has been able to wring from some state legislatures small appropriations for art, which, along with gardening, is the current pastime of the middle class. Now because of their similarity and being open to the public, botanic gardens are sometimes included as members of museum societies and listed among museums in statistical data. Thus, any vein of gold, however thin, is worth being worked.

This sleight-of-hand is valuable in that it brings a little much-needed money but it is dangerous in that it disguises the importance of such institutions in their own right. Certainly in the history of mankind gardening, including agriculture and forestry, and art have run neck and neck as two of man’s most important contributions to advancement and happiness and neither should be allowed to eclipse the other.

Our early presidents were usually good gardeners. Washington and Jefferson both planted well. John Quincy Adams developed orchards and gardens around the President’s house and even started a plantation of live oaks in Florida.

Under the prodding of men like John Muir and Gifford Pinchot in the early 1900’s governments became forest conscious and state nurseries and reforestation projects appeared. In 1927 the National Arboretum was established but it was not until 1950 that it was given enough money to develop into a truly presentable arboretum.

Still, neither governments nor colleges and universities seem to realize thoroughly the importance of botanic gardens and arboreta. They hold the key to repair man’s despoiling of the earth. Men create cities with smog that kills trees. So, botanic gardens try to find trees that endure smog. Men bring diseases and pests from one continent to another, as the Dutch elm disease and Japanese beetle. Botanical gardens try to find controls for these troubles or plants to substitute for the destroyed species.

All the arboreta in the U. S. are trying to develop shade trees for the future. The chestnut is gone.

*Director, George Landis Arboretum, Esperance, N. Y.

Our elms are going. The white ash is in danger from a combination of diseases. The sugar maple is in trouble. In the Midwest oaks are dying of a wilt and in the Far West some long-used species of eucalyptus have suddenly proved too tender. Which will be the shade trees of the future, for the dooryard, the city street, the college campus? No one knows, yet, but each botanic garden has a collection of possibilities for its area.

The Experiment Station in Beltsville has been doing intensive work on the Dutch elm disease. The National Arboretum is experimenting with sycamores and sweet gums. In the George Landis Arboretum are 20 seedling American chestnuts. Just possibly, one may be the chance seedling that is completely resistant to the blight. The *Cercidiphyllum japonicum* and Amur cork trees or phellodendrons at the Arnold Arboretum in Boston demonstrate the possibility of these as replacements for some endangered trees.

At the moment botanists are much concerned with species and studying the insides of plant cells to throw new light upon them. But to study cells botanists must have plants. The botanic gardens and arboretum have these plants.

There is an added value to the assembling of species in an arboretum. When related species from distant sections of the world are brought together they will often hybridize and these hybrids often have more vigor and are more desirable than the species. For example, hybrids between the European and Japanese larch have proved more valuable for reforestation than either. Attempts are being made to develop a hybrid between the eastern white pine and the Himalayan, a hybrid which might combine the hardiness of the American species with the more rapid growth of the Himalayan one.

Equally important are the records of trees. All arboretum have these records and can offer evaluations of the species for their areas.

Few persons realize how many dooryard shrubs and trees are available because some wise arboretum director sent a plant collector to Japan or China for new and promising material, tried what was collected, and introduced the best to nurserymen. Thus, the Arnold Arboretum is responsible for the introduction of many shrubs and trees. The Strybing Arboretum in San Francisco, the University of Washington Arboretum in Seattle and the Los Angeles State and County Arboretum have all made important contributions to gardens and city streets. In the Midwest, the Morton Arboretum in Illinois and the University of Minnesota Landscape Arboretum have done the same for the Upper Mississippi Valley.

Then why are these arboretum and botanic gardens not better supported by their respective government units or the universities and colleges? Our priorities are all wrong. The United States government spends billions on atom bombs, moon shots and space labs but little for our continued living on a green and flowering earth. Our colleges spend millions on football stadiums, gymnasiums and student unions but only a few paltry thousands on arboretum or botanic gardens. What is the answer?

(continued from p. 6)

volunteers will be able to meet regularly with Professors Hatheway, Walker, and Witt to report on their results. Early meetings of the group will bring volunteers up to date on techniques and important results of earlier hardiness research. It is clear that in the volunteer phase of our frost hardiness study program we will need freezers in Seattle, preferably at the Arboretum, or if space does not permit, at the Botany greenhouse of the University of Washington.

REFERENCES

FROM A COLLECTOR'S NOTEBOOK*

BRIAN O. MULLIGAN

brothers on Captain Cook's second voyage and described by them in 1776, almost two hundred years after Winter's discovery.

