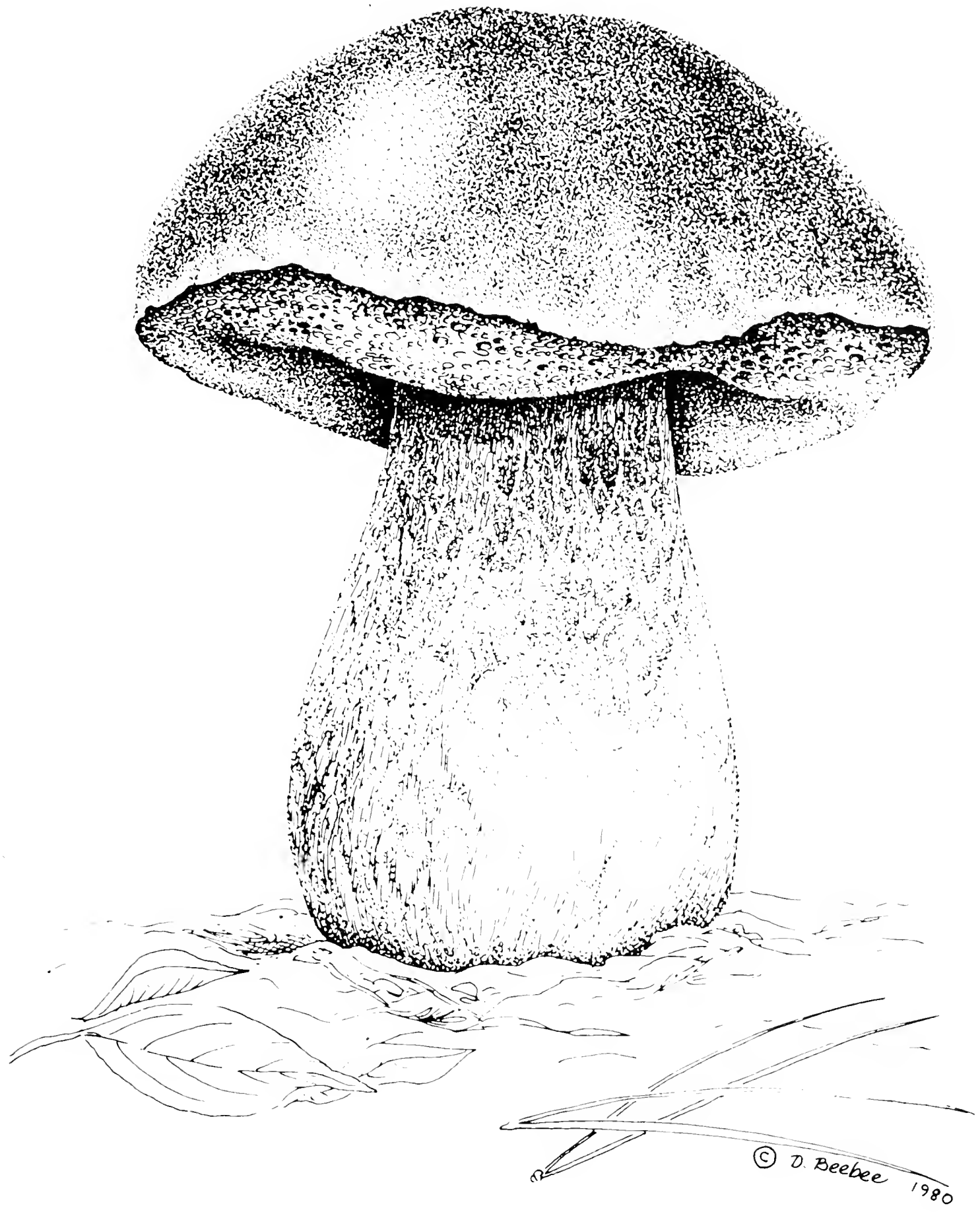


University of Washington

ARBORETUM BULLETIN

Published by the Arboretum Foundation

Autumn 1981, Vol. 44, No. 3

Concerning this issue . . .

As befits an end-of-autumn issue, we feature the processes of decomposition and decay, and the subsequent springing up of fungous growths from the dark earth.

Two articles deal with the earth itself—one concerning soil as a haven for plants, the other discussing the return of plant debris to the soil. While Drs. Gessel and Zasoski characterize local soils, outline solutions for common problems encountered in the Pacific Northwest, and explain the mechanisms involved in nutrient supply, Emily Mandelbaum summarizes soil enrichment through composting.

From humus to fungus with Miriam Rice, who describes common autumn mushrooms valuable for dyeing wool. Of a similar hue are Jean Witt's discoveries of native northwestern plants and lichens appropriate for the dyepot.

Don't miss Jack Poff's tour of the fascinating Berry Botanic Garden in Portland, Oregon. Mrs. Berry's garden clearly merits an early spring visit! In addition, the Lohbrunners have shared with us their memories of Rae Berry herself.

Finally, Mary Alice Sanguinetti furnishes another reminder of spring-to-come in her account of the alpine azalea, *Loiseleuria procumbens*.

SUSAN LIBONATI-BARNES

The ARBORETUM BULLETIN is 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, Seattle, Wa. 98195 or by calling 206-325-4510. Annual subscriptions are available to educational institutions for $5.00. Articles on botany and horticulturally-related subjects written by professional and amateur botanists, horticulturists, educators and gardeners are welcomed. No part of the BULLETIN may be reprinted without the authority of the Arboretum Foundation. Typesetting and lithography by Frayn Printing Company.

University of Washington

ARBORETUM BULLETIN

AUTUMN 1981, VOLUME 44, NUMBER 3

TABLE OF CONTENTS

COVER

Boletus edulis, the king bolete,
is valued for its dye properties as well as for its
gastronomic excellence (see page 11).

Drawing: Dorothy C. Beebee

Arboretum Foundation Classes

The following courses are offered to all Foundation members. This year we are also offering Arboretum Beginners' classes. These are introductory courses designed for those with little or no knowledge in the subject. Checks should be made payable to the Arboretum Foundation, marked with the name of the desired class, and sent to the Arboretum Foundation Office, University of Washington Arboretum, Seattle, WA 98195. Further information is available at 325-4510.

DYE PLANTS AND DYEING. Instructor Jean Witt will give two classes on dye plants and methods of dyeing. The first meeting will include a slide presentation and a discussion of plants and of suitable dyeing materials. In the second class dyeing methods and equipment will be demonstrated. Dye materials will include common lichens, leaves and roots. Mondays, February 22 and March 8, 10 AM-noon, in the Arboretum meeting room. Maximum enrollment 20; fee $5.

VEGETABLE GARDENING. Two evening lectures on vegetable gardening will be given by Mr. Francis Dean of the Cooperative Extension Service and the Pea-Patch Program. Mr. Dean will cover soil preparation, seed and plant selection, maintenance, pest control, and harvesting. Wednesdays, March 10 and 17, 7-9 PM, at the Museum of History and Industry, 2131 E. Hamlin St., Seattle. Fee: $5 per person, or $7.50 per couple. (Please enroll before March 1.)

AT INTRODUCTION TO RHODODENDRONS AND AZALEAS, FOR BEGINNERS. Speaker: Mary Ellen Mulder. Thursday, February 18, 10 AM-noon, in the Arboretum meeting room. Limited to 20; fee $3.

PRUNING FOR BEGINNERS. This class will cover tools, books, and pruning techniques. Instructor: Cora Gardiner. Thursdays, March 25 and April 1, 10 AM to 11:30 AM, in the Arboretum meeting room. Limited to 20; fee $5.

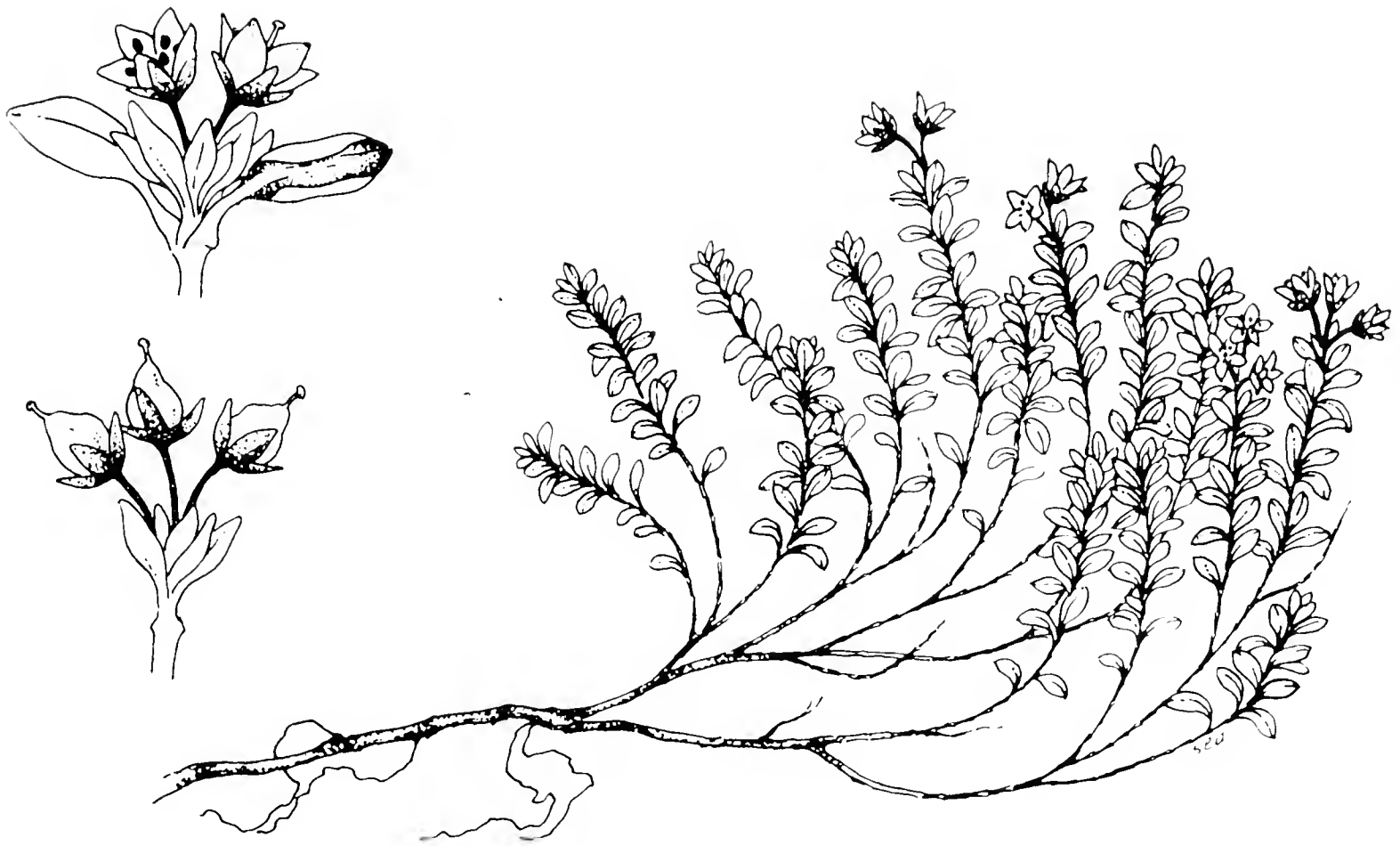
Announcements from the Unit Council

Don't miss the HORTICULTURAL EXHIBITION at Southcenter Mall, March 20 and 21. There will be exciting displays and demonstrations, and all ideas and volunteers are most welcome. We hope to increase the number of tables from 45 to 70 this year. We would love to have your help! Call Suzanne Wilson, 823-4972.

The BULB SALE in October was very successful thanks to the hard work of Jeanne Gardiner, Jane Rogers, and their helpers.

Membership in the Arboretum Foundation is now 2,987. Thirty-four new members were added in October due largely to the activities of the Bulb Sale. Welcome!

SHEILA TAFT



Loiseleuria procumbens, the alpine azalea. Courtesy of the Northwest Ornamental Horticultural Society.
Drawing: S. Dickman

The Alpine Azalea

*MARY ALICE SANGUINETTI**

Although interest in growing alpine plants and in rock gardens began in England in the seventeenth and eighteenth centuries, it did not spread to the United States until the early 1900's. Numerous books have been written about the culture of alpine plants, and alpine and rock garden societies have been established in many countries.

Many ericaceous plants, needing fairly acidic, moist soil, are represented in the alpine flora. Their frequently evergreen habit and small, engaging flowers make them particularly charming. Among them is the alpine azalea, *Loiseleuria procumbens*, a compact woody shrub with pink or white azalea-like flowers blooming between June and August. *Loiseleuria procumbens* (formerly called *Azalea procumbens*, *Chamaecistus procumbens* and *C. serpyllifolia*) was named in honor of the French botanist Jean-Louis Auguste Loiseleur-Deslongchamps, and appears to have been cultivated since the 1800's.

Loiseleuria has a circumboreal distribution in both arctic and alpine locations on the Alaskan tundra, in the Scottish highlands, in montane Europe and even in the state of Washington. The main areas in which *Loiseleuria* occurs are North America and Greenland, with a more limited distribution throughout Europe and Eurasia, including northwestern Russia, Siberia and Japan. In Alaska it grows on well-drained rocky sites up to 1500 m. On the tundra in the Bristol Bay region it is often associated with *Dryas octapetala*, forming delicate mosaics of pink and white flowers in June. In Europe

*Mary Alice Sanguinetti, editorial assistant for the UW Arboretum Bulletin, is a librarian. She became acquainted with *Loiseleuria procumbens* while living in the Bristol Bay region in Alaska.

and northern Britain *Loiseleuria* grows on dry meadows and heaths with acid soils from 1500 to 3000 m, or on granite formations.

This species has been thoroughly studied at Mt. Patscherkofel, Austria where it sometimes dominates communities near tree line, such as an extremely windswept west slope with well-aerated acid soil. Despite the drying effects of cold windswept habitats with little or no snow cover in winter, *Loiseleuria* survives. The leaf water content of this evergreen remains above the lethal level throughout the winter. Transpiration rates are low all year, helping to conserve plant water, and in late winter while the soil is still frozen, shallow adventitious roots can take up meltwater.

At high elevations where certain species of the Ericaceae are very common, nitrogen can be especially difficult for plants to obtain. Mycorrhizal associations, in which the roots of a green plant are enveloped by the thread-like hyphae of certain fungi, appear to be particularly important in the growth of *Loiseleuria* in stressful environments. Because the fungus is more efficient at gathering mineral nutrients from the soil than is the green plant, the fungus can supply nutrients to the plant and receive sugars in return.

It has been shown that plant vigor is directly related to the extent of mycorrhizal infection. Where *Loiseleuria* is the dominant plant, it shows significantly greater mycorrhizal infection than other ericaceous plants (*Calluna vulgaris* and *Vaccinium uliginosum*) from the same site.

Loiseleuria's dense green foliage and small attractive flowers are most alluring to alpine gardeners. Although there are reports of varying success in its culture, Hitchcock describes it as an attractive ornamental, easily propagated by cuttings or layering. Plant growers in the Seattle area corroborate this opinion.

For more than twenty years Sallie D. Allen has been cultivating plants from Alaska and comparable regions with little difficulty. Several specimens were removed, with the roots intact, from the *Sphagnum* muskeg near Ketchikan, Alaska. The transplants were placed directly in the acid gritty soil of Mrs. Allen's Seattle garden. She prefers to make cuttings of *Loiseleuria* in May or June, including both new and old growth in each cutting. These she heels in on the cool north side of her garden, in peaty well-drained soil.

Mareen Kruckeberg's propagation method involves taking cuttings in October, November or December, treating them with a rooting hormone, and allowing them to form roots either in a cold frame or in a propagation chamber with bottom heat. By spring, when some roots have formed, the cuttings should be planted in a peaty soil and protected in a cold frame or shady location for at least one growing season (the summer in the Seattle area). The cuttings can be planted out in the autumn if they have added vigorous new growth during the spring and summer. Otherwise they should be protected through an additional winter. A sunny but not dry location with peaty soil is appropriate for *Loiseleuria*.

Layering, started in April, is another means of propagation. A sprinkling of sand beneath the branch and a layering pin are used. The branch is then covered with peat. The following year, the layering is lifted and placed in a deep pot and protected until autumn. Propagation by germination of seeds is also possible, but very slow.

In the Austrian alps *Loiseleuria* grows on soil generally poor in minerals, with a stony, sandy surface. British gardeners suggest a compost of leaf-mold, loam and coarse sand. The situation should be moist and sunny with good drainage, such as coarse acid soil on a north slope.