It is native principally in southern Chile, from Chiloe to Cape Horn, and in adjoining Argentina in Tierra del Fuego, as well as farther north on the east side of the Andes. The vernacular name in Chile is "Canelo," the Cinnamon tree, no doubt from the odor of the broken twigs or leaves.

In the British Isles it is usually only seen thriving in gardens near the coast, especially in the west of England, Scotland and Ireland where both humidity and rainfall are higher than on the east side and frosts are less frequent and severe. Trees up to 50 ft. in height are known, and those of 30-40 ft. are quite frequent.

The tree illustrated was found in bloom on a very showery day in mid-May at the Forestry Commission's famous arboretum at Westonbirt, Tetbury, in Gloucestershire (elevation 600 ft.) where it is evidently thriving among large native oak, yew and other trees and had reached about 24 ft. in height. The inflorescences are composed of several umbels of fragrant ivory-white flowers each an inch or more across, making a conspicuous display even at that time of the year.

It is regrettable that so far it has not been possible to establish this handsome evergreen in the Arboretum here, no doubt due to the origin of the material tried (California) or the severe early freeze of November 1955. Fresh seed or plants from the most southerly parts of South America would probably bring more success.

1. Drimys winteri var. latifolia

Drimys winteri is an evergreen shrub or tree, commonly called Winter's bark from the fact that it was first made known to Europeans by Captain William Winter, one of Sir Francis Drake's captains, on his voyage around the world. He found it growing near the Straits of Magellan in South American in 1578 and used it both for flavoring meat and as a valuable anti-scorbutic for his crew. Subsequently, it was collected by the Forster

*With this issue we begin a series of mini-articles of interesting trees and shrubs. Mr. Mulligan shares with us his photographic art as well as his extensive knowledge of plant material.

2. Magnolia sinensis

This species from western China, in the province of Szechuan, is one of the small section Oyama in the genus, composed of deciduous large shrubs having pendant or nodding white flowers after the leaves have opened, flowering in May or June. The others are M. sieboldii (M. parviflora) from Japan, M. wilsonii from western China, and M. globosa from Sikkim eastwards to Upper Burma and western China. All are valuable

*NOTEBOOK*
and desirable plants for gardens in the Puget Sound region, in general needing a well-drained soil and shade from afternoon sun in the summer.

The flowers are all fragrant, usually having contrasting red anthers. The best method of propagation is from seed.

M. sinensis was first found by E. H. Wilson in 1908 and introduced by him to the Arnold Arboretum. In suitable situations it is capable of growing 15 or more ft. high and up to twice that in width, so the plant needs room to develop. The photograph was taken in a garden in Co. Cork, Ireland, where the plant was growing in a shady, moist situation and was consequently of large dimensions. In a much drier and more sunny position in the Arboretum, where it has been since 1952, it is no more than eight or nine ft. high. It can tolerate calcareous soils.

3. Abutilon vitifolium

This is a very distinct and attractive large shrub from southern Chile, flowering in May, but unfortunately not quite hardy enough to withstand our colder winters without some protection. The wood and foliage are soft and never become hard enough to endure sudden or prolonged frosts, especially if accompanied by northeast winds.

However, the plant grows so rapidly up to ten or even fifteen ft. that if it can be given a sheltered corner against a wall facing west or southwest it may well produce those loose clusters of charming 3-inch wide, lavender colored flowers before some winter eliminates it. There is also a white flowered variant and a very free flowering pale lavender selection named 'Veronica Tennant'. This species is easily and best raised from seeds but can be propagated by cuttings if necessary for a particular form. Near the ocean it should be quite successful since it has a good reputation for standing up to wind, despite the soft looking foliage.

In the Arboretum here three plants were set out in the Cistus section, June 1967, sheltered on the
north side by mature evergreen trees. They flowered a year later, but by 1971 only one plant remained and none by 1973. Cold weather during those winters, especially 1969-70 and 1972-73, gradually removed them.

The photograph was taken on May 9, 1975, in a garden in North Devon, England; the plant was growing against an old brick wall.

4. *Sorbus esserteauiana*

Among the numerous species of mountain ashes (genus *Sorbus*) described from western China this century, *S. esserteauiana* is one of the more distinctive, by reason of the larger size of the tree itself, 35 to 40 ft. or even more in height, of the leaves with conspicuous stipules and as many as seventeen coarsely toothed leaflets persistently hairy on the underside, and the large, many-flowered hairy inflorescences seven to eight inches across. *S. conradinae* is a synonym of this species.

In the fall and early winter they heavy corymbs of small bright red fruits are most conspicuous and decorative, but because of its size it is not a tree to be recommended for small gardens — even if it were available in local nurseries.