An unusual specimen of *Loiseleuria procumbens* grown by the British gardener, Mrs. Dawson, received a cultural commendation award for 1967 from the Alpine Garden Society of England. The plant was considered unique both because of its erect rather than prostrate habit, and because of the multitude of deep-pink flowers. Mrs. Dawson had found the plant above the village of Loen, Norway, in 1960. It

A mat of *Loiseleuria procumbens* growing with *Empetrum* on the Bristol Bay tundra. Photo: M.A. Sanguinetti

had been washed from the soil by water undercutting a path and was collected with roots. For several years she kept it in a pot plunged in a peat bed in semi-shade where it did not flower. In 1966 she placed it in a peat bed which was sunny until late afternoon and the plant responded by forming deep-pink buds. The soil consisted of peat, leaf-mold, sharp sand and good acid loam, and the plant was watered during dry weather.

Other British and American gardeners report that *Loiseleuria* does not flower freely in cultivation. In Seattle, however, flowering seems to depend upon the individual plant. Mrs. Allen, of Seattle, reports differences in leaf size, habit, flower color and amount of flowering among her plants. Those from near Ketchikan bloom every year. Several plants from the Mendenhall Glacier area near Juneau have much paler foliage, leaves half the size of the others, and white flowers. Neither a Japanese specimen, large-leaved with an open habit, nor an upright plant from Norway has thrived.

Success in growing *Loiseleuria procumbens* probably depends upon an open site with soil which is well-drained and has sufficient humus for the formation of adequate mycorrhizal association. *Loiseleuria* is an alpine plant which can be easily grown when given an appropriate situation, and it may reward the alpine gardener with a delightful carpet of pink flowers in the spring.

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Arboretum Foundation Horticultural Exhibit

Saturday, March 20, 10 AM—6 PM
Sunday, March 21, 11 AM—5 PM

Southcenter Mall

Come, and bring your friends to see displays of flowers, shrubs and trees to delight both the eye and the intellect.

Come, and work an hour or two; talk to the people who have gardening questions, or who are curious about the Arboretum.

Come, have fun, enjoy the displays, learn from the demonstrations. The displays will range from native plants to spring-flowering plants, from plants in containers to rock gardens. There will be various demonstrations, including pruning and propagation. For further information, call Suzanne Wilson, 823-4972.

Mushrooms for Color

*MIRIAM RICE**

illustrations by
DOROTHY BEEBEE

Dyeing with mushrooms yields an extraordinary array of subtle, beautiful colors—the whole spectrum of reds, oranges, yellows, greens, blues, purples and of course, browns, tans, grays and blacks.

Dyes traditionally have been extracted from the roots, leaves, stems and flowers of herbaceous plants, from bark and wood of trees, from lichens, and even from clay and earth. From a gland of the Mediterranean sea snail or Trumpet Shell near Tyre came the purple once only royalty could wear, and the most prized crimson was obtained from the cochineal insect. Only recently have the pigments obtainable from fungi burst upon the natural dyer's world in a glory of color.

Although the natural dyeing literature is replete with references to the use of lichens as a source of dye, only recently have there been such records of mushrooms. Brooks and Higgins include some fungi in their book *Gentle Dyes*, and Miriam Rice in *Mushrooms for Color* records the results of numerous dye experiments performed in a search for valuable dye fungi. The investigation has now spread to Sweden where Carla and Eric Sundstrom have assessed the dye properties of many northern European fungi. Their work on the chemistry of mushroom dyes will appear late in 1982.

By no means has the subject of dyes from fungi been exhausted. Many mushrooms have not yet been assessed for dye possibilities. In addition, because species of fungi are often limited to certain geographical areas, dyers can expect to find different useful fungi in different localities. *Hapalopilus nidulans,* the source of gorgeous purples, occurs commonly in Europe and in the eastern United States, but not in the Pacific Northwest, while many dye-worthy species of *Cortinarius (Dermocybe),* such as *C. phoenicius* and *C. semisanguineus,* are particularly prevalent here.

For the mycologist, dye color may yet prove to be a tool for the identification of closely related species such as those of the *Cortinarius phoenicius* complex. The pigments produced by these mushrooms are characteristic for each species, and are expressions of their different styles of body chemistry.

THE DYE PROCESS

Water, a dye source (the pigment in the mushrooms, in this case), a mordant (a chemical to enable pigment to bind to fiber), and the fiber itself are the necessary ingredients for natural dyeing.

Water

When purity of color and reproducibility of results are desired, distilled water is best, but in ordinary practice city water, private wells or running streams are suitable as long as the differing results are acceptable. Chlorine bleach, alkali, and metal salts such as iron or copper in the water supply darken a dye color or cause it to be more green. Such results no doubt were the precursors to controlled mordanting methods.

*Miriam Rice, who has been experimenting with dyes from fungi for many years, lives in the mushroom belt—Mendocino, California. The book *Mushrooms for Color* represents the culmination of her work, in collaboration with Dorothy Beebee, scientific illustrator.

Mordant

The Latin verb *mordere*—to bite—gives us our word *mordant*. Mordants are metallic salts which fix the pigment molecules to the fiber and in so doing can alter the color obtained. In the past, dyers noticed that copper, tin, or iron pots produced fibers of different colors although the dyestuff was the same. Today we use non-reactive enamel pots and five basic mineral salts to obtain consistent results.

Cream of tartar (tartaric acid or potassium bitartrate), a residue of wine-making, is added to most mordants to brighten the color. Glauber's salt (sodium sulfate) sometimes is added to distribute the color evenly and thus to control streaking.

Pre-mordanted wool has been mordanted before being used in a dyebath. A supply of pre-mordanted wool to slip into a simmering mushroom pot is most useful.

Fiber

Wool is the best fiber for dyeing with mushrooms and plant materials. Silk, another protein fiber, will also dye with mushrooms, although the formulae are different. The cellulose fibers, cotton and linen, are harder to dye satisfactorily with natural materials.

From time immemorial wool, light and durable, has meant warmth, comfort and insulation from rain and cold. Made of millions of coiled springs (protein molecules) that stretch in use but coil back to their original positions, wool can be twisted without breaking. Its unmatched dyeing quality is due to the moisture-borne dye actually combining with the protein structure, thus becoming an integral part of the fiber. The fleece of sheep is not the only wool. The hair of South American wool-bearing llamas, alpacas, guanacos and vicunas, and perhaps the softest of all, angora rabbit and cashmere goat, all accept dye magnificently.

To remove foreign materials such as dirt, twigs and dead leaves from the fleece, and to eliminate the lanolin which would inhibit the binding of the dye, scour the wool by simmering it for ½ hour, four ounces of wool to two quarts of water with two or three tablespoons of flakes of mild soap. To remove sizing and bleach from commercial yarns simmer for one hour. Rinse in warm water several times, squeezing the water out gently, then rinse in cold water.

Dyeing with Fungi

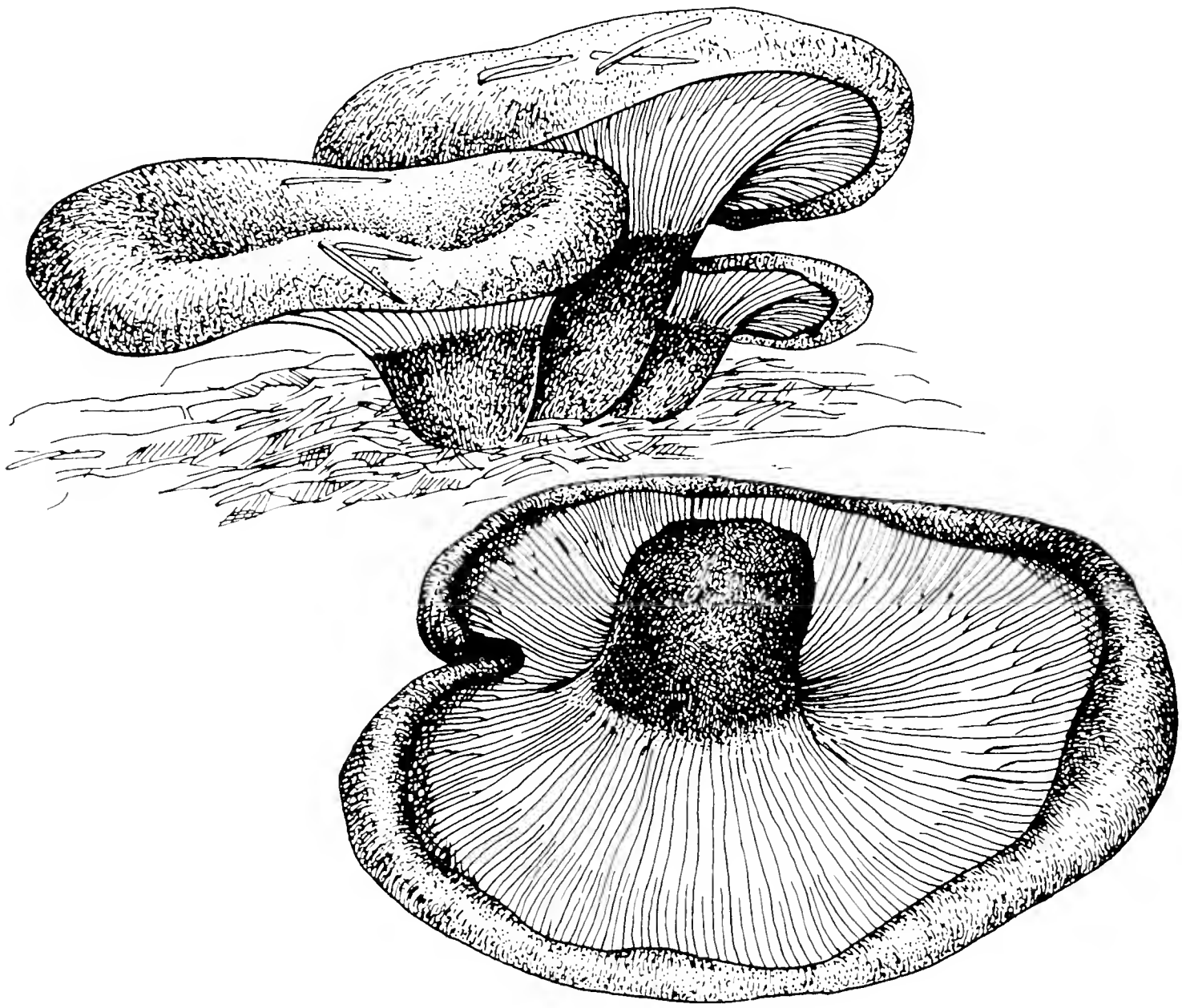
The quantity of mushroom dyestuff available is crushed or cut into small pieces, covered with water and simmered for one-half hour or more. There is little doubt that the larger the quantity of mushrooms in proportion to the wool, the deeper the color obtained, although the quantity of fungal material needed is strictly determined by the percentage of dye pigment present in any particular species. Species of *Cortinarius* in the *Dermocybe* group contain a large amount of the dye substance and thus will color a larger amount of fiber than most mushrooms. The age and condition of the specimens also contribute to possible colors. Whether mushrooms are young, mature, or over-mature and whether they are fresh, frozen, or dried can alter the dye colors they will yield.

The premordanted wool, pre-wetted thoroughly, is added to the dyepot and simmered for one-half to one hour or more. In the case of all but the corky-hard Polyporaceae (hard shelf fungi) and some Hydnellums which benefit from soaking overnight, no harm is done by putting the wool directly into the dyebath without previous simmering. After an hour or less, remove the wool, rinse with hot water, cool gradually and finally wash with mild soap flakes, rinse and dry.

The color fastness is assured when no further bleeding of color in the successive washings occurs. Exposure to sunlight indicates light fastness. The color is fugitive if it fades readily; if not, it is light fast. The reds from *Cortinarius (Dermocybe) phoeniceus* var. *occidentalis* and from *C. semisanguineus* are astonishingly light fast. Blue and purple are notoriously fugitive obtained from any natural dyestuff, witness the indigo blue of jeans' fame. Even the aniline blues and purples fade noticeably in a short time. But I have high hopes for the future performance of my favorite dyestuff—mushrooms.

The Pacific Northwest enjoys a wealth of good dye mushrooms. We cannot hope to describe them all here, so I have limited the descriptions to those fungi which produce beautiful colors, which are readily identifiable and which occur in the forests of the Puget Sound lowlands, some even in the Arboretum itself.

Do not use the descriptions and illustrations of these fungi as a basis for identification of any mushroom you intend to eat. There are field guides listed in the bibliography to aid in the identification of edible and poisonous species of fungi.



Paxillus atrotomentosus. **Drawing: D. Beebee**

Paxillus atrotomentosus

Colors obtained from fresh fruiting body: no mordant—brown-green; alum—purple; chrome—brown-green; tin—navy blue; copper—purple-black; iron—forest green.

Colors obtained from aged fruiting body: no mordant—forest green; alum—lavender; chrome—brown-green; tin—dark gray; copper—purple-black; iron—forest green.

Found in groups on decayed coniferous logs and stumps in late summer and early fall. The cap is up to 15 cm wide, light brown with flattened-down hairs (felty-tomentose), dry to the touch and centrally depressed. The margin is strongly inrolled, the flesh whitish to beige-yellow. Beneath the cap is a series of radiating blade-like gills, bright yellow to pale brownish yellow, turning brown where bruised, and running down onto the stalk. The stalk is attached to the cap and is off-center, short, fat, and covered with a characteristic thick velvety layer of dark brown hairs.

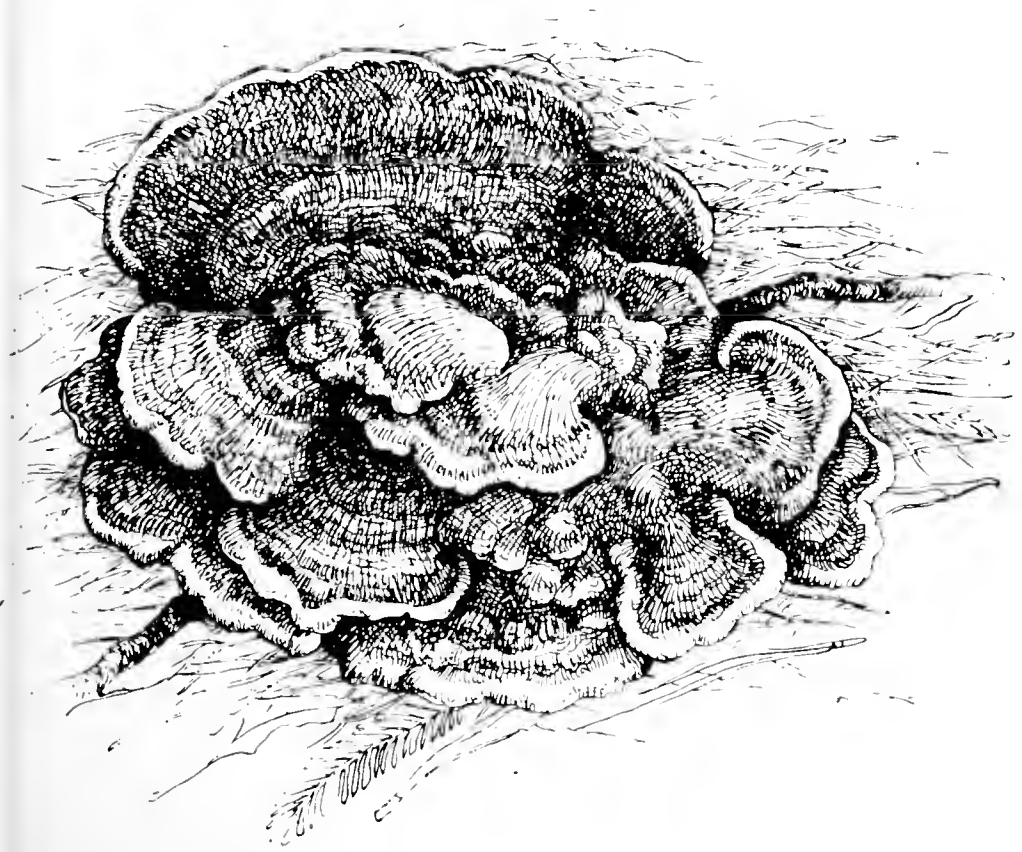
Phaeolus schweinitzii

Colors obtained from very young fruiting body: no mordant—yellow; alum—yellow to mustard; chrome—mustard; tin—yellow-orange; copper—mustard to golden brown; iron—green to olive.

Colors obtained from margins of fresh fruiting body: no mordant—yellow; alum—yellow-orange; chrome—burnt orange; tin—orange; copper—red-brown; iron—brown-black.

Colors obtained from entire mature fruiting body: no mordant—burnt orange; alum—burnt-orange; chrome—red-brown; tin—red-brown; copper—red-brown; iron—brown.

Found on the roots, often buried, of living and dead conifers, frequently growing up the lower part of the trunk or appearing to spring from the ground. The new growth of the fungus appears soon after the first late-summer rains and throughout the winter. The fungus is found during the rest of the year as a rosette of dried, brittle brackets, often quite large and many-layered. Known as "red-brown butt rot" it is one very distinctive blight of coniferous forests. The fruiting body consists of a rosette—a cluster of caps arising from a common base. The caps range from 10 to 30 cm across, and when young are a bright yellow-orange, and soft, spongy and watery. In age the color turns to cinnamon brown, and the consistency becomes tough and corky to brittle and rigid. The distinctive yellow margins of the young caps thus turn to brown. The stalk is short and woody, the same color and texture as the cap. Beneath the cap are pores, greenish ochre-yellow when young, staining or bruising progressively darker brown with age.



Phaeolus schweinitzii. **Drawing: D. Beebee**

Hydnum imbricatum. **Drawing: D. Beebee**

Hydnum imbricatum

Colors obtained brom mature fresh fruiting body: no mordant—warm gray; alum—green-blue; chrome—gray-green; tin—blue; copper—forest green; iron—greenish blue.

Colors obtained from dried fruiting body: no mordant—gray; alum—gray; chrome—blue gray; tin—blue; copper—green-gray; iron—green-gray.

Found in fall in moist coniferous forest or mixed forest of both coniferous and hardwood trees. The cap is 8 to 20 cm in diameter, dry and fleshy, convex at first, then flat and centrally depressed. The surface of the cap is light brown tinged with gray, and is covered with large, dark brown, coarse, raised scales. The flesh of the cap is grayish buff. Under the cap are a series of downward-directed spines, 5 to 15 mm long, whitish in color, turning grayish brown with age. The stalk is 5 to 10 cm long, light brown, smooth and dry. Sometimes fruiting bodies are fused at the base of the stalk, forming clumps.

Cortinarius cinnamomeus group

Colors obtained from fresh fruiting body: no mordant—orange; alum—orange; chrome—cinnamon; tin—orange; copper—cinnamon; iron—orange.

Colors obtained from dried fruiting body: no mordant—orange; alum—orange; chrome—burnt orange; tin—orange; copper—burnt orange; iron—mustard.

Found under conifers in late summer and in fall. The cap is 2 to 5 cm broad, raised in the center when young but becoming almost flat in maturity. The cap color ranges from yellow-brown to cinnamon brown and the flesh is pale yellow. The gills are yellowish to orange when young, turning rusty brown at maturity due to the spores. The stalk is yellow to yellowish-cinnamon, often with fine, flattened-down hairs. This mushroom and the other species of *Cortinarius* are partially characterized by the cobwebby strands that run from the edge of the cap to the stem. This feature, together with yellow, orange or red gills, is indicative of a potentially good dye mushroom, yielding vivid colors.

Cortinarius phoeniceus var. *occidentalis*

Colors obtained from fresh fruiting body: no mordant—apricot; alum—wine red; chrome—burgundy; tin—blood red; copper—grayed burgundy; iron—blue-purple.

Colors obtained from dried fruiting body: no mordant—apricot; alum—rose; chrome—burgundy; tin—red; copper—grayed purple; iron—blue-black to dark blue-purple.

This mushroom is also found growing singly or in clusters in mixed coniferous forests from fall to early spring throughout the Pacific Northwest. The cap is 3 to 7 cm wide, dark reddish maroon with a silky appearance, shiny when dry. There is a definite knot on top of the cap and remnants of the cobwebby veil are often visible along the margin. The gills are brilliant red (almost iridescent) when young, turning brownish with the formation of the spores. The stalk is ochraceous yellow to straw yellow, with flattened-down hairs.

Cortinarius sanguineus

Colors obtained from dry or fresh fruiting body: no mordant—tan or purple; alum—red orange; chrome—rose; tin—orange-red; copper—cinnamon; iron—tan.

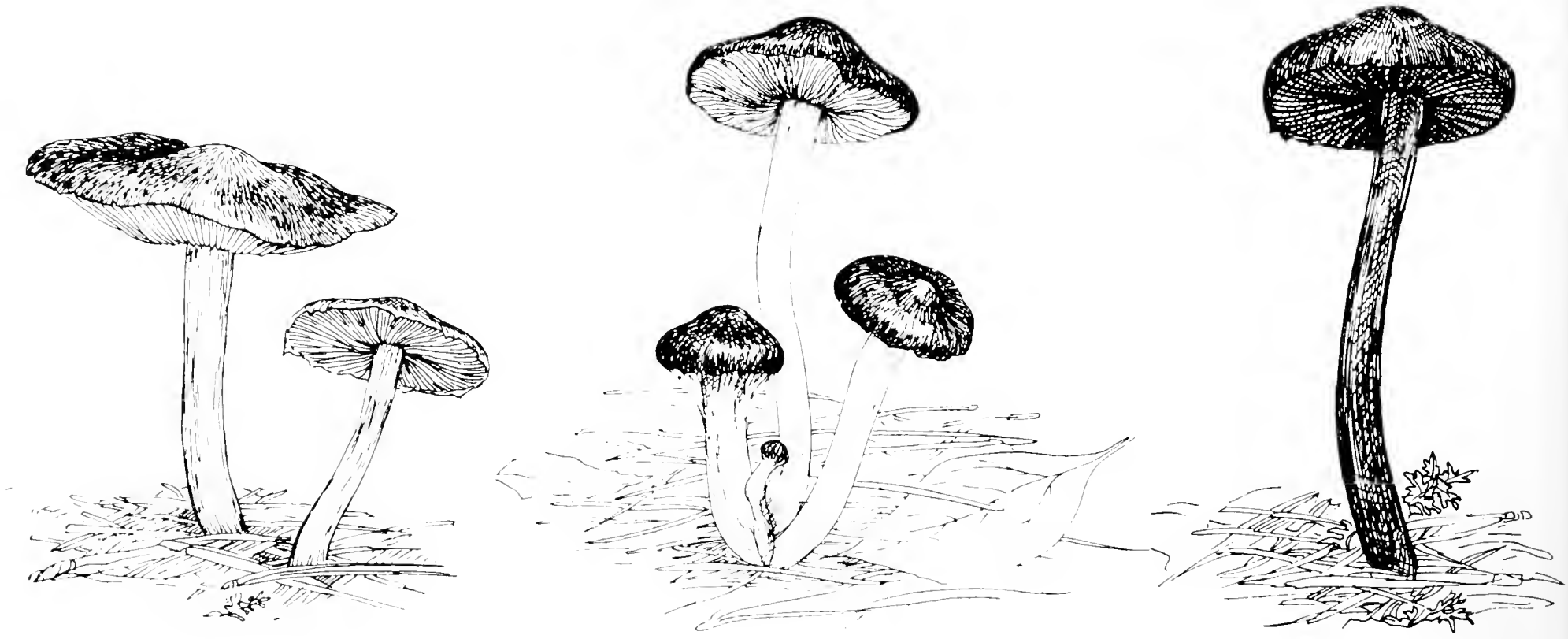
This mushroom is very similar to *C. phoeniceus* except that the stalk of *C. sanguineus* is dark red, as are the cap and gills, while the stalk of *C. phoeniceus* is yellow.

Boletus edulis

Colors obtained from tubes: no mordant—yellow; alum—greenish yellow; chrome—golden brown; tin—orange; copper—mustard brown; iron—mustard.

Commonly found on the ground under pines or other conifers from late summer (depending upon the rainfall) through fall. The cap is 10 to 25 cm across at maturity, convex in shape, expanding to nearly flat. The texture of the cap surface is dry and smooth, but with a sticky or gelatinous appearance in wet weather. The color is light brown at first, darkening to cinnamon brown with a paler margin. Below the cap is a thick layer of whitish to yellowish

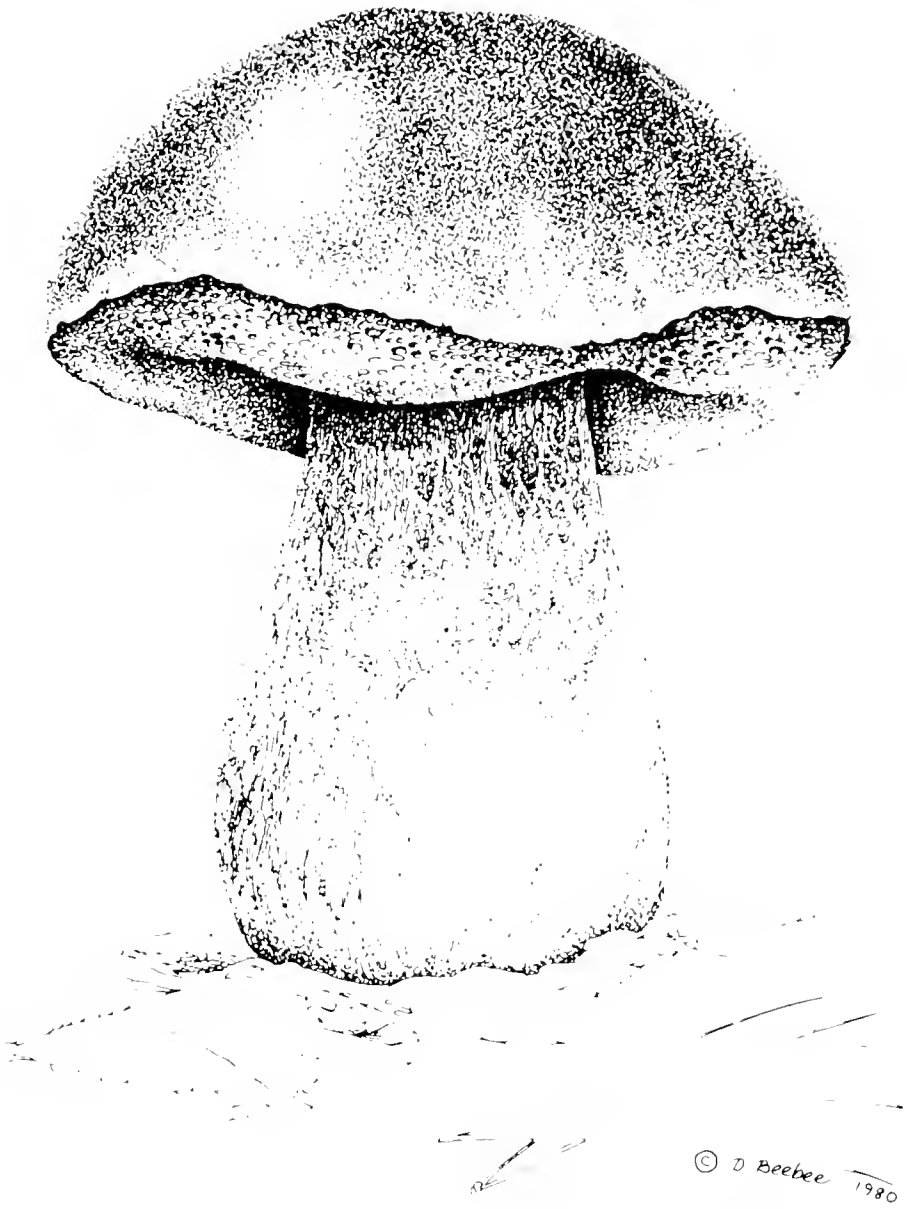
From left to right: *Cortinarius cinnamomeus*, *C. phoeniceus* var. *occidentalis* and *C. sanguineus*. Drawings: D. Beebee



brown tubes. This tube layer is the best part for dyeing and can be removed from the rest of the cap with ease. The tube mouths are small, 2 to 3 per mm, angular in shape and the same color as the tubes themselves. The stalk is up to 20 cm long, slightly to very bulbous at the base and yellowish white to yellowish brown. A distinctive feature of *Boletus edulis* is the network of white raised ridges, especially obvious on the upper third of the stalk.

Those who have caught the natural dyeing fever and who wish to learn more about dyes from fungi could benefit from membership in a mushroom club, or from mushroom exhibits. For Puget Sound Mycological Society membership information, call Mrs. Aino Kunz, 362-7402.

Dyeing with mushrooms has created excitement in the weaver's world. The first International Fiber and Fungi Exhibition was held in 1980 in Mendocino, California. Further information about this exhibition can be obtained from the Mendocino Art Center, Mendocino, California.



Boletus edulis. **Drawing: D. Beebee**

MORDANTS

Name	Amount of mordant for 4 oz. wool (with water to cover)
alum (potassium aluminum sulfate)	1 T with 2 t cream of tartar
chrome (potassium dichromate)	½ t with 1 t cream of tartar
tin (stannous chloride)	½ t with 4 t cream of tartar
copper or blue vitriol (copper sulfate)	1 T
iron or copperas (ferrous sulfate)	4½ t with 1 t cream of tartar and 2 T Glauber's salt

To premordant, dissolve the chemicals in one or two cups of hot water in a pyrex pitcher, then pour the dissolved chemicals into the dyeing pot (enamel, stainless steel, pyrex) with the required two or three quarts of water. Add four ounces of water-soaked wool. Cover and simmer for one hour, shifting the wool gently to insure that all parts of it receive the liquid evenly. Allow the wool to cool in the bath. Remove it from the bath with rubber gloves, squeeze it gently—never twist—rinse it in cool water and hang it up to dry in a dark place. CAUTION. Some of the dyestuffs and chemicals are toxic, particularly chrome and tin mordants. Use dyepots for dyeing only. Keep them covered while simmering and avoid breathing the fumes. KEEP ALL DYE MATERIALS AND CHEMICALS OUT OF THE REACH OF CHILDREN.

By adopting a system of knots representing the five mordants, we share results at a glance. Wool is cut to lengths of a foot or longer, pre-mordanted and tied with the appropriate number of single knots on one end of each of the five mordanted strands. After adding an unmordanted, unknotted strand, the six strands are tied together to make a test swatch, which can be plopped into a simmering mushroom dyepot at a moment's notice.

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Soils for the Home Gardener

*S.P. GESSEL and R.J. ZASOSKI**

Hospitable soil for vigorous plants—this is a basic aim of home gardeners. But such an easily stated objective can be difficult to attain given a variety of soil conditions and plant requirements.

The task is somewhat simplified if an ideal soil is defined as a goal to approach in gardening operations. Soil is the medium in which the roots live and grow; therefore, soil conditions must be conducive to good root development. Adequate aeration, available water and a supply of essential nutrient elements are necessary in any productive soil.

Soil is a complex system, serving as a location for many chemical and biological processes which may affect plant growth. A gardener need not understand all these complexities, but only needs to appreciate some simple operating rules which can insure proper soil management.

Air and Water Supply in Soils

The root systems of most plants require an adequate oxygen supply and must also acquire water for the whole plant. Therefore, productive soils must provide a proper balance between air and water. A soil that is completely filled with water for lengthy periods has sufficient water, but not sufficient oxygen. Only a select group of plants can grow in such soils. Other soils may have good water and air supply in the surface few inches but are underlain by compact soil strata which impede water drainage, aeration and root growth. These conditions are generally not productive for plant growth; therefore, aeration and water status in the entire rooting zone must be considered. This implies providing a relatively deep soil with good drainage, so that soil layers are not saturated for extended periods. In these soils the interchange between water and air movements will insure that sufficient oxygen is present for the root system.

Diagnosing Problem Soils

Water deficiencies can ordinarily be made up by irrigation. The following examples assume that water is adequately supplied.

Stony, gravelly, or sandy soil

Aside from the problems of physically impeding the growth of root crops, such as carrots, these types of soil are generally well-drained, having excessive aeration but low available water. This situation can be corrected by screening the soil through a ½ inch screen to the depth of rooting. In some local soils as much as 50% of the soil may be removed by this screening. Fine sand or silt loam in combination with organics can be added back in place of the rocks. Compost from garden residues, or sawdust and fine bark can be used in a 3:1 (soil or sand:organics) mixture. If sawdust or bark is used, additional nitrogen must be supplied to prevent nitrogen deficiency in garden crops. Peat moss from local peat bogs can also be used as an organic matter source to improve physical properties of the soil. If the loss of volume from screening does not need to be replaced, the organic matter can be mixed directly with the screened soil. Organic matter will have to be provided continually as it is lost each year through natural decomposition processes. It must be realized that screening soil is a very labor-intensive procedure and is only feasible on a small scale such as a garden plot.

Surface soil underlain by compact subsoil

This occurs in many of our local soils because of the glacial hardpan. One solution is to

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*Dr. Gessel has been Associate Dean for Research of the College of Forest Resources, and since the 1950's has done extensive work on mineral cycling in forests. He is a horticulturist as well. Dr. Zasoski, who has been teaching about soils at the UW since 1973, is interested in soil chemistry, and in the nutrition of coniferous trees. To this end, he has many species of conifers even in his home garden.

break up the hardpan to at least 36 inches with hand tools such as a pick, or with power equipment such as a jackhammer. The hardpan material can be stony and low in clay and organic matter; therefore, fertilizer should be added and mixed with the broken-up subsoil. Manure may serve both as an organic matter source and as a fertilizer. Mix in the manure about 3:1 (soil:organic) proportions. The addition of organic material need not be accomplished all at once, but may take place over a period of years as garden compost becomes available.