This species was found by E. H. Wilson in western Szechuan, China, in 1907, and introduced by him. Seeds were received at the Arboretum under this name in 1947 from a nursery in England but the plants raised from them proved to be hybrids although possessing some characters of the species. One tree remains in the *Sorbus* collection which in 1974 was 20 ft. high. The fruits ripen in October and are less than $\frac{1}{2}$ inch in diameter. Species of *Sorbus* appear to hybridize so easily in a mixed collection that propagation by budding or grafting seems essential to secure plants true to name.

This particular plant was found in the famous garden at Mount Usher, Co. Wicklow, Ireland, in May 1975.

5. *Telopea truncata*

This evergreen shrub or small tree, the Waratah of Tasmania, is found wild only in that Australian state, and in fact all four species of *Telopea* are native to Australia. It is capable of growing up to 25 ft. or so in height but in cultivation is usually seen as a shrub of eight to ten ft., although in Ireland and the south of England it has attained at least 18 ft. In Tasmania it occurs in mountain forests from 2000-4000 ft. elevation, but when photographed in May 1975 was thriving in a garden in Co. Dublin, Ireland, very close to the coast and certainly within a maritime type of climate.

*Telopea* belongs to the large family *Proteaceae* which contains more than 60 genera and about 1300 species of mostly woody plants from the southern hemisphere (South America, South Africa, Australasia to eastern Asia). Amongst them are the *Protea* species and silver tree (*Leucadendron*) of S. Africa, the Chilean fire-bush (*Embothrium coccineum*), and the silky oak of eastern Australia (*Grevillea robusta*) which grows successfully in Santa Barbara, California.

The leaves, as can be seen from the photograph, are oblanceolate, entire, and 5-6 ins. long,
Flower heads of Telopea truncata in Co. Dublin, Ireland.

Young leaves unfolding on Sorbus hedlundii in Ireland.

3/4 to 1 inch in width, dark green in color. The bright red to crimson flowers are crowded into a congested raceme at the ends of the shoots and are extremely decorative since all open at the same time, although not making such a vivid or extensive display as an Embothrium in flower. A yellow form is also known. The plant apparently grows well in the south of England where rhododendrons flourish so would probably succeed also in the Puget Sound area in some of the warmer and more sheltered locations. It evidently prefers acid soil conditions with plenty of moisture during the growing season.

Since it flowers in December and January in Tasmania it is cut and used there for Christmas decorations. Plants imported to the Arboretum from England in 1950 and 1951 failed to survive; the latter from the effects of fumigation upon arrival. Propagation may be either by seeds or cuttings but is not easy by either method.

6. *Sorbus hedlundii*

The mountain ashes are basically divided into two sections — those with pinnate leaves like the common European mountain ash, *S. aucuparia*, and those having only lobed or serrated leaves, of which the white beam tree, *S. aria*, also native in Europe, is a good example. Both groups are well represented in the parks and gardens of Europe and deserve much more use here for their value in flower, foliage and fruit, as well as their general hardiness in this climate.

*Sorbus hedlundii* is a rare and attractive member of the latter group, as the photograph clearly shows, native in the eastern part of the Himalaya range from eastern Nepal to Bhutan. The underside of the leaves is completely covered with a thin coating of silver-white hairs, but rusty-brown on the prominent veins, making a most unusual and delightful contrast. The leaves when mature may be 7-9 inches long, 3-4 inches wide, and are finely serrated. The rusty hairs continue on the inflorescence, providing a useful...
character for distinguishing this species from the other Himalayan white beam, Sorbus cuspidata. The white flowers are borne in rather tight clusters at the ends of short twigs.

S. hedlundii appears to have been first collected by J. D. Hooker in Sikkim, about 1848-49, but apparently was not introduced into cultivation until early in this century. It was found growing in one of the older Irish gardens prior to World War II. Seed was obtained for the Arboretum from another Irish source in 1961 and one plant is now growing in the nursery from this origin. It is hoped that it will turn out to be as handsome in foliage as its parent.

The photograph was taken in a garden in Co. Kildare, Ireland, some forty miles west of Dublin, in late May, 1975.

7. Richea scoparia

This is a small genus of only ten species, nine of which are confined to Tasmania, the other extending to Victoria in Australia. They are placed in the family Epacridaceae, which is closely related to Ericaceae, and only differs from it in comparatively minor details, almost entirely replacing the latter in Australasia. Several species of Cyathodes or Leucopogon are cultivated in the Puget Sound region and of Epacris in California.

Most of the plants in this family are small evergreen shrubs of varying sizes, occasionally small trees. The foliage is often heath-like, or even resembles that of some conifers. Flowers may be either axillary or terminal and are usually tubular in shape.