A second option would be to grow plants in raised beds, which provide adequate rooting depth above the restrictive soil layers.

Clay-like soil with poor tilth

These soils lack large pores for aeration, and have a high water-holding capacity. Many local soils are formed from old lake beds or marine deposits, and need drainage or diversion of surface waters. Drainage requires the installation of drainage tile or open drainage channels to lead excess water away from the garden. In areas where surface drainage is not a problem or has been corrected, poor tilth can be ameliorated through the addition of sand or organic materials which are locally available. Sand or organic materials should be added to the upper 12 to 18 inches of the soil or throughout the rooting depth. Substantial quantities of additives are necessary. Up to a ton of sand is needned for a 10 foot by 10 foot plot, and 1:3 (organic:soil) mix worked into a depth of 18 inches would require 1.9 yards of organic material.

Nutrient Supply

The simplest system (although not the least laborious) for providing plants with their nutrient element needs would be a well-aerated water solution in which all the nutrients were dissolved! Many plants can grow very well in such systems, and in fact, much greenhouse culture is based upon liquid (rooting) media. This is essentially the case in extremely poor sandy soils, where a nearly continuous supply of necessary elements is provided in irrigation water (or alternatively by leaf feeding).

Most soils add considerable complexity to determining plant nutrient supply because the soils hold essential elements in forms many plants cannot use. Soils also contain a host of organisms which frequently compete with plants for essential elements, which adds another component of uncertainty. An obvious question is then, why bother with soil?

Most gardeners, however, have no desire to set up hydroponic tanks. In addition, outright purchase of equipment and of all essential elements is expensive. One benefit of a natural soil system when properly managed is that most nutrients are naturally supplied at the proper rate and frequency at a low cost. Plants derive nutrients from several sources in the soil. Metering out these elements in the proper frequencies and dosages in a liquid culture would be time-consuming and laborious.

Despite the implications of some organic gardening literature, plants cannot supply their own elemental needs by absorbing chunks of organic matter. Elements such as nitrogen must be taken up from water solutions in what is called ionic or dissolved form. Decomposition of the organic material, initiated by soil microorganisms, renders organically-combined nutrients into their water-soluble ionic forms. Other elements such as calcium, magnesium and potassium are derived from the rocks and minerals in soils by chemical breakdown, which renders them also into soluble ionic forms.

The element-supplying capacity of the soil depends upon the total supply of the element and the rate of conversion of the element to a soluble (ionic) form which the plant can take up. Competition for the element between the plant and the microorganisms within the soil; and the ability of the element to stay within the rooting depth of the plant after conversion to an available form, rather than being leached away with drainage water, are also significant factors. And, finally, the ability of the element to be maintained in a plant-available form in the soil is important.

Many plants have developed special associations with other organisms in order to cope with some of these elemental supply problems. The classical examples of beneficial plant associations are the mycorrhizal symbioses between plant roots and fungi, and the nitrogen fixation by bacteria associated with legume roots and alders.

Some of the complexities of nutrient uptake will be illustrated using nitrogen, which is

needed in fairly large quantities for adequate plant growth. Four-fifths of the earth's atmosphere is nitrogen gas, of no use to plants in the gaseous form. Nitrogen must be present in what is called a "fixed" form as either nitrate (NO_3^-) or ammonium ions (NH_4^+). Some plants, such as alders and legumes, have the capability of "fixing" nitrogen for their own use, and this nitrogen becomes available for other organisms only through *mineralization* (the process of decomposition). Red alder is a species which exhibits this nitrogen-fixing ability, and a stand of red alder trees may fix up to 90 pounds of nitrogen per acre per year. Home gardens need to have nitrogen supplied at rates of 75 to 150 pounds per acre, or about 0.2 to 0.3 pounds per 10 foot by 10 foot plot.

To be available for plants, the nitrogen in decomposing organic matter must be converted (mineralized) to either ammonium or nitrate ions by microorganisms. Nitrate can be rapidly leached from the soil by excessive water while the ammonium ion can become attached to soil clay particles and held until removed by plant roots.

While the nitrate and ammonium ions in solution are available for plant use they are also available for many other soil organisms to use. If the populations of these other organisms are very large, they can outcompete the higher plants and deplete the available soil nitrogen supply. This nitrogen depletion happens most commonly when a carbon-rich food supply such as sawdust is introduced into the soil, and microbial populations rapidly increase. Any gardener can cause a soil nitrogen deficiency by incorporating sawdust or other low-nitrogen material such as straw, grass clippings or uncomposted garden residues. Nitrogen deficiency is characterized by a light green to yellow coloration of the leaves, especially of older ones. The deficiency will last as long as the carbon-rich food supply can support a large microbial population which competes for the nitrogen. The problem can be alleviated by adding extra nitrogen to lessen the competition, or by adding organic matter in the fall so that the rapid microbial growth will be over before spring planting.

Soil acidity or alkalinity—referred to as soil pH or soil reaction—is an important factor in elemental supply. The soil reaction can affect populations of microorganisms and therefore, rates of mineralization or decomposition. Acidity can also affect the solubility of many elements and thus their availability to plants. For most soils and plants, a pH range of 6 to 7 provides a good growth medium, but some plants require more specific pH ranges. To maintain pH in this optimal range requires the periodic addition of lime or dolomite lime to western Washington soils. The quantity of lime depends upon original soil pH, clay content, and frequency of fertilizer and lime applications. For many soils a rate of 10 pounds of lime for 1,100 square feet will be adequate.

A low pH and nitrogen deficiency are the most common nutritional problems in western Washington; however, when nitrogen fertilizer is added, plants may then outgrow their phosphorus supply. Specific recommendations for nitrogen, phosphorus and lime requirements can be obtained from your local Agricultural Extension Office.

An Overview

Essential elements can and do come from atmospheric inputs, from rocks and minerals in the soil, by breakdown or weathering, or from soil organic matter by decomposition and mineralization. In the case of all elements there can be an oversupply or an imbalance. The gardener's objective is to establish and maintain a soil which will provide all the elements at the lowest cost in time, money, and energy. If the soil parent material contains all essential elements, then it becomes a matter of breakdown rate to supply them. If the soil is deficient, additions must be made. Over a long time, some elements may be removed from the soil system by plant harvest or by leaching, and may have to be replaced. Organic matter enters the picture not only because of elements in it but also due to the fact that under the right soil temperature and moisture conditions, decomposition and mineralization proceed at a rate to supply plant needs. Gardeners can use the resources available to insure an adequate supply of essential elements.

Jean Witt and her outdoor stove for dyeing.
Photo: Joseph A. Witt

Some Native Northwestern Dye Plants

*JEAN WITT**

Editor's note: Jean Witt will be offering a class—Dye Plants and Dyeing—in late February. See Classes of Interest, this issue. For an explanation of dye terminology, a list of references on dyeing, and instructions for mordanting, see the article on dyes from mushrooms. It is unfortunate that some desirable dyestuffs such as certain native species of Galium *do not occur in abundance and therefore should be protected. Dyers could give some thought to raising their own dye plants. Coreopsis is easily grown, and both sweet woodruff* (Asperula) *and* Galium boreale *from the Madder family are suitable for Pacific Northwestern gardens. Since rock-inhabiting lichens in general are very slow-growing, the species of* Umbilicaria, *especially the larger ones, must be gathered with appropriate caution. The dye from these is so potent, however, that as little as a tablespoonful of crushed lichen is sufficient to dye at least two ounces of wool. Nonetheless, the beauty of dyes from native plants makes the art form that is home dyeing more than worthy of the attention lavished here.*

By the time the Pacific Northwest was settled, hand weaving and home dyeing were arts no longer practiced in every household. Therefore, dye plants were not actively searched out in our area, as they had been in the eastern United States in colonial times. Beyond a few species used by the Indians, the dye properties of our native flora remain largely uninvestigated.

Using plant dye books from other areas as guides to possibly useful genera, we have experimented with a wide spectrum of local flowers, roots, and barks, as well as a number of lichens, with varying results. A great many plants produce dyes in the yellow-gold-tan-brown range, but very few provide anything approaching the sort of blue, purple and red colors we are used to in modern commercial dyes. So far, for instance, we have found nothing indigo-like, producing a colorfast blue—all the berry blues and purples are less than light-fast. Here are a few of our native plants which we can recommend for giving bright and attractive colors on wool.

Chrysothamnus nauseosus, rabbit brush, is a shrub of the Composite family, with linear white-pubescent leaves and sheaves of small yellow flowers. This component of the sagebrush steppe blooms in September. Flowers, leaves, and twigs produce a clear yellow dye on wool with alum mordant, brightened with

*Jean Witt, who has a Master's Degree in Botany from Washington State University, became interested in plant pigments and related dye substances through her work in hybridizing *Iris*.

tin. The plant is strongly aromatic, though not as disagreeable as the name suggests. Personally, I find the odor of the stewing foliage rather pleasant—but not at close quarters. This one is definitely a plant for out-of-doors dyeing!

Pinus ponderosa, western yellow pine, is common east of the Cascade crest. The scaling bark of mature tree trunks has a yellow dustiness about it, and when soaked and boiled, gives a strong orange-yellow color with alum and a pinch of tin mordant. Resins, unfortunately, tend to come out into the dyebath, and a method to remove them with solvent before dyeing should be devised.

Coreopsis atkinsoniana, Columbia coreopsis, is a summer-blooming annual found along the banks of the Columbia River and some of its tributaries from Portland, Oregon into British Columbia. This plant is related to the cultivated *C. tinctoria*, an annual from the plains of the central United States. As the name indicates, the flowers of the cultivated species are dye-producing. Flowers of *C. atkinsoniana* can also be used for dyeing, and give burnt orange to terra cotta tones, similar to those from *C. tinctoria*.

Cuscuta pentagona, dodder, is a parasitic plant which causes considerable damage to clover and alfalfa in agricultural districts. It can often be seen enmeshing roadside weeds in its tangle of yellow to orange, leafless, threadlike stems. Orange dodder collected in the Methow Valley in August, and in western Washington in September, gave a bright yellow color with tin mordant. The same material, frozen—and possibly fermented—produced a pale salmon tint with alum. Other species of dodder should be tried as well.

The Madder family, source of fine red dyes since ancient times, is represented in our area by the genus *Galium*, several species of which have been used as dye plants in the eastern United States and in Europe. Known as bedstraw or cleavers, Galiums are easily recognized by their whorls of pointed leaves spaced evenly along square scratchy stems, and by the small hooked fruits which fasten themselves to clothing. Various species that we have tried—*G. oreganum*, *G. multiflorum*, *G. triflorum*, *G. aparine*, and *G. boreale*—have slender jointed rhizomes or theadlike roots, yellow in color during the growing season. All these species give a bright coral color with alum and/or tin mordant; if one could obtain enough roots, near-scarlet might be achieved. Those with roots no thicker than sewing thread have proportionally the most dye, and the roots from a single plant of *G. aparine* are enough to dye an ounce of yarn bright pink. The yellow component in the color fades away with time, leaving an equally attractive rose.

Some of our most satisfactory native plant dyes have come from lichens. These are of two types: those which will dye wool directly, and those of the orchil type, in which the dye-substances must be developed through fermentation with ammonia prior to dyeing.

Letharia vulpina, wolf moss, is a conspicuous, mossy-looking, bright chartreuse lichen common on dead branches of yellow pines and Douglas firs east of the Cascade mountains. *Letharia vulpina* rarely produces any brown fruiting bodies, while *L. columbiana*, a related species, has them in abundance. My experience with it has been distinctly uneven, leading me to believe that it may give better results at some times of the year than others. On wool premordanted with copper sulfate, with ammonia added to the dyebath, a soft gray-green color develops. Without the copper sulfate the result is a lemon yellow. The best greens—elegant lettuce to apple greens—come from adding the copper sulfate to the ammonia dyebath in very small amounts until the yellow changes to a clear green. Some batches of lichen, probably *L. columbiana*, have produced only poor muddy olive greens by this last method—possibly the brown fruiting bodies should have been removed? Nevertheless, at its best, this is a very good dye plant indeed.

Another lichen found growing on dead branches of young yellow pine trees east of the Cascades resembles small yellow ruffles and is *Cetraria canadensis*. It dyes a clear yellow without mordant.

Lobaria pulmonaria, horse lettuce, is a large leafy lichen common on maples and other hardwoods in valleys west of the Cascades. The similar appearing *L. oregana* and *Pseudocyphellaria* occur on conifers. These dye a lovely warm camel's hair brown without mordant. *Lobaria* has the merit of falling to the

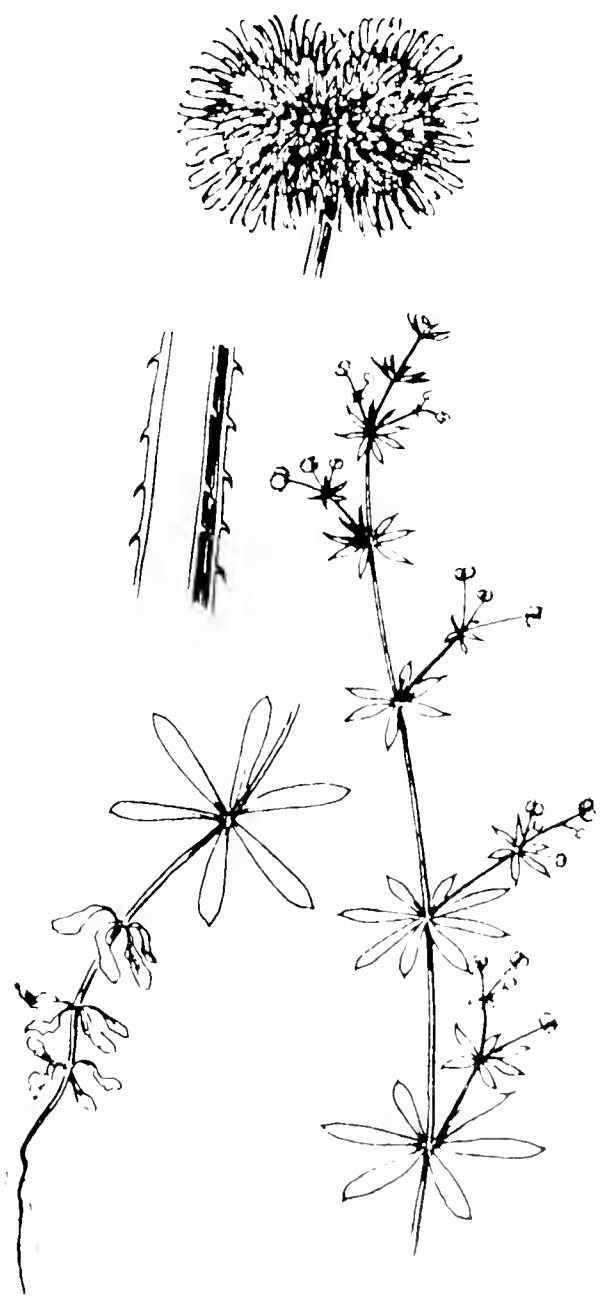
forest floor in great quantities every winter. A pleasant licheny odor clings to the dyed wool, but to avoid its pervading the entire house, the dyeing shoud be done out-of-doors.

Our region also has a number of orchil-type lichens. My greatest success has been with species of *Umbilicaria*, common on Columbia River basalt talus in central Washington. This small, nearly black lichen resembles a tiny saucer, anchored to the rocks at a central point. To obtain the dye, the lichen must be ground to a fine powder, mixed with ammonia solution (1 part household ammonia to 2 parts water) and fermented for several days or weeks until the color develops. Temperature affects the process, which works best in warm weather. No mordant is necessary on the wool. The color is remarkable—clear magenta purple. This dye is very strong and the dye bath can be used repeatedly, until it produces only pale orchid pink. On a third dyeing I added vinegar to the solution and obtained a soft brick red, while additional ammonia turned the color toward violet. I also had one complete fiasco—on adding vinegar to one batch of magenta dye solution I lost the color completely—it vanished to water-clear right before my eyes!

The lovely orchil colors, alas, are as notorious for being fugitive as they are famous for their beauty. Consequently one should plan to protect the yarn or fabric from sunlight or be prepared to redye it occasionally.

One final intriguing plant from our sagebrush steppe is reported to have been used for dyeing in the Southwest. This is *Comandra umbellata (C. pallida)*, bastard toadflax, of the Santalaceae or Sandalwood family, of which some tropical members are dye plants. It is said to have been used formerly by the Arapahoes, though just how the dyeing was achieved remains a bit of a mystery at present. The sky blue coloration is clearly visible in the cortex of the roots, but appears to be insoluble in hot water. From a rubbing alcohol suspension the pigment crystallizes as tiny dark blue needles. Surely someone with a bit of chemistry know-how should be able to remove this good blue from the *Comandra* cortex and fasten it onto fiber!

From left to right: *Coreopsis Atkinsoniana*, Columbia coreopsis, and *Gallum aparine* var. *echinospermum*. From Hitchcock, C.L., *et at.*, *Vascular Plants of the Pacific Northwest*, courtesy of the University of Washington Press, Seattle
Drawings: J. Rumely and J. Janish



Events of Interest

ARBORETUM FOUNDATION HORTICULTURAL EXHIBIT, March 20 and 21, Southcenter Mall. For further information, see page 5, or call Suzanne Wilson, 823-4972.

THE QUASHQA'I: TRIBAL ART OF IRAN, will be on exhibit in the Foyer of the Burke Museum until March 1, 1982. The exhibit includes antique rugs and saddlebags, as well as color photographs depicting the life-style of these nomadic people. The collection of NORTHWEST COAST INDIAN GRAPHICS will remain in the North Gallery until spring, 1982. For further information please call 543-5884.

NOHS LECTURES, held at the Museum of History and Industry. THINGS YOU NEVER KNEW ABOUT TREES, Tuesday, February 9, 1982, 10:30 AM in the McCurdy Room. James R. Clark, professor of environmental horticulture, will discuss why trees grow into the shapes they become, and how to select a tree for the garden, considering its shape. THE EYE OF THE DESIGNER, Tuesday, May 4, 1982, 7:30 PM, in the Auditorium. Sir Peter Shepheard, past president of the Royal Institute of British Landscape Architects, will present an illustrated talk on the visual qualities of design in both plants and architectural elements of gardens. Don't miss these!

THE AMERICAN ASSOCIATION OF BOTANICAL GARDENS AND ARBORETA ANNOUNCES A WRITTEN EXAMINATION FOR THE NORTH AMERICAN DIPLOMA IN HORTICULTURE. This examination will be given for the first time March 3 and 4, 1982. This program of certification is intended to provide an internationally recognized standard of competence in horticulture apart from the traditional avenue of higher education. For further information write to Carol Schutz, Executive Director, American Association of Botanical Gardens and Arboreta, Box 8044, Charlottesville, Virginia, 22906.

HAMAMELIS AND ITS RELATIVES, a lecture by Brian O. Mulligan, on Wednesday, February 17, at 10 AM. Admission is free, but there is a limit of 24 participants. TRAINING FOR GENERAL ARBORETUM GUIDES also will begin on February 17 with the lecture on *Hamamelis*, and will continue into April. A duplicate training series will be held on Saturdays, as well. For information about these events, and for reservations, call 543-8800.

FOURTH THURSDAY WEEDING PARTY—WEEDERS OF THE WORLD UNITE! You are invited to join the loyal band of weeders in the University of Washington Arboretum, February 25 and March 25, and succeeding fourth Thursdays at 10 AM. No previous experience necessary; pleasant working conditions, good company. Details available at 543-8800.

RHODODENDRON CLASSIFICATION, a lecture by Frank Doleshy, one of Seattle's foremost experts on rhododendrons, will be given at 10 AM, March 17, in the Arboretum meeting room. For more information, call 543-8800.

A view of the water garden, taken from the head of the *Peltiphyllum* mass; native bog plants are flourishing on the small island in the stream (page 21). Photo: V. Marttala

A Tour of the Berry Botanic Garden

*JACK POFF**

Editor's note: In 1938 the Berrys started work on the five-acre site of the yet-to-be Berry Botanic Garden. The location was a heavily wooded valley, very steep on one side, with a creek at the bottom. The area had clay soil and was also very wet, though eventually improved by tile drains.

One enters the garden by means of a driveway winding down through the trees of the steeper side of the valley. The east-facing house, located just above the creek, overlooks the woodland and west-facing rhododendron slope. Primroses are so well suited to the spot that one species seeded itself into the lawn which had been cleared in front of the house!

Much of the original landscaping and shrubbery were planned by John Grant, well-known Pacific Northwestern landscape architect and author. Stanley Anderson was the gardener for many of the developing years of the garden, before the time of Jack Poff. What follows is Mr. Poff's very personal tour of the Berry Garden, still so full of the vivid Mrs. Rae Berry.

I first met Mrs. A.C.U. Berry in the winter of 1967 during a job interview. Today I remember very few of the questions that were asked of me then, for I was detached. It seemed to me that I was seeing many more varieties of plants then in bloom than this climate should allow. It was late January, and yet we were surrounded by flowers, most of them new to me. From one vantage point in the driveway it was possible to see *Viburnum grandiflorum*, *V. farreri* (*V.*

*Curator, Berry Botanic Garden, Portland, Oregon.

The Berry house, as seen from the woodland border.
Photo: V. Marttala

fragrans) and *V.* x *bodnantense* all in full bloom. Overhead flowered *Prunus subhirtalla* 'Autumnalis' and *Hamamelis mollis*, Chinese witch hazel. In the rhododendron border was a peculiar early-blooming form of *Rhododendron rubiginosum*, and the lawn was showing a scattering of *Galanthus nivalis*, common snowdrop, and mixed species of *Crocus*. In a further walk around the garden Mrs. Berry proudly showed me *Primula rosea*, more rhododendrons and some assorted flowering bulbs in the rock garden. That year must have broken records for early bloom—I have never again seen such a performance until at least the beginning of February.

Mrs. Berry later confided that she had decided to buy this particular property only after she had discovered a natural wonder of the original place—a beautiful moss-covered log bridge spanning the creek in the canyon, below the present site of the house. In my searches for the crucial bridge I found only its remnants and a giant stump, now covered with red huckleberries and ferns, that must represent the parent tree.

If Mrs. Berry had not seen that mossy log bridge there might be no garden here! Today this part of the garden remains in its natural state although a path is planned that will integrate it more fully into the plantings. Even with no new plant additions this area will add an interesting diversity to the garden.

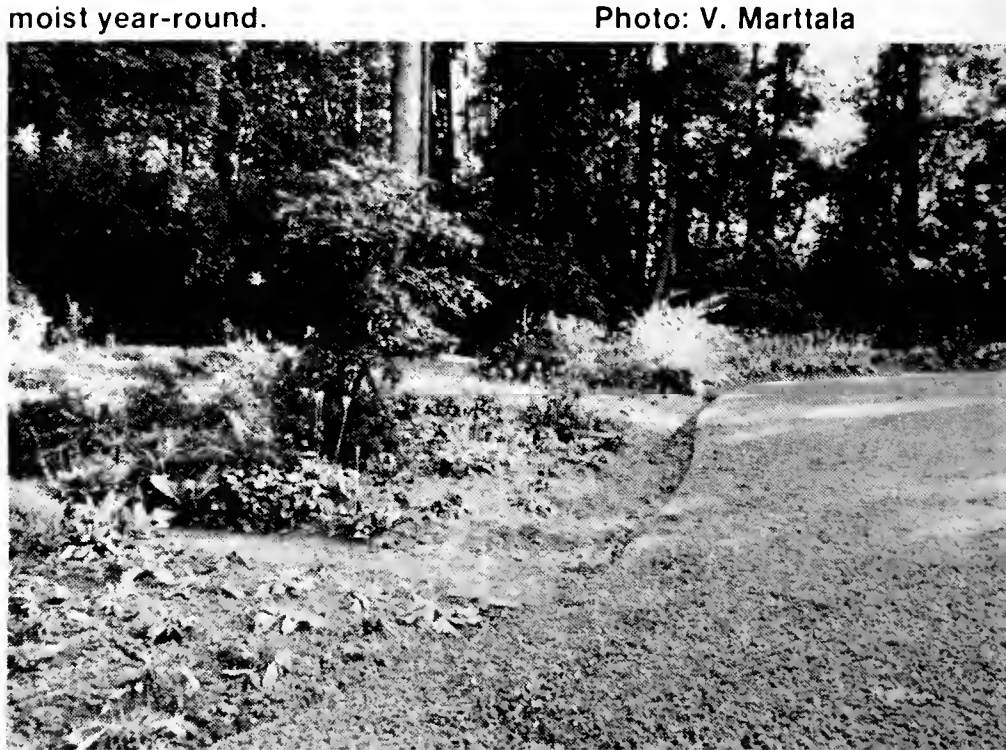
While I can't begin to tell you the details of how the garden came to be the way it is, I can relate some of the particulars I learned from Mrs. Berry.

Elementary work was begun by diverting the natural drainage away from what is now the lawn and the site where the house stands. (The house today provides space for the office of the Friends of the Berry Botanic Garden and for the library and herbarium. The upper floors serve as living quarters for the caretaker.) Excess trees were removed and only a few of the original Oregon ash *(Fraxinus latifolia)* remain. Full advantage has been taken of a still damp area above the lawn to plant candelabra primroses in large numbers, a remarkable sight in June and into July when color begins to disappear in the rest of the garden. A good selection of Lapponicum (now subsection Lapponica) and Saluenense series (now subsection Saluenensia) rhododendrons and other low shrubs are harmoniously combined in these beds. Species of *Meconopsis*, Asiatic poppy, have been reintroduced here after an absence of many years.

On the left the hillside is dominated by rhododendrons. We are told they were planted when the limbs of the Douglas firs were barely off the ground; today the limbs are about 60 feet up. Where this hillside borders the lawn many trees and shrubs were introduced. A complete list would be too lengthy but some of the important ones are *Magnolia kobus* var. *borealis*, a magnificent tree now exceeding 50 feet, whose relatively long blooming season never fails, and a large *Magnolia sieboldii* nearby, which is considerably broader than tall and which is slightly atypical because the anthers are pale.

To the far right in this border stands a particularly tall example of *Enkianthus campanulatus*, towering 20 feet over a clump of *Kalmia latifolia*, mountain laurel. The taller border ends with a magnificent trio of *Rhododendron calophytum*. These vary in shades of pink and white, with deep maroon blotches in the flowers. At this point the trail, flanked by many low-growing species, begins the approach up the hill. *Synthyris reniformis* covers the ground

Primulas flourish south of the house, in beds which remain moist year-round. **Photo: V. Marttala**



***Primula modesta* var. *faurei* 'Alba' blooms in the rock garden (page 24). Photo: V. Marttala**

with its highly selected forms of pink and white. They are allowed to seed and establish themselves wherever they choose. *Shortia uniflora*, Nippon bells, is in abundance here with a scattering of other *Shortia (Schizocodon)* species such as *S. soldanelloides* vars. *ilicifolia* and *magna*. We also see fetid adder's tongue *(Scoliopus bigelovii)* and species of *coptis*, gold-thread, and *Cypripedium*, lady's slipper. This particular slope in the garden takes very kindly to new plants and some are temporarily grown here to be moved later to more permanent homes.

We have seen a few trilliums up to this point but now the show really begins. They come into view by the thousands, and in fact we step carefully, for it seems that most seed germinates on the path. The ground cover here is mainly *Disporum hookeri*, fairy-bells, *Vancouveria hexandra* and sword fern *(Polystichum munitum)*, with occasional patches of *Oxalis oregana*, redwood sorrel, and *Achlys triphylla*, vanilla leaf. These colonies appear to have firmly staked out their territories and a sense of order persists unless the environment is disturbed. After the ice storm of 1979 topped five Douglas fir trees in a small area, the pattern of sun shafts striking the ground was changed. The result— a mad rush to fill these new niches and a competition for space that still has not been resolved. Since that storm we have become more acquainted with *Lapsana* than with any other weed in the garden.

We are beginning to see the results of our efforts of two years ago to establish the fragrant *Linnaea borealis*, twinflower, various species of *Pyrola*, shinleaf, and *Asarum*, wild ginger. Fallen logs will be allowed to remain, becoming nurseries for other plants, including some native ferns.

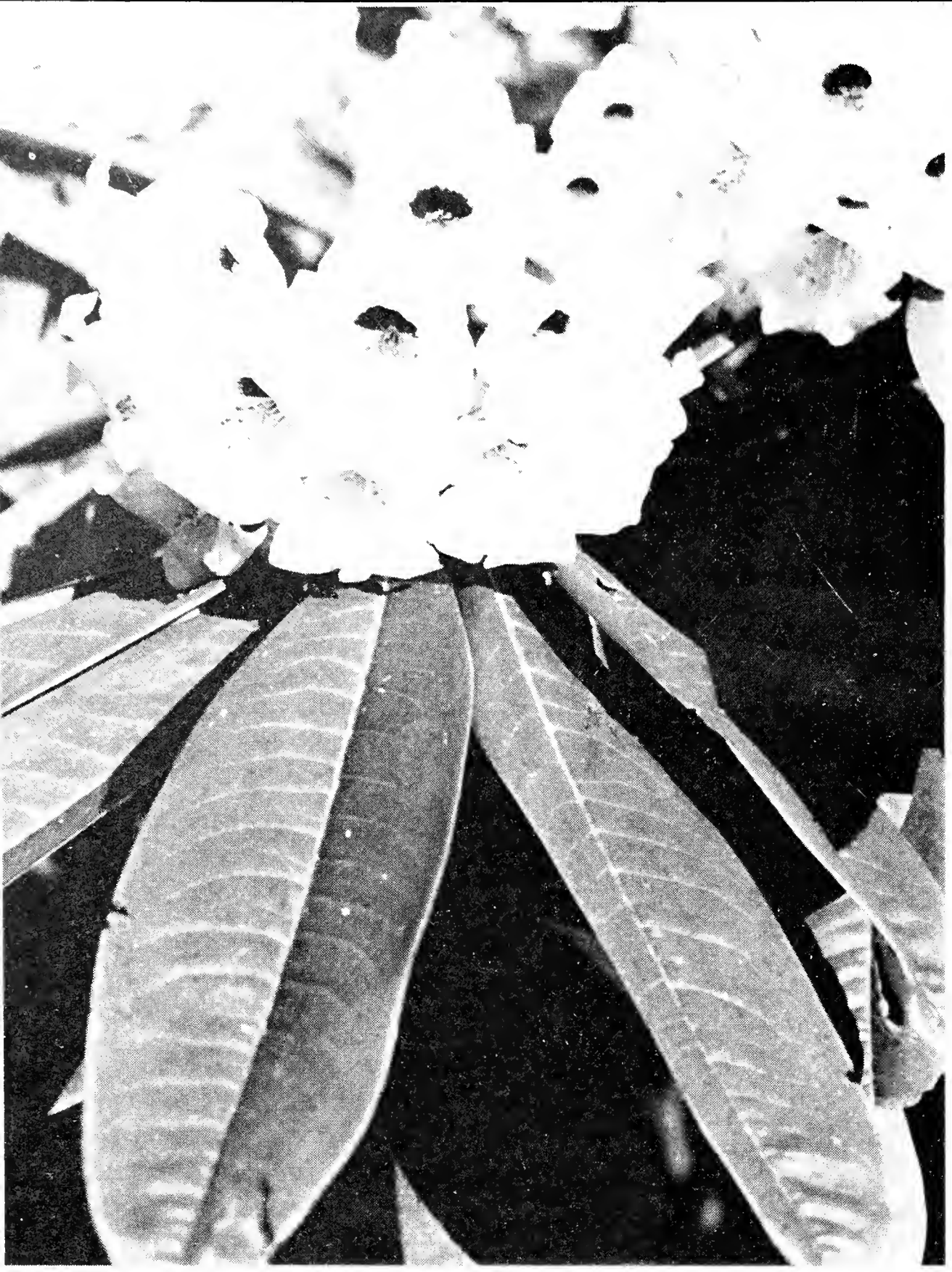
On the north side of the driveway we have a spring that provides continuous flow the year around. The upper part of the this area had been planted with *Peltiphyllum peltatum,* umbrella plant. Conditions were fairly ideal until a tree was lost that was the source of shade during the hot part of the day. Now the *Peltiphyllum* sunburns and we lack the autumn color effect. We will leave only a portion of the *Peltiphyllum* at the back, and channel the stream into some very sharp "S-curves" typical of those in mountain meadows. This should be ideal for some of the moisture lovers, including, we hope, the grape fern *Botrychium*.

Slightly downstream, a small island was built a few years ago to provide a place to experiment with some bog lovers. The results have been very encouraging. *Darlingtonia californica*, cobra lily, planted over serpentine boulders at the edge of the running water is increasing. Several species of sundew *(Drosera)* and butterwort *(Pinguicula)* are now happily established. Species of *Habenaria*, bog orchid, and *Cypripedium*, lady's slipper, have been planted and a few have now bloomed. The island is replete with dwarf *Mimulus*, monkey flower, *Hypericum anagalloides*, St. John's wort, *Marsilea vestita*, pepperwort, and *Vaccinium oxycoccos*, swamp cranberry. These bog inhabitants will be introduced into the new stream bed when it is developed. We are fortunate to have this habitat in the garden, for we would be foolish to attempt most of the above-mentioned plants without it.