In the genus Richea they remain closed, in the shape of a small conical cap; the color may vary from white to pink, orange to red. The plant illustrated was photographed in the National Botanic Garden, Glasnevin, Dublin, where it is now about five ft. across and three ft. in height, growing on a slight slope in the rock garden fairly well sheltered by surrounding trees, shrubs and rocks. The date of planting is unknown to me but it must probably have been prior to the Second World War, judging by its present size. The dense racemes of orange flowers surmounting the stiff, almost Araucaria-like foliage form a most unusual combination. I was informed that this particular plant has never produced viable seeds, so presumably is a self-sterile individual.

Richea scoparia grows naturally in the mountains of central and southern Tasmania, where in sheltered places it can attain ten ft. in height but in windy and exposed sites only two to three ft. It was introduced to cultivation in England by the late H. F. Comber in 1930. Plants from this source flowered by or perhaps before 1939.

Some years ago this Arboretum obtained a plant from Mr. Carl S. English, Jr., of Seattle. This was grown in a cool greenhouse for several years but subsequently lost. It would be well worth the effort to try and reintroduce this uncommon and very unusual plant from Tasmania.

Inflorescences of Richea scoparia at the National Botanic Garden in Dublin, Ireland.
U. of W. Arboretum Classes—Winter Quarter-1976

PLANT FINDING WITH AERIAL PHOTOGRAPHS. Peter Harvard, photointerpretive specialist, will teach this class. Designed for the novice, the class will include principles of map reading, photo-interpretation, land navigation, and plant community ecology. Students will use maps and photographs to locate interesting plant communities in western Washington for botanic study in the field. Equipment furnished; a number of maps and photos provided for class exercises and later personal use. Class will include one all-day field trip. Class limited to 20; meet in 302 Anderson Hall on campus. Wednesdays, Jan. 14, 28, Feb. 11, 25; 7:30-9:30 p.m.; and Saturday field trip (date to be determined by class). 4 sessions + field trip, $20.

BIRD IDENTIFICATION FOR BEGINNERS. Marilyn D. Hatheway, experienced birder, will conduct a field class on land birds commonly found in the Arboretum and waterfowl on Lake Washington. Binoculars required; appropriate clothing and boots recommended. Class limited to 15; meet at Arboretum office. Saturdays, Jan. 24, 31, Feb. 7, 14, 28, March 6; 9-11 a.m. 6 sessions, $15.

WINTER PROPAGATION. Mr. Richard van Klaveren, Arboretum propagator, will teach techniques for propagating woody plants, including cutting and seeding. Materials and plants furnished. Arboretum greenhouse; class limited to 15. Saturdays, Jan. 17 & 31; 9 a.m.-12 noon 2 sessions, $12.

GRAFTING ORNAMENTALS. Mr. van Klaveren will instruct in techniques for grafting woody plants. Materials and plants furnished. Arboretum greenhouse; class limited to 15. Saturdays, Feb. 7 & 21; 9-12 noon. 2 sessions, $12.

HOUSE PLANTS. Mr. van Klaveren will discuss indoor plants. Topics covered include identification, techniques of propagation, and care. Materials and plants furnished. Arboretum greenhouse; class limited to 15. Saturdays, March 6, 13, 20; 9:30-12 noon. 3 sessions, $15. (continued on p. 15)

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (July 1, 1975 through November 30, 1975):

Contribution — Mrs. John H. Owen. Sustaining — Helen C. Baxter, Mrs. Michael E. Mire, Mrs. Thomas J. Kornell, Mrs. Walter Supersmith, Dr. Michael A. Leff, Mrs. Fred A. Maxam, Mrs. David R. S. McColl, S. M. Nelson, Mrs. L. Douglas Peterson, Mrs. Walter E. Rogers, Mrs. Esther Wagner. Annual — Mrs. Ruth Audette, Edwin W. Barton, Mrs. Charles A. Berg, Mrs. Ronald Bergman, Mrs. William Bergman, Mrs. Otis F. Bienz, Mrs. Thomas P. Binford, Mrs. Palmer Bissell, Mrs. Ruth Boone, Mrs. Staton F. Brandt, Mrs. C. S. Brandt, Mrs. Daniel Brooks, J. B. Brotherton, Mrs. John Buttrey, Mr. & Mrs. Neil C. Christensen, Nile Clark, Mrs. Gerald Coma, Mrs. William W. Converse, Mrs. Chester Cook, Mrs. Dwayne E. Copple, Mrs. H. R. Crawford, Mrs. A. G. Daubert, Mrs. William R. Davison, Mrs. Marion Davis, Mrs. Craig R. Dodel, Kelly L. Dodson, Mrs. Richard A. Doss, Mrs. Leslie C. Erickson, Mrs. Gordon Faulkner, Mrs. Jack R. Fletcher, Mrs. John P. Florenzen, Mrs. Nancy L. Fotheringham, Miss Janiss Furry, Mrs. John E. Galimian, Mrs. Shanta Gangolli, Mr. & Mrs. Don Gibbs, Mrs. Ken Gedof, Mrs. Lawrence Glosten, Mrs. John F. Gorman, Mrs. R. M. Griffin, Mrs. Henry Hanson, Mrs. William Henshaw, Mrs. G. Allen Holloway, Jr., Mrs. Ray Horton, Mrs. Lee Howard, Paul L. Illg, Mrs. Terry D. Jackson, Mrs. Richard F. Janke, Mrs. William F. Johnston, Mrs. C. Thomas Jones, Mrs. A. Frank Kandt, Jr., Georgia Kruse, Mrs. Norman V. Laurich, Mrs. Albert J. Lazzar, Gail Livingston, Mrs. James Louy, Mrs. Wayne Loverich, Mrs. Richard Lyons, Gary K. MacPherson, Mrs. James J. Mcardle, Mrs. Robert K. McComb, Sandra McNeil, Mrs. Grace Miller, Mrs. Patrick S. Morris, Mrs. Hubert Moseley, Mrs. Richard R. Neklason, Mrs. George Newman, Mrs. James W. Parker, Mrs. W. P. Philbrick, Mrs. Phillip J. Richards, Mrs. W. A. Rockenfield, Mrs. Kathleen A. Rogers, John Rozdilsky, Mrs. Donald M. Russell, Mr. & Mrs. Thomas Ruthford, Mrs. Rudolf Schaad, Mrs. Granville Smith, Mrs. Henry Ladd Smith, Mrs. William W. Staley, Jr., James L. Stanard, Sara Mae Stonebaugh, Mrs. Stephen L. Stroh, Mrs. F. W. Teepe, Mrs. Robert L. Thompson, Mrs. Guy Townsend, Mrs. Harry Truman, Mrs. Peter G. Vanderpool, Mrs. Richard L. Vining, Mrs. George Van Waters, Miss Alice J. Wanamaker, Mrs. J. F. Watson, Mrs. Gene G. Winn, Mrs. D. G. Woodcock, Jr., Mrs. John Zamelis, Mrs. George P. Zonoff.

We are also grateful to the following who have increased their dues to: Supporting — Mrs. Alexander Fisken. Contribution — Mrs. Howard C. Eddy, Mrs. Gordon B. Mulder, Mrs. George Ryan. Sustaining — Mr. & Mrs. Douglas R. Bailey, Mrs. Mary H. Douglas, Mrs. B. P. Henry, Major & Mrs. Joseph W. Marshall, Mrs. Edward G. Morgan, Mrs. Clarence C. Pearson, Mrs. C. E. Vorobik, Mrs. William L. Wilton.
BASIC GARDEN MAINTENANCE. Mr. Chico Narro, expert nurseryman, will conduct a class on basic gardening techniques. Topics to be covered include soil preparation, planting, fertilizing, mulching, pruning, and seasonal care of plants. Arboretum greenhouse; class limited to 15. Saturdays, Feb. 14, 21, 28, March 6, 13, 20; 1:30-3:30 p.m. 6 sessions, $15.

PRUNING ORNAMENTALS. Mr. Narro will demonstrate techniques of pruning trees and shrubs. Arboretum greenhouse; class limited to 30. Saturdays, March 20 & 27; 9:30-11:30 a.m. 2 sessions, $5.

To register for the above classes, send check made payable to the University of Washington to: Arboretum Classes, Anderson Hall (AR-10), UW, Seattle 98195. For information, call 543-2730.

THE LIFE OF TREES—AND THEIR ROLE IN OURS. Dr. R. F. Stettler, Professor of Forest Genetics, will teach this 9-session course through the Non-Credit Evening Class program at the University. Intended for the layperson, the class is aimed at a better understanding of trees, their biology, their importance in our environment, and their significance in our life. Thursdays, Jan. 15 through March 11; 7:30-9:30 p.m.; $30.

Registration information for this class is in Spectrum, available by calling 543-2590, or call Non-Credit Evening Classes, 543-8037.

Edmonds Community College—Winter Quarter-1976

GREENHOUSE MANAGEMENT (Horticulture 135-3 credits). Whether you have a large greenhouse, small one, or many there are basic operating procedures everyone should know about heating, cooling, watering, fertilizing, carbon dioxide and so on. Types of structures and materials are also looked into. Greg Paulson, Manager of Furney's Nursery (Midway). (Tues. 6:30-10:20)

SPRINKLER DESIGN (Horticulture 185-3 credits). Advanced design concepts having to do with methods and applications chosen to design, bid, and construct large and small irrigation systems. If you have not had Sprinkler Repair (Horticulture 184) there is a pre-test which must be taken. (Tues. 6:30-10:20)

GRAFTING (Horticulture 132-2 credits) Would you like to make your own semi-dwarf apple trees? Add more varieties to present fruit trees? You'll get a chance to try your hand on projects like these plus many more. Enrollment limited so register early. Taught by Marvin Black, Arborist of Seattle City Engineering Division. (Saturdays, Feb. 14-March 13, 1-4:50 p.m.)