Near the bog a bridge spans the creek, downstream from which is a wild and almost impenetrable gully. The removal of the criss-crossed fallen trees left from the ice storm two years ago was begun this fall. Above here stands a wood of tall trees with a wall-to-wall sword fern carpet. This wood, never actively developed by Mrs. Berry, is seldom visited, but holds much promise.

The path from the bridge leads into our best rhododendron plantings. Here one may stroll under a pure stand of *Rhododendron decorum* with fantastic twisted and contorted trunks. They become more fascinating each year as their weight becomes heavier.

To the east is a stand of *Rhododendron calophytum* tall enough to walk underneath.



Clockwise from upper left: *Rhododendron cal*
20; B.O. Mulligan). A view across the lawn fron
20; B.O. Mulligan). Mrs. A.C.U. Berry and her
(B.O. Mulligan). Additional summer shade is p
at the north end of the rock garden (pag
Rhododendron decorum forest (page 21; V. M

rtum, with its maroon-throated blossoms (page
house, with *Veratrum* in the foreground (page
l of flowering hybrids of *Lewisia*, in May, 1965
ded for a few of the plants in the trough garden
; V. Marttala). The contorted trunks of the
ala).

A portion of the rock garden, immediately behind the house. Photo: V. Marttala

But here the trunks are upright and undistorted. Also in this vicinity are several groves and individual specimens of rhododendrons, many from the Dr. J.F. Rock collections. Some notable ones are *R. tsangpoense* now five feet wide and nearly as high, a low growing form of *R. arizelum*, and a pair of *R. campylogynum* with flowers smaller than the type, but strangely dark. They are absolute jewels.

After passing through a mixture of rhododendrons of several series we can enter the new Lily Project from the lower end. This is composed of island beds surrounded by gravel paths. Sixteen species of lilies are now planted here while the main collection of 42 others, still in the seedling stage, will come to the garden gradually over the next two years. When first I saw this field in 1967, it was a series of holes and mounds caused by trees uprooted during the famous Columbus Day wind storm of 1962. In time the mounds were leveled and clusters of rhododendrons were planted under the remaining fir trees. Grass was planted and for a while it was a pleasant area which we were proud to show off. In March about six years ago a freak wind blew down those remaining firs, two of them into a neighbor's house, and we were back where we had started with holes and mounds, although we did enjoy the subsequent good blackberry picking. Once again the terrain has been transformed and today is planted to annual wildflowers to retain the beds until the arrival of the lilies for which it has been reserved.

At the top of this lily field stands our new greenhouse complete with an automatic mist system. This has proved valuable for holding and revitalizing tranpsplants and for growing the many varieties of seed we select each year. The surplus plants are sold at our semi-annual plant sales. This most useful and appreciated structure was built by funds from the Founder's Fund of the Garden Club of America, proposed by the Portland Garden Club.

We enter the main body of the alpine collection, passing among an assortment of variously shaped cement troughs. It is here and in the adjoining rock garden that the bulk of our collection is represented. Over 500 genera are found here, some with all the known species of that genus. Few mountain ranges have been overlooked, although the emphasis today is on plants of the Pacific Rim. Plant acquisitions had been crowding us so insistently that we had no space to give them the fair trial they deserved, so it was decided to enlarge the rock garden area. The original scree beds were made up of several log rectangles, each about 40 feet long and 6 feet wide. The logs were available from the clearing of the land. The logs held some moisture and many plants found them comfortable. However, slugs also found them cozy and there was a constant battle to keep their numbers down. Mrs. Berry was very choosy in selecting plants to go into these beds. Only those she regarded as high quality were used.

The rock garden has a slight east slope and is backed by tall trees on the west that provide shade in the late afternoon. Perhaps a few special plants deserve our attention. One that I consider rarest and known by few people is our own Oregon and Washington native *Suksdorfia violacea*. This is no startling beauty but has quaint little violet flowers and small saxifrage-style leaves. *Suksdorfia ranunculifolia*, the only other species in the genus, occupies a nearby trough. It has spice-scented leaves and larger cream-colored flowers. *Epilobium obcordatum*, rock fringe, occupies tight seams in the rock garden reserved for Oregon natives, where it grows in close proximity with *E.*

Epilobium rigidum in the rock garden. Photo: V. Marttala

Development of this stream area will provide additional habitat for moisture-loving west coast lily species, and other native plants. This view is taken from the bridge (page 21). Photo: V. Marttala

rigidum. Several small-growing rhododendrons which would otherwise disappear in the main planting are also found in the rock garden. Not only are rhododendrons well represented in the alpine garden but also other members of the Ericaceae which were favorites of Mrs. Berry. These include *Cassiope*, *Phyllodoce*, mountain heather, *Gaultheria*, salal, *Pernettya* and *Epigaea*, ground laurel. *Androsace*, rock jasmine, *Cortusa*, *Cyclamen*, Persian violet, *Dodecatheon*, shooting star, the white *Douglasia laevigata*, *Soldanella*, and *Primula auricula*, auricula, by the hundreds represent the Primulaceae. The Saxifragaceae would form a very long list indeed.

Not only are the names of the plants interesting but so are some of the sources. Many of these plants are here as the result of exchanges with people, some now gone, who are well known contributors of the informative articles in the back issues of the garden magazines we enjoy today: W. Ingwersen, C. Elliott, E.H.M. Cox, Ira N. Gabrielson, J.G. Bennett, C.R. Worth and Lester Rowntree.

During Mrs. Berry's time the area surrounding the rock garden was filled with cold frames—26 in all—most of them crowded with pots plunged to the rim. One frame was reserved for *Tecophilaea cyanocrocus*, Chilean crocus, and *Rhodohyposix baurii*. (Eighty flowers were counted on the *Tecophilaea* one year.) Many potted plants such as *Fritillaria*, fritillary, and species of *Narcissus* stayed permanently in the frames. It was quite a job at that time to maintain a constant supply of the ingredients for the different soil mixtures which Mrs. Berry deemed necessary for each plant's survival. I wish I had paid closer attention then to some of her recipes, but I felt it was impertinent to ask her about them.

The frames and the clutter they created are now gone, the last two were removed only this spring. Their space has been taken up by lawn, giving the garden a "spruced up" look. But I miss some of the old frames for they offered a variety of aspects and possibilities for growing plants that our new frames will never provide.

While it is impossible within the scope of so brief an article to do justice to the Berry Garden, I have attempted by this short tour to point out some of its important features and fascinating plants and to recall some of its past.

Tours of the Berry Botanic Garden are available at certain times of the year, but must be scheduled in advance. For more information call (503) 636-4112.

The Friends of the Berry Botanic Garden contribute to the growth of this delightful place. Annual memberships are available by writing to:

P.O. Box 8595
Portland, Oregon 97207

As We Remember Rae Berry

*ETHEL and ED LOHBRUNNER**
in conversation with Nan Ballard

Ed and Ethel Lohbrunner knew Mrs. Berry for many years and made numerous plant searching trips with her. "Of all the people we have travelled with over the years, we never met a finer travelling companion than Mrs. Berry." They remember that she was easy to get along with, had a great sense of humor, and adapted graciously to any situation. So well did she read lips that one soon forgot that she was totally deaf. Once, after meeting a gentleman for whom English was a second language, she said "My, he certainly has an accent, doesn't he?"

Ed told of Rae Berry's pleasure in accompanying Ethel and himself to the Olympic peninsula. They had heard that the tiny maidenhair fern found in Alaska had been seen on the peninsula, and longed to come across it. One day when they stopped for a noon break at a spot overlooking the ocean, Ethel and Rae started getting things out for lunch and Ed said he would run down the bank to "bring back the dwarf maidenhair." This was in an area of rugged shoreline with a perpendicular cliff rising out of the water. Only at low tide was it possible to clamber over the rocks at the base, which Ed did to admire up close a very large specimen of our native maidenhair. Looking up he was amazed to see tufts of the tiny maidenhair growing in crevices of the rock wall above. He managed to scale the cliff to reach a plant which came out easily in his hand. It was a very small specimen of the dwarf form of *Adiantum pedatum subpumilum*. Ethel and Rae were both dumbfounded and very pleased when he placed his treasure in the middle of their makeshift table.

Then, there was the time that Mrs. Berry and Dr. Dan Labby were with the Lohbrunners in the Choteau area in the Montana mountains not far from Augusta. On that jaunt, they found *Eritrichium howardii*, *Douglasia montana* and, near the river, *Cypripedium pubescens*. From the plain they climbed to a high alpine ridge to search for *Aquilegia jonesii* which Ethel had found and admired on a previous visit. She had seen a colony more than two feet across with numerous lovely almost stemless blue flowers growing on the edge of a precipice. She had slithered across a sloping scree to identify it, then stood up to say something to Ed and glanced into emptiness immediately behind her. Ed sensed something was amiss and called out "Are you all right?" Standing perfectly still, Ethel replied "Of course I'm all right" but she was rooted to the spot. he called again and she said, "I'm all right...oh, no I'm not!" Ed to the rescue. This story had intrigued Rae and she asked to accompany them when they returned to that spot.

In 1936, Ed and his brother had gone plant hunting in Alaska. They had started from Whitehorse, drifted down the river collecting, and then gone over the White Mountains to Fairbanks. Eighteen years later, Ed and Ethel decided to retrace this route and Mrs. Berry asked if she might accompany them. Ethel did not know Rae as well then as in the years to follow and was concerned that this fine lady might not realize how primitive the trip might be. Mrs. Berry pulled herself erect, looked Ethel in the eye, and said, "Ethel, I have not been an engineer's wife for nothing. My husband built the Tillamook Railroad and I lived in a tent!" They had made reservations in Fairbanks at the Pioneer hotel, one of two hotels in Fairbanks. Two nights before they left Vancouver, they learned the Pioneer had burned to the ground. The other hotel, when they arrived, was brimming with guests, but the manager found them a tiny log cabin with only one room. On one side were two bunks, one above

*The Lohbrunners have managed an excellent nursery in British Columbia, and are well-known as outstanding propagators and horticulturists.

the other, and across the room was a single bunk against the wall. Between was strung a rope holding up a sheet-like curtain. Ed and Ethel took the double bunk and sat reading and settling in for the night. The curtain was pulled open and there stood Rae in a lovely blue robe. She gestured behind her, "Ed, Ethel! My boudoir!"

From Fairbanks, they took a-rented pickup truck up the Steese highway which had been used as a military road during the war. That night they stopped at the Miller House of local historical interest, built in 1895 and now run as a guest house by the present owners named Miller (though not of the same family). This Mrs. Miller had cooked for President Harding and showed her skill in preparing for them a delicious dinner featuring the excellent vegetables for which this region of Alaska is so well known. Their accommodations were in bunkhouses and nearby was the square bath house where water was heated in huge galvanized cans. Ethel suggested that Rae be first to enjoy her first bath in days. In a few minutes, Rae popped out, calling "Ethel, Ethel, no hot water!" The water had cooled in transit from tank to tub.

Another leg of their journey was to Mayo. They flew into a rugged airport, found a taxi labelled "Chateau Mayo". As they travelled down the muddy street, bouncing from pothole to pothole, Rae sighed and said "All I ask is that it be clean." The chateau proved to be a rough hewn, well-worn, store-front type structure and the entry hall was covered with worn linoleum with a large hole cut in the center to sweep the dust onto the ground below. Ethel's heart sank as they started up the stairs. At the top they were greeted by a starchily uniformed young lady who showed them to their rooms, pine-panelled and exquisitely clean. Down the hall was the bath and, again, Ethel gave Rae the honor of first bath. Ethel, waiting anxiously in the hall, was relieved to see clouds of steam coming from the cracks around the door. Out popped Rae, "Ethel, oh Ethel! No cold water—only hot water!"

Continuing their trip by the White Pass and Yukon Railroad, they passed banks of *Cassiope*, *Phyllodoce*, and plants of similar ilk, wishing they could get a closer look. At the White Pass summit, the boundary between Alaska and British Columbia, they stopped overnight at the railroad section house. Next day they tried to take pictures of many plants including *Cassiope lycopodioides*, *C. mertensiana*, *C. tetragona*, and *Dodecatheon frigidum* even though the day was darkly overcast. Ed remarked to the attendant at the railroad section house where they had bunked that night that the plants were spectacular despite the gloom. To which the man replied "You should see them in the sunshine. Let me see, we had two days this past season without rain."

This very successful trip was one of many Ed and Ethel Lohbrunner were to take with Rae Berry in the years to come. She was in her early 90's when, as the three of them reminisced about their past travel, Rae said, "Ed, Ethel, let's go back to Alaska." When they demurred, she said, "Well, then, let's go to the Aleutians!"

More About Mrs. Berry

Some Articles and Notes by Mrs. A.C.U. Berry

Primulas in My Garden. *National Horticulture Magazine*, 11(2): 115-120. April 1932. Washington, D.C. Illustrated with photographs by John Bacher.

"A shady, tiny plot in back of our house on a small city lot was the reason for my beginning with primroses many years ago.

Two Women in Search of a Plant. *Quarterly Bulletin of the Alpine Garden Society* 14(1): 31-38. March 1946. London.

Hunting for *Aquilegia jonesii* in Montana and Wyoming, with Mrs. W. J. Regan of Butte, Montana.

Penstemon rupicola alba and *Primula cusickiana*. *Quarterly Bulletin of the Alpine Garden Society* 15(3): 174-177. September 1947. London.

Kalmiopsis leachiana var. 'M. le Piniec'. *Quarterly Bulletin of the Alpine Garden Society* 28(1): 23. March 1960. London

Quotes from letters about *Kalmiopsis leachiana* var. 'M. Le Piniec' written by Mrs. Berry to Brian Mulligan in December 1960.

> "M. Le Piniec was with us when we collected the *Kalmiopsis*—there are places on the cliffs where it is heaped over the rocks yards long—others growing over flat or rounded rocks with apparently nothing to eat—spare diet!"
>
> "Yes, I certainly think it deserves a specific name—for M. Le Piniec—I sent seeds of its a few years ago to the Scottish Rock Garden Club and named it *Kalmiopsis leachiana* var. 'M. Le Piniec'."

Scoliopus bigelovii. Quarterly Bulletin of the Alpine Garden Society, 29(2): 188. June 1961. London.

> Found in northern California when on a trip with Dr. and Mrs. Ira N. Gabrielson. Plants still exist in the Berry Botanic Garden.

Plant Material Donated by Mrs. A.C.U. Berry to the University of Washington Arboretum, May 1948 to May 1968.

1948: May, seedlings of *Lilium auratum* var. *virginale;* December, collection of plants including 20 species of rhododendrons, some 3 to 4 feet tall, and species of *Gaultheria* and *Pernettya.*

1951: July, seeds of *Daphne retusa;* December, plants of *Gaultheria nummularioides.*

1952: November, six plants of *Buxus microphylla* 'Kingsville Dwarf', one of which is still in the Japanese Garden.

1955: April, collection of seeds from the Stainton, Sykes and Williams expedition to Nepal; 60 packets, mostly of trees and shrubs. The following are growing in the Arboretum from this collection: *Caragana brevispina, Cotoneaster adpressus, Lonicera obovata, Pinus wallichiana, Rosa brunonii, Rose sericea.*

1960: April, plant of *Cassiope selaginoides,* that died in 1967.

1962: May, a primrose plant.

1963: November, seeds of *Magnolia* and of a pine.

1968: May, plants of *Kalmiopsis leachiana* and *Rhododendron forrestii;* the former still is in the Arboretum.

B.O. MULLIGAN

Some Contributors of Plants to the Berry Botanic Garden.

"When I refurbish the rock gardens I turn up old labels of plants that no longer exist. These indicate that (Mrs. Berry) had received plants from the following list of people. Some of them you may know.

"Mrs. Minto, K. Wada, (in Japan), W.H. Preece, Nettie Gale, Agnes James, W. Ingwersen (an English nurseryman), Jack Drake (nurseryman in Scotland), E.K. Balls (English collector of plants in Turkey and Morocco), Prof. Suendermann (German botanist and nurseryman), Mrs. K. Marriage (of Colorado), C.R. Worth (American plant collector), Claude Barr (nurseryman from S. Dakota), General Murray-Lyon (amateur grower in Scotland), Harold Epstein (of New York, former President of the American Rock Garden Society), Col. D. Lowndes (English plant collector in the Himalayas), Jane Byman, Roy Davidson (of Bellevue, Washington), Ed Lohbrunner (retired grower of alpine plants at Victoria, BC), Carl S. English, Jr. (of the Chittendon Locks Gardens, Seattle, now deceased). . .

JACK POFF

Tiered bins and shed at a community composting project (page 30). Photo: D. Stromberg

A Perspective — on Composting

*EMILY MANDELBAUM**

"Use it again, Seattle, Compost!" These are the words of Good Soil Sam, spokes-worm for Seattle's program to encourage city residents to compost. Sam has been seen or heard on buses, television and radio spots, utility bill stuffers and a bright green how-to-compost brochure. Composting is being sold to the public as an easy way to improve and enrich the soil, and to substitute for purchased soil conditioners such as steer manure and peat moss.