SPRAYS — THIS IS FOR YOU! FUNDAMENTALS OF PESTICIDE APPLICATION (Horticulture 155-5 credits). Need to know the laws? How to calibrate equipment? How to do some basic repairs and maintenance? This and more will be covered. A good brush-up or a first time course for new men. Taught by Bud Johnson, manager of Washington Tree Service. (Thurs. 6:30-10:20 and four Saturday afternoons: Feb. 14-Mar. 6)

PRUNING (Horticulture 170-2 credits) A course for everyone. The methods, the tools, the dressings, the timing, the rationale and requirements of various types of plants. What more could you ask for? Esiquiro Narro, foreman of the grounds for the Arboretum. (Saturdays—two 5-week sessions. Section RA: Sat. 1-4:50 Jan. 10-Feb. 7 — for night I.D. students; Section RB: Sat. 8-11:50 Feb. 14-March 13 for daytime students and all others).

WINTER PLANT IDENTIFICATION (Horticulture 107-5 credits) Needleleaf Evergreens and the major trees and shrubs in the deciduous state are named and identified. Landscape usage is also discussed. Wally Bubalis, staff. (Mon. 6:30-9:20, Sat. 8-11:50 a.m.)

DAY COURSES — Landscape Design, T-Th 1:00-4:00
— Interior Landscape, W 1:00-5:00
— Winter Plant I.D., Filled
— Soils, Filled
One of my favorite plants at this season is the Christmas Rose, (*Helleborus niger*). This perennial herb is one of a family of Helleborus with the uniqueness to proudly present a succession of sparkling two to four inch pure white flowers from December to March, brightening the grayest days of winter. Each flower lasts a month or more. Rain, sleet, frost or snow does not mar its bold beauty.

The pearly white blooms resembling anenomes in form, are centered with prominent yellow stamens, and sturdily arise above substantial leathery divided foliage, of which the seven to nine leaflets are each notched. Unlike other perennials, this little gem of a plant retains its attractive, clean looking green leaves the year around, growing to a one and one-half foot shrublet.

Not only is the Christmas Rose extremely dependable and hardy in our coldest areas of Puget Sound, but it is practically care free. It deserves a carefully planned location in partial shade, where it can remain permanently, to naturalize with a tremendous variety of other shrubs, such as evergreen English ferns, wild ginger, hardy cyclamen, azaleas or epimediums.

This Helleborus is grown from seed successfully, and a two year old plant should be sturdy, with a vigorous root system, and can produce some flowers even at this young age. It is best planted in a soil rich in humus, moist but well drained, neutral or slightly alkaline; with the crown placed about one inch below the surface. An annual spring mulch of composted steer manure is beneficial. Older plants will reseed, but do not lend themselves to division.

An additional bonus of growing this fine plant, is to cut the flowers for indoor arrangements, when cut, the sturdy stems need to be seared with a match or candle flame.

I enjoy so much the versatility of this plant. A group of these, now well established, are tucked in pockets between large grey slabs of mossy mountain rock, above the driveway and herald my arrival at my Hoods Canal property, boldly displaying their blooms for four months.

*HELEN C. JOHNSON*, Homestead Nursery

The original Garden Book is a memorandum book of 158 leaves, most of them blank, but thirty-three filled with Jefferson's notes of his garden activities and his plans for developing the grounds and gardens of his home at Monticello and, later, at Poplar Forest. To this slight framework, Professor Betts has added many explanatory notes, letters and extracts of letters to and from Jefferson, extracts from several other memoranda books and various loose papers on the subjects of gardening and farming.

Each year, from 1766 to 1824 (two years before the death of Jefferson), forms a chapter of the book, presenting first the entries in the Garden Book for that year, followed by explanatory notes, letters and extracts of letters for that year, and finally extracts from other sources. The first note is always a brief summary of the principal occupations of Mr. Jefferson during the year. Additional notes identify plants or people mentioned, or provide historical background.

The Garden Book seems to have been kept at Monticello. There are no entries for the years 1784 to 1789 when Jefferson was in France, none for the years 1796 to 1801 when Jefferson was in Philadelphia as Secretary of State and Vice-President, and none for a scattering of other years. However, these years are well represented by the notes, letters, and extracts from other writings, so that there is a continuous narrative of the life and times of Thomas Jefferson as gentlemen farmer, gardener, and landscape designer.

The first entry in the Garden Book, made March 30, 1766, when Jefferson was not quite twenty-three years old, records "Purple hyacinth begins to bloom." All eight entries made this year refer to the blossoming of flowers. Two years later, four entries were made in the Book, in early spring, all of them relating to peas. The dates of planting, blossoming, and harvesting of peas are regular entries through most of the years. It was a custom among the older gentlemen of Jefferson's neighborhood for the first one among them to have peas for the table to announce it by inviting the others to dinner. The honor was usually achieved by George Divers. One year Jefferson had peas first. When his family reminded him that it was his right to invite the company, he said, "No, say nothing about it; it will be more agreeable to our friend to think that he never fails."

One of Jefferson's purposes in keeping a record of the garden activities was to make a comparative study of the blooming, the fruiting, the time the different articles came to the table, and the time they disappeared. Beginning in 1809, a regular feature of the Garden Book was a calendar of the vegetable garden year, tabulating the varieties of seeds, where and when they were planted, and the date the produce came "to table." One entry records that the average number of strawberries per plant was twenty and that a hundred berries were needed to fill half a pint. Another reports another gardener's estimate of the number of cucumbers required to supply the needs of the family from one season to the next.

The Garden Book shows Jefferson's delight in growing plants and trees, his interest in efficient management of his gardens and farms, and his concern for the conservation of the soil. He devoted much thought and study to crop rotation as he searched for the best method of preserving the fertility of the soil while providing maximum production. He was an enthusiastic promoter of the system of contour plowing developed by his son-in-law, Thomas Mann Randolph. Since there were great quantities of earth to be moved in leveling and building cellars and roads, he made observations to determine whether the one-wheeled barrow or the two-wheeled barrow was more efficient.

On March 4, 1809, in his sixty-seventh year, Jefferson retired from public life, later describing himself as an old man but a young gardener. He had been preparing for this eagerly awaited day for more than two years. His notes in the Garden Book in former years had been generally sparse, but his enthusiasm for his new career is evident in the volume of notes, plans, and lists entered in the Book as he filled his garden and orchard with an amazing number of vegetables, berries, and fruits. He wrote "No occupation is so delightful to me as the culture of the earth, and no culture comparable to that of the garden."

Jefferson once wrote to his daughter, "there is not a sprig of grass that shoots uninteresting to me." Wherever he went he observed landscape design, ornamental trees and flowers, and fruit trees. He collected seeds, cuttings, or plants for Monticello or for introduction to American gardens and farms. English gardens inspired his landscaping at Monticello. After a trip through southern Europe he tried to introduce olive trees in South Carolina. He collected as many varieties as he could of the seeds of dry land rice believing that its culture would be less threatening to the health of the growers who were producing rice in low wet lands. In France he developed a warm friendship with Mme. de Tessé, aunt of the Marquis de LaFayette and a connoisseur of gardening. For years they exchanged letters on horticulture as well as plants and seeds.

He was especially pleased with the sweet currant and the Snowberry bush which Lewis and Clark brought back from the Pacific coast. Seeds and plants came to him from everywhere and he generously shared these with seedsmen, nurserymen and other farmers.

Jefferson's knowledge of farming and gardening grew out of his own keen observation, his exchange of ideas with other farmers, gardeners, and nurserymen at home and abroad. In his library there were almost two hundred books and pamphlets on agriculture, gardening, and botany.

Of the many facets of the Jefferson personality — lawyer, political theorist, diplomat, statesman, scientist, educator — the one which seems most appealing and human, the one which he probably liked best himself is that of gardener. Culture of the earth had been one of his constant joys. The theory of this culture had fascinated him though he was never able to apply it with any great profit.

This book was originally planned for publication in the bicentennial year of Jefferson's birth. It is certainly appropriate that it should be reprinted at this time of the bicentennial of the birth of the nation which he so ably served.

LEOLA OLMSTEAD MARSHALL
WILDFLOWERS 2 SAGEBRUSH COUNTRY, by Ronald J. Taylor and Rolf W. Valum, The Touchstone Press, Beaverton, Oregon, 1974. $7.15

This flora describes some 200 species of flowering plants by color photographs and a short descriptive paragraph.

Although the book is quite comprehensive, the plants described are for the most part the obvious and the most colorful. The photographs, by and large, are excellent and it should prove relatively easy to connect a living specimen with its photograph, particularly while in flower. There are very few where there might be some confusion.

In addition to the colored photographs, there is a key for the identification of represented families; a Glossary and lined drawings which illustrate flower parts; inflorescence; leaf types and symmetry.