This advertising campaign is part of a strategy to reduce the amount of solid waste the city must truck to landfills. Landfill space is becoming scarce and the cost of hauling is increasing. Good Soil Sam is portrayed chewing a mouthful of the garden wastes that constitute an estimated 20% of all Seattle's trash.

The earthworm Sam is also an appropriate symbol for the composting process, being one of the creatures which produce humus as a

*Emily Mandelbaum initiated composting in her neighborhood and later served as composting consultant for the city of Seattle Pea-Patch program.

by-product of their life cycles. It is, after all, earthworms and bacteria which do the labor, while people simply provide optimum working conditions.

Composting is nothing more than the management and manipulation of a process that takes place in the woods without human assistance. Leaves, twigs, branches and animal remains accumulate on the forest floor. Gradually they are buried and digested by bacteria, fungi, actinomycetes, earthworms, flies, millipedes, sowbugs and other organisms. But biological decomposition in the forest can take years. By following a few simple principles people can speed up this process and produce humus (usually called compost) in as little as two to four weeks.

Planning a System

Entire books have been written on composting and magazine articles on the subject are legion. One magazine, *Compost Science,* is totally devoted to composting. Literature on large-scale composting emphasizes high technology, logistics, public relations, and marketing or distribution of the product. Literature on home composting emphasizes various small-scale techniques, suitable ingredients and simple tools and structures. For the home composter this latter material can be interesting but also confusing and frustrating. The basic principles of composting are often overwhelmed by details and examples. There are disagreements concerning which ingredients are essential, unsavory accounts of improperly managed compost, too many "best" systems, and axioms that will contradict the reader's experience. Composting literature also sometimes gives the false impression that the bins are the most important part of the system.

If you take the literature as seriously as I did, you may strive in vain to recreate someone else's system on your own turf. After all, your needs, resources, living conditions and attitudes are probably different. I was exasperated to read one author's claim that manure is an essential ingredient. How could I, a city dweller, acquire manure without great expense and effort? Having struggled with volumes of composting literature, here are my recommendations for the aspiring home composter:

1. Learn the principles of composting.
2. To get some ideas about what is possible, look at pictures of various structures used for composting and read about a few techniques.
3. Decide how the principles of composting can best be applied given your particular needs, resources, living conditions and attitudes.
4. Recognize the need for trial and error. I am still searching for a more satisfactory system for fall and winter composting.
5. Don't try to be a perfect composter. My carbon-nitrogen ratio (explained later) is seldom correct, my compost is not always fine and crumbly, and rodents occasionally visit my pile. But my plants love it; they are thriving.

My life-style has determined my composting system in the following way. I am a city dweller in a residential neighborhood. My neighbors provide nitrogen-rich grass clippings in spring and summer (so that is when I make the most compost), but I have no acces to nitrogen-rich manure and I also need to establish an inoffensive system. My vegetable garden grows year-round and there are fruit trees, ornamentals, and a small lawn. Much compost is needed to improve the clay soil and provide nutrients for plants. However, the garden does supply raw materials: leaves in the fall, grass and weeds in spring and summer. Since my family uses a lot of fresh produce, eggs and tea, moderate amounts of food wastes suitable for composting are available. We burn one to one-and-a-half cords of wood each year, thus generating wood ash and sawdust.

Using Composting Principles

Compost in bulk. This holds in heat and moisture and minimizes the loss of nutrients due to exposure. One cubic yard is the minimum volume recommended for fast composting. Many composters will decide to buy or build one or more containers. Containers provide compact storage and give the appearance of good management. Containers may be bins, wire cages, trenches, garbage cans, metal drums or styrofoam coolers. They should be designed so that it is easy to add raw materials, aerate the pile and remove compost. Three bins are a common choice but two or

even one may suffice. Compost can be turned in and out of the same bin, but the first batch must be finished before the second is started. Bulk may also be achieved by composting in mounds (called windrows). Mounds are less compact and neat, but they cost nothing and work well, expecially in the Northwest where such piles are unlikely to dry out.

Aerate the compost. The bacteria responsible for rapid decomposition and thus for heating the pile require oxygen. Turning compost (usually with a pitchfork) once or twice a week is the most common and effective method of aeration. Compost on the edges of the pile will decompose more slowly than material in the center, and such material should be placed in the center when the pile is turned. Turning also ensures that all the compost will be subjected to high temperature. Aeration is also facilitated by adding some rigid materials like twigs to the compost to create airspaces, by building bins with perforated sides, or by creating vents by forcing rods into the pile and then removing them. If aeration is inadequate, aerobic bacteria will be replaced by a set of anaerobic bacteria that work more slowly and produce foul odors.

Keep the pile moist. If some decomposing organisms can work without air, none can work without water. Experimentation with watering is the best way to decide how much moisture is needed. If the pile is too dry it will not heat. Some ingredients such as fresh grass and kitchen scraps contain sufficient internal moisture. Because I use large quantities of grass, I seldom need to water my compost. Continual exposure to rain may leach nutrients from uncovered compost, but a sheet of black plastic thrown over the pile will help to prevent this loss.

Cut up raw materials. Cutting, chopping or shredding hastens decomposition by providing more surface area and by breaking protective coatings. It also generates finer textured compost. Fortunately, many raw materials such as grass clippings, sawdust and ashes are already cut up. Many leaves will compost well whole. The only materials that need chopping for my system are kitchen scraps, large, tough weeds, and plant wastes such as pea vines.

Each composter has a favorite tool for tackling tough weeds and plant wastes. Some choices are hedge clippers, machetes, mattocks, shovels and hatchets. Materials should be cut into pieces two to six inches long, but here again experimentation is the best guide. If something emerges whole and recognizable after three weeks' exposure to frenzied bacterial attack, then it was too large. Raw materials also must not be cut too fine. I processed kitchen scraps in my blender but this produced an impenetrable sludge lacking the airspaces needed by aerobic bacteria.

Finished compost is dark brown and most raw materials cannot be identified. A few items, such as egg shells and corn cobs, will not decompose beyond recognition in three weeks. This is no cause for concern; they will eventually decompose after the compost has been added to the soil. Most authors cite fine, crumbly humus as the product of composting. My compost has never acheived this ideal; it is always lumpy but it works beautifully in my garden.

Mix or layer two or more raw materials, one of them nitrogen-rich. There are three reasons to use a variety of raw materials: efficient decomposition, texture and nutrient content.

Rapid decomposition and a high composting temperature require a good supply of nitrogen. Raw materials like fresh grass clippings, manure and bloodmeal can provide it. If most of your raw materials are not nitrogen-rich, forget about fast composting. For efficient fast composting the nitrogen-rich materials must be balanced with carbon-rich raw materials such as leaves, sawdust or straw. If the proportion of carbon-rich materials is too low, nitrogen will be lost as ammonia. Maximum efficiency occurs when carbon and nitrogen in the raw materials are present in a ration of about 30 to 1. This is the carbon-nitrogen (C/N) ration so often mentioned in composting literature.

Having a supply of carbon-rich and nitrogen-rich materials ready to layer at the same time is often difficult. Fresh grass, high in nitrogen, is abundant in spring and early summer; leaves, high in carbon, are ready in the fall. Because grass must be used fresh the best strategy is to stockpile leaves. Another option, one that I often choose, is not to worry about the proper balance. Use the fresh grass and concede the loss of some nitrogen as ammonia.

Mixing materials also improves the texture of compost. Grass clippings alone will decompose but the product will consist of slimy chunks. Thin layers of soil between layers of grass will greatly improve this texture. Layering distributes raw materials evenly throughout the pile and is a convenient way to get approximately the proportions you wish. Layers of dense materials like soil should be no more than two inches thick, while lighter materials like grass clippings can be added in layers up to six inches thick.

Many raw materials such as seaweed and ashes are incidental to successful decomposition but contribute nutrients and trace minerals important to plant growth and human nutrition.

Raw Materials

The availability of raw materials will help determine whether you choose fast or slow composting. Raw materials can be ranked according to their cost and accessibility. To qualify for my compost a raw material must be free and readily available. Grass clippings, leaves, weeds, wood ashes, sawdust and non-meat kitchen scraps are all very useful. Prunings are difficult to use unless you have access to a chopper. Avoid meat, bread, or grease. These are attractive to rodents, and grease will slow the decomposition process.

Ingredients that require travel but often are free include seaweed which is rich in potassium and trace elements, sawdust, produce, coffee grounds from restaurants, ashes from restaurants that barbecue meats, rock powders from quarries, straw, and manures. I seldom use costly raw materials such as bloodmeal, rock powder, chemical fertilizer or manure. Books such as *The Rodale Guide to Composting* provide extensive lists of compostable materials and indicate the nutrients they contain.

Fast versus Slow Composting

Gardeners may wish to choose between these two styles of composting. In fast composting, the principles outlined above must be observed. When this is done, the bacterial work force will reproduce and metabolize furiously enough to generate temperatures of 140 to 160° F. The high temperatures help kill weed seeds and pathogens, and produce finished compost in just 2 to 4 weeks. Disadvantages of this system include the necessity for chopping materials well and for aerating the pile regularly. Batches of compost must be made at one time, and excess raw materials must be stored until needed again. The raw materials must be nitrogen-rich.

Fortunately for those who dislike pitching compost, or who have few nitrogen-rich materials, there is the slow composting system. Proponents of slow composting must keep decaying materials moist but can slight other principles depending upon the exact method chosen. While composting in bulk, chopping raw materials and mixing types of materials are sensible practices, they are not essential. Aeration and the use of nitrogen-rich materials can be ignored. Raw materials can be added as they become available. Of course, slow composting requires six months to one year or more for decomposition, and weed seeds and pathogens are less likely to be destroyed. Nonetheless, slow composting systems are the more popular in my neighborhood.

Systems Used in my Neighborhood

Six of the seven systems described below are slow composting systems, and are very successful.

The abandoned-pile system. One neighbor piles all garden wastes, including prunings, in the far corner of the yard. Material is added to the pile when it becomes available. Kitchen scraps are not used. Because the pile is never turned, decomposition is probably anaerobic. However, odors are not evident because the pile is seldom disturbed. Decomposition takes at least a year, and exposure to sun and rain probably depletes the supply of nutrients in the compost. Compost is harvested from the bottom of the pile as needed.

The bucket-and-soil system. The reason most of us make compost is to improve the soil. So why not bypass containers and mounds, save some labor and make the compost where there are plenty of microorganisms and earthworms waiting to do the job? Kitchen scraps can be collected in a bucket and each layer covered with some soil. When the bucket is full the material can be buried in the garden. The kitchen scraps will decompose in a few months. Earthworms multiply beautifully. This system has the disadvantage that the kitchen scraps must not be buried too near growing plants

lest the decomposing material rob the soil of nitrogen needed by the plants. This particular neighbor uses grass clippings to mulch plants and maintains an abandoned-pile system in the back of the yard for hedge clippings and prunings.

Worms-in-the-garbage-can. This composter prepared a bed of moist leaves and soil in a garbage can in the garage. Some earthworms and kitchen scraps were added then covered with damp burlap. Periodically more kitchen scraps can be added (the *Rodale Guide to Composting* has detailed instructions for this kind of composting). One must guard against adding more kitchen scraps than the earthworms can eat in a short period of time, because decaying material may begin to heat. Temperatures over 100° F will kill the worms.

Brown-bag composting. This does not mean brown paper bags; the paper would decompose too. It means anaerobic composting in heavy polyethylene bags. The bags are filled with raw materials and tightly closed. Decomposition takes months but odors are contained and no management is necessary. Loss of nutrients due to oxidation and leaching is prevented.

Sheet-composting. In the fall after crops have been harvested the garden can be covered with leaves and cut-up plant wastes. Turn these materials into the soil, and they will decompose over the winter. In spring and summer plants can be mulched with grass clippings and young weeds.

The fanciest-system-on-the-block. This system consists of two cinder block bins about 5 by 3 by 3 feet. The bins have a concrete floor. A gas-powered shredder-grinder is used to shred prunings and leaves, which are stockpiled in plastic bags. Every two weeks two layers are added to the bins. A layer of kitchen scraps and manure is covered with grass clippings or shredded materials. Small amounts of commercial bacterial culture are added from time to time. When both bins are full, material from the first bin is either used, or stored in piles covered with polyethylene sheeting.

Fast composting in cylindrical wire cages. Composting is limited to spring and summer when fresh grass is available. Grass, leaves saved from the previous fall, and some kitchen scraps are layered in a hardware-cloth cylinder 2½ feet high and 3 feet in diameter. The compost is turned at least once a week by detaching the ends of the hardware-cloth and removing it from the pile. Ends of the hardware cloth are hooked together again and the empty cylinder is placed next to the free-standing compost heap. The compost is then pitched back into the cylinder.

Some Problems to Think About

Weed seeds and pathogens. Some authors believe that the heat produced by fast composting kills most weed seeds and pathogens; others disagree. Experiment and let experience be your guide. I have used insect-infested material in compost with no regrets but I do not add plants affected by fungal or viral diseases.

Contaminants. As beneficial as it is, compost can contain small amounts of some highly undesirable substances—heavy metals, and pesticide and herbicide residues. The presence of these substances is hard to avoid, expecially in cities. Heavy metals are considered the more serious problem.

It is important to remember that the problem is not the contamination of compost but the contamination of food. Before reaching your fruits and vegetables a contaminant must survive the rigors of the composting process, must be taken up by the plants, and must be stored in their edible parts. It may be better to avoid some of the more direct sources of contamination before worrying about compost. You can do this by washing all produce from your garden and by avoiding crops that are known to take up heavy metals if you believe your soil is heavily contaminated with them (some leafy vegetables are known to take up lead and cadmium). If your soil is acid, add lime to neutralize it; this helps block the absorption of some heavy metals by plant roots.

If one wishes to reduce the contaminants in compost, avoid raw material collected next to right-of-ways (highways, powerlines and the like). Non-crop herbicides are often used in these areas and their residues persist. Such areas also receive the greatest lead fall-out from automobile exhaust. I ask the neighbors who supply grass clippings whether they have just used weed-killing products.

What's in it for the Plants: The Value of Compost

When I started composting I wanted to produce humus that could be considered a fertilizer. I hauled manure, collected seaweed and even purchased sacks of powdered rock phosphate. I soon realized that having my compost meet the standards for fertilizer set by the state of Washington was not worth all that effort. I also realized my desire to do this was based on my unsubstantiated belief that fertilizer is more valuable than compost. The key question is—valuable for what?

Fertilizers contain nutrients that are immediately available to plants. The availability of nutrients in fertilizers also means that what is not used by the plants may be leached away and lost. Fertilizers, then, provide short-term nutritional benefits. I often use a nitrogen fertilizer to help transplants get started in the soil. However, fertilizer does nothing to improve the soil itself.

Compost, on the other hand, provides long-term benefits. It improves the capacity of the soil to sustain growth by adding decayed organic material and organisms that help create good soil structure. Good soil structure increases the soil's moisture and nutrient-holding capacity, prevents crusting and compaction, provides air spaces for root penetration and soil organisms and improves water penetration.

Compost is also a source of nutrients, the amount and kinds depending upon the raw materials used. Most of the nutrients are in storage and are released slowly, usually when plants need them most.

Seattle's Composting Program

Composting is most efficient if it is done where raw materials are generated and where finished compost can be used. Both the hauling of raw materials and the hauling of finished compost are expensive and energy intensive. The City of Seattle recognized this in its recently adopted composting strategy. The major objective of Seattle's program is to encourage citizens to compost at home. Information and advice on composting are available to citizens on a Composting Hotline: 625-2089. Also, trash collection charges are now based on the number of cans used. This is intended to encourage composting and other forms of recycling. The other two objectives of Seattle's program are to promote community composting and to study the centralized composting of yard wastes. Community composting is intended to serve citizens who cannot compost at home but wish to recycle their organic wastes or acquire compost for their gardens. Obvious locations for this project were Pea-Patch sites (community gardens administered by the city). Other composting projects were initiated in receptive neighborhoods not associated with community gardens. Participants built bins, collected raw materials, organized regular turning and layering sessions, and distributed finished compost. The feasibility study of centralized composting will attempt to identify markets for composted and uncomposted yard waste, determine whether Seattle's transfer stations can accommodate such an enterprise and find other sites where the collection, shredding and composting might be possible.