The index is by family, plus a few relatively unique species. However, there is an appendix which lists all species represented in the book by Vegetative Zone. Page numbers, however, are not indicated in this list. The “Sagebrush Country” is broken into ecological zones such as standard-type zone; lithosol zone (a thin-soil zone of basaltic lava flow area); sand dune zone; talus zone; meadow zone; and saline zone.

In addition, the book is particularly valuable in describing the ecological relationships of this type of area. Not only is there an excellent introduction to “Sagebrush Country” as a major ecological area, but many of the plants are described as to the kind of ecosystems in which they are found; their response to overgrazing; the interrelationships of neighboring species and our unique adaptation of particular plants for survival.

Of the two co-producers of the book, Dr. Ronald J. Taylor is a professor of Biology at Western Washington State College, and an outstanding teacher of Systematic Biology and Plant Geology. He has spent most of his life in or near sagebrush country and each year takes his students on field trips to that area.

Rolf W. Valum is chairman of the Mathematics Department at Sehome High School and also is a member of the Technology Department of Western Washington State College. He has a keen appreciation of the beauties of nature and is an excellent photographer.

This should prove to be a helpful book for the serious amateur student of this kind of area, as well as an excellent reference for the casual but interested “Sunday driver botanist” while in “Sagebrush Country.”

JOHN PUTNAM

Sagebrush has long been known for the beauty of its location and for the impetus given to horticulture by its early residents. Estates of beauty with outstanding plantings were developed. This book is valuable in that each tree and its description includes data listing the garden or park in which specimen trees may be found.

The ACACIA, Leguminosea, Pea Family is to be found in many gardens, along lanes and along highways. It is used extensively as a screening shrub. Twenty different varieties in all may be found. With its fragrant, golden yellow flowers appearing in the spring, it is a favorite shrub. Two specimens are illustrated in color; Acacia glesuens, flowering branch and Acacia podalyriaefolia.

EUCALYPTUS, Myrtaceae, Myrtle Family has over fifty different varieties described. It is a tall tree often reaching seventy five feet. A towering specimen of Eucalyptus cladocalyx or Sugar Gum is in Mission Park.

The FICUS, Pig Moraceae, Mulberry Family grows in great numbers in this area. It is a large genus containing some 600 species of evergreen or deciduous shrubs and trees. The Ficus macrophyllea or Moreton Bay Fig is a spectacular tree with one of the largest in this country planted in 1877 near the Railroad station. A handsome specimen is in the garden of my daughter, Mrs. Le Roy Weller in Carpinteria. It was a part of an old estate owned by the Robert Louis Stevenson family and is taller than a house.

One of the most prevalent trees in this area is the PALM, Palmae, Palm family. Some are native to Mexico, Argentina, Paraguay and Australia. It is a beautiful tree of countless varieties. Phoenix or Date Palm, native to Africa and Asia is the feather palm common by so called The Canary Island Date Palm. Phoenix canariensis has many specimens in Santa Barbara, on the Alameda Plaza and Courthouse Grounds.

The aforementioned are just a few of the trees and shrubs described in TREES OF SANTA BARBARA. It is a truly fascinating book with colored illustrations of many varieties and as the authors state it is designed for those who wish to learn more about the trees of the Santa Barbara region. I have often visited in this area and this book has enhanced my enjoyment.

ROSAMOND P. ENGLE


This book is profusely illustrated, many from old sources, and has maps and an extensive bibliography. The author is a graduate of the U. of Glasgow with degrees in history and economics and has had some years of experience as an advertising and publishing executive. Since 1962 she has been engaged in historical research, with special reference to social conditions and influences that have shaped them. The book is exceptionally timely with our current food crisis round the world. The account is original and absorbing. To quote:

The mid-1800's saw much food adulteration. — Tea had also been counterfeited on a grand scale in the days when it had to be brought all the way from China and was liable to a heavy excise duty. There was a flourishing trade in “smouch,” a substance made from leaves of the ash tree, dried and curled on copper plates and sold to tea merchants at a few pence per pound for mixing with real tea. In the last decade of the 18th century this trick had become so common in England that an Act of
Parliament condemned it not only for diminishing the revenue, causing "the ruin of fair trade, and the encouragement of idleness," but for the wholesale "destruction of great quantities of timber, wood and underwoods."

In an epilogue, the author conjectures as to what might be done to solve food demands for the expanding population of the future.

RUTH VOROBIK

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Editor's Note:
Both indexes have been prepared for the BULLETIN by Linda Parlin, a graduate student at the University of Washington.

U. of W. Arboretum Foundation presents
Author ERNESTA D. BALLARD
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## REMEMBER

Every TUESDAY — Greenhouse Day; Every FIRST FRIDAY — Herbarium Committee; Every FOURTH WEDNESDAY — Arboretum Explorers