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Arboretum

The Washington Park Arboretum

ARBORETUM ANNUAL REPORT

WASHINGTON PARK ARBORETUM

June 1, 1980—May 31, 1981

To: *H.B. TUKEY*
Director of Arboreta

From: *JOSEPH A. WITT*
Curator of Plant Collections

and

JAN PIRZIO-BIROLI
Naturalist and Volunteer Coordinator

The past year has seen a number of changes in the operations and condition of the Arboretum. Our most positive event was the incorporation of the management and operations of the Arboretum into the Center for Urban Horticulture. This new and vital program, established last year by the University, is charged with teaching and research in the area of horticulture within the urban context. The Arboretum serves as the principal plant materials resource and provides a focus for the educational and other public service activities of the Center. Dr. John Wott has accepted an appointment with the Center and will be responsible for countinuing education programs, including those at the Arboretum. Dr. Wott's experience will be most welcome in improving and enlarging our efforts in this field.

As mentioned in the Summer issue of this *Bulletin*[1], two major projects are completed or well started. The replacement of the irrigation system has been finished, much to the delight of those of the staff who had spent many hours in the past several years digging up and repairing the old system. Most of the old galvanized pipe has been replaced by PVC waterlines which should resist rust and corrosion for many years to come. Automatically operated irrigation heads were installed in a number of sensitive areas such as Loderi Valley, Rhododendron Glen and Azalea Way. These are programed to activate at night, avoiding the problem visitors formerly had of ducking the old hand-set sprinklers.

The filling, grading, and grass sowing of the conifer meadow was completed, with plans for planting the trees being made. If all goes well, much of this work will be completed this winter and early spring.

The traffic study initiated by the City of Seattle known as the East Central Area Transportation Plan has been considered by the City Council. A public hearing was held in mid-January at which time a number of comments were made by those concerned over the high

[1] *UW Arboretum Bulletin* 44(2):28. Summer, 1981.

level of traffic using Lake Washington Boulevard East through the Arboretum. Proposals to help alleviate this problem have been submitted to the Council and, while there seemed to be concern for the Arboretum, there does not appear to be much chance that any action taken by the Council will result in significant reductions in the number of automobiles using the Boulevard.

The financial problems of the State filtered down to the Arboretum, and our budget was reduced by about $40,000 on July 1, 1980. Besides losing one gardener and all of the monies used to pay part-time and temporary staff, we were forced to withdraw all maintenance from the Japanese Garden. Fortunately this was less of a catastrophe than it might have been, since the Arboretum Foundation agreed to pay for routine care and the Seattle Department of Parks and Recreation gave a grant to pay for a gardener and some badly needed pruning for the period February through June 1981. After July the city will assume complete responsibility for the Garden.

This same budget reduction has thrown an additional burden on gift funds given to the Arboretum for its operation; we must now use some of this money for supplies and equipment. In addition we have had to make some reduction in the area of plant introduction.

Operations

Much of the staff's time has been spent in routine maintenance, weeding, pruning, weeding, spraying, weeding, and removal of brush and unwanted trees.

Plantings

Although it has been our policy not to increase the plantings to any large extent because of staff reduction, we have continued to make replacements in the collections where necessary and to add to unfinished plantings. An exception however, was a new heather display garden established in Rhododendron Glen. Twenty-seven kinds of summer-blooming heathers, for a total of nearly 1000 plants, were planted in October. The bed was designed and the plants donated by members of the Northwest Heather Society.

Other plantings include a small collection of evergreen oaks; some from the mountains of Mexico were place on a sunny bank at the south end of the oak collection. In all, 320 plants (excluding the heathers mentioned above) of some 130 taxa were planted on the Arboretum grounds.

Seeds and Plants Acquired and Distributed

We continue to search for new and better plants to fill out our collections. During the period covered by this report we received 371 lots of seeds and 112 kinds of plants from 84 different sources. Among the more interesting were: 17 small plants collected in Japan and sent by the U.S. National Arboretum; 26 lots of seeds from the Shanghai Botanic Garden, Peoples' Republic of China; and 52 packets of seed collected in China by the Sino-American Botanical Expedition, sent by Dr. Bruce Bartholomew, curator of the University of California Botanical Garden, Berkeley.

In return, the Arboretum distributed 565 plants to 26 institutions and gardens. Through the seed exchange, 2993 packets of seeds were sent to 228 sister institutions, handled again by volunteers from Unit 66.

Staff

Two new staff members have been added during the year. Mrs. Jan Pirzio-Biroli started work in November as Naturalist and Volunteer Coordinator. She has developed a number of programs for volunteers, organized guide training, and has helped to coordinate activities in the office. As the educational programs of the Center become established, we expect to increase not only the diversity and size of the volunteer programs but also their enrichment value.

Sarah (Sally) Tatman replaced Jeanne Northey as Gardener I in February. Sally had been working with the staff on a temporary and part-time basis for some time prior to this appointment.

Ms. Phyllis De Friese who had been our secretary for two years resigned in June 1980.

Meetings, Educational and Volunteer Activities

The University and the Arboretum were hosts for the Western Regional Meeting of the American Association of Botanical Gardens and Aboreta in October 1980. Some sixty

members of the AABGA from the western US and Canada attended this two-day gathering which included lectures and tours. Delegates visited the Arboretum where they were greeted by members of the Arboretum Foundation. They also spent a half-day at the Bloedel Reserve, hosted by Mr. and Mrs. Bloedel.

Dr. Tukey and Professor Witt represented the Arboretum at the annual meeting of AABGA in San Mateo, CA in May.

In July the annual meeting of the Pacific Northwest Heather Society was held on the University campus and they visited the new summer-flowering heather planting mentioned above.

Mr. Van Klaveren attended the meeting of the Western Chapter of the International Plant Propagators Society in October 1980.

A horticultural Tour of New Zealand was organized by Professor Witt and sponsored by the College of Forest Resources Continuing Education Division. A complete report on this activity appeared in this *Bulletin*[2].

The staff gave 15 lectures and demonstrations and 14 tours. Among the groups that visited the Arboretum during the year were representatives from the Strybing Arboretum, the Saratoga Horticultural Foundation, the Holly Society of America, the Pukeiti Rhododendron Trust of New Zealand, the University of British Columbia and an Italian agricultural group. The Explorers' Walks had long been led by Robert Van Denburgh, formerly the Arboretum's Recorder. Upon his sudden death in April, they were taken over by Mrs. Pirzio-Biroli. These public tours, offered monthly throughout the year and semi-monthly in spring and fall, are attended by as many as 30 people and as few as 5 or 6 during off seasons.

Arboretum Courses remain a major public service. In the year 1980-1981, subjects included pruning, propagation, tree and bird identification, as well as Professor Witt's Arboretum tours. Mr. Van Klaveren taught propagation courses in Winter and Spring quarters and gave a series of classes on greenhouse management for the Arboretum Unit Council.

Educational activities were augmented with increasing support and participation by the new University of Washington Center for Urban Horticulture, which created the staff position intended to coordinate the docent and other volunteer programs and to expand public services offered through the Arboretum. This position owes much of its success to the cooperation and advice of active guides and the members of the Arboretum Unit Council who pioneered the docent programs.

The staff is grateful to the members of the Arboretum Unit Council who developed a most successful program of office volunteers in the Arboretum Office. Over 45 people are involved in this service to the Arboretum, which has provided more enthusiasm to the office as well as releasing staff time. In addition, the Arboretum office is staffed on spring Sundays with volunteer Sunday Office Staffers (SOS'ers) as in past years.

Concentration of responsibility in the Arboretum office for scheduling tours has led to greater predictability in this service. Records for 1980 are unavailable, but during the first five months of 1981, 68 tours led by 108 guides brought approximately 1635 people into contact with the Arboretum.

Two Sunday open houses were held: in the Japanese Garden in April and emphasizing the Rhododendron collection in May. On each of these afternoons ten guides participated.

In Spring of 1981 a sensitive training series was offered for the Japanese Garden Guides. Training for Native Plant and General Arboretum Guides, held on alternate years, will take place in 1982. In all, 62 guides are presently enrolled in the docent program.

A series of public lectures was begun in February, each followed by a pertinent tour of the Arboretum. These were planned as enrichment for the General Arboretum Guides as well as for the public.

All special programs connected with the Arboretum were publicized in a newsletter sponsored jointly by the Arboretum Foundation and the Center for Urban Horticulture.

The Arboretum logo which heads this article was created by Jeffrey Berend, a student in Professor Richard Dahn's University class in graphic design. It was selected as being most representative of the spirit of the Arboretum and will be use on all Arboretum documents.

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[2]*UW Arboretum Bulletin* 43(4):19-25 and 44(2):17-28. Winter, 1980 and Summer, 1981.

Other Activities

A small grant to study the potential of composting Eurasian milfoil harvested from Lake Washington was received in Summer, 1980, sponsored by the Department of Parks and Recreation with funding from the Environmental Protection Agency. Eight trial compost piles were established on Foster's Island, and the composted material is being used in studies of growth and nutrient level of a range of ornamental and vegetable plants both in trial garden plots and in the greenhouse.

Weather

The winter of 1980-1981 was relatively mild and not especially wet. The lowest temperature was -6.1°C (21°F) on February 11, 1981. January was dry with less than half the twenty-year average rainfall, and the entire 12-month period showed a continuation of the drought which has been evident the past four years.

WEATHER RECORD

	Precipitation		Temperature* High		Low	
	mm	(in)	°C	(°F)	°C	(°F)
1980						
June	63.8	(2.51)	25.6	(78)	5.6	(42)
July	9.9	(0.39)	30.0	(86)	7.8	(46)
Aug	23.5	(0.93)	31.5	(89)	8.9	(48)
Sept	34.9	(1.37)	25.6	(78)	6.1	(43)
Oct	37.8	(1.49)	26.7	(80)	0.6	(33)
Nov	147.8	(5.82)	18.2	(66)	-0.6	(31)
Dec	165.2	(6.50)	16.1	(61)	-5.6	(22)
1981						
Jan	57.5	(2.26)	16.7	(62)	-1.1	(30)
Feb	100.2	(3.94)	18.3	(65)	-6.1	(21)
Mar	62.3	(2.45)	18.9	(66)	-2.2	(28)
Apr	58.9	(2.32)	24.4	(76)	-0.6	(31)
May	61.5	(2.42)	27.8	(82)	3.3	(38)
Total	823.1	(32.40)				

*Days with maximum below 0°C (32°F): 1
*Days with minimum below 0°C (32°F): 36

Library

The library grows slowly but steadily. Thirty-two titles were received during the year, about the same number as in 1979-1980. A number of these were gifts to the Arboretum Library. These included: seven volumes from the estate of the late Carl S. and Edith H. English; a volume of field notes on the rhododendrons collected by Rock in 1923/24; three volumes on the woody flora of New Zealand; and the magnificent *Wild Flowers of Mount Olympus* by Arne Strid, donated by the Northwest Unit of the American Rock Garden Society.

The staff acknowledges the invaluable assistance of Ms. Lyn Sauter who has spent considerable time in cataloging and sorting various library collections.

The continued help which the Arboretum and the Center for Urban Horticulture receives from our support groups and from the interested public is vital to our operation, especially during difficult financial times. Donations of funds, gifts of plants and books, and donations of time by numerous volunteers is gratifying. The list of contributions is long, and the staff would like to acknowledge each publicly with a sincere "thank you." This kind of support is essential as we plan for the future, with new facilities, new faculty and staff, and new educational opportunities.

LIBRARY ACQUISITIONS

This represents a partial list of acquisitions. Those interested in seeing the complete list may inquire at the Arboretum office.

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A Tribute to Volunteers

Volunteer—to render a service, to offer or bestow voluntarily, so says the dictionary.

In my estimation, members of the Unit Council fulfill that definition to the fullest. I would like to point out just two facets of Unit Council activities for the year 1980-81. Members of the Unit Council have given their time six hours a day, five days a week, to be in the Arboretum Office to answer telephones, to greet visitors, to respond to questions, and to be of service. This activity alone accounts for at least 1,400 hours of service since the volunteer program began.

In addition, members of the Unit Council have contriuted more than $25,000 to the Arboretum for maintenance and development.

My hat is off to these find volunteers, the members of the Unit Council!

MARY ELLEN MULDER
past General Chairman,
Unit Council

The Unplanned Pyracantha

Accidental effects often have pleasing results in a middle-aged garden such as ours. Two plants of red-fruited variety of *Pyracantha*[1] were planted against a south wall when our three-room house was built more than 25 years ago. I had intended to espalier them in an informal, asymmetric manner, and this was successful for several years.

Eventually, however, the wall became shaded by a volunteer *Acer macrophyllum* which was left in place for the summer coolness it provided. Although the lower branches of the pyracantha stopped bearing fruit, those which reached above the roof found enough sun to continue flowering. They have been permitted to grow into a solid mass about six feet above the roof level, where they are visible from the second-story windows of a later addition.

This screen provides a degree of privacy from a nearby house throughout the year. The brilliant display of scarlet berries appears in September, barely able to compete with the excesses of autumn color that surround us. When the leaves fall, however, the pyracantha offers a cheerful accent in the winter landscape until the migratory robins find it one day and strip it in a matter of hours.

JAN PIRZIO-BIROLI

[1]*Pyracantha coccinea* 'Government Red', perhaps.

Sarcococca for Winter Fragrance

A notable shrub even in dark winter weather is the fragrant *Sarcococca ruscifolia*, native to China. *Sarcococca* species are prized for their elegant habit and for their dark evergreen glossy leaves. This species is further graced by a pervasive floral fragrance and by transulcent crimson succulent fruits. Thus is derived the name *Sarcococca*, from the Greek *sarkos* for flesh and *kokkos* for berry.

The petal-less whitish flowers, though inconspicuous to the eye, are not so to the nose! In addition, the male and female flowers are separate, though occurring on the same branch. This provided, even in midwinter, an intriguing plant phenomenon with which to surprise my biology students.

With moderate moisture, sarcococcas thrive in light to deep shade. They spread slowly by underground runners and are easily propagated.

This shrub has thus endeared itself to me this season, and will henceforth be part of my winter repertoire. The hedge-like planting north of Bloedel Hall on the University of Washington campus is blooming now. Follow your nose!

SUSAN LIBONATI-BARNES

Classes of Interest

University of Washington Arboretum— Urban Horticulture Courses

Because the Arboretum is open to the public for education and recreation, courses are offered as a public service. Preregistration is required. Classes fill rapidly, so early registration is recommended. To register, send check or money order with your name, address, and daytime telephone number to Arboretum Courses, Anderson Hall, AR-10, University of Washington, Seattle, WA 98195, or call 545-1373. For information on course content, or to find out about other courses, contact Professor J.A. Wott, Center for Urban Horticulture, 543-8602 or Jan Pirzio-Biroli, Washington Park Arboretum, 543-8800.

IDENTIFICATION OF NORTH AMERICAN EVERGREENS. Here's an opportunity to learn about evergreens. This field course will cover such plants as pines, spruces, hemlocks, cedars, Douglas fir and others. Learn how to identify and use these popular plants in your home or landscape. Instructor: Carla Culver. Lecture and discussion, February 6; field tours February 13, 20, 27 and March 6, 10 AM-noon; $30. (Wear warm clothing and waterproof footgear.)

PROPAGATION AND HARDWOOD CUTTINGS. An opportunity to share the instructor's 47 years of experience awaits the participants in this course. Learn the materials required and how and why specific woody plants can be rooted by means of hardwood cuttings. Instructor: Richard van Klaveren. Greenhouse course February 13 and 20, 9:30 AM-noon. Materials and plants furnished; $25.

SPRING PRUNING OF ORNAMENTALS. This popular course is taught by one of Seattle's top home gardeners and is intended for novices. You will learn the basics of pruning landscape trees and shrubs, and how to select and use pruning trees. Outside demonstrations at the Arboretum are featured. Instructor: Chico Narro. March 13 and 20, 9:30-11:30 AM; $20. (Wear warm clothing and waterproof footgear.)

GRAFTING ORNAMENTALS. This is a greenhouse course on methods of grafting woody plants, taught by an experienced propagator. Instructor: Richard van Klaveren. February 13 and 20, 9:30-noon. Limited to 15. Materials and plants furnished; $25.

Arboretum Foundation

Information concerning these classes is available at 325-4510. See also page 2.

DYE PLANTS AND DYEING. Jean Witt will present dye plants, dyeing materials and methods of dyeing, on February 22 and March 8. $5.

VEGETABLE GARDENING. In two evening sessions, March 10 and 17, Mr. Francis Dean will cover the basics of vegetable gardening. $5.

AN INTRODUCTION TO RHODODENDRONS AND AZALEAS, FOR BEGINNERS. Mary Ellen Mulder will speak on February 18. Fee: $3.

PRUNING FOR BEGINNERS. Cora Gardiner will cover tools, books and techniques March 25 and April 1. $5.

University of Washington Continuing Education

For complete details on these and other courses call (206) 543-2590 weekdays and ask for SPECTRUM, free journal of Continuing Education.

Although this issue of the Arboretum Bulletin is not in synchrony with the University quarters, there are several courses which might be of interest to readers, if only for future reference.

WINTER BIRDS OF SAN JUAN ISLAND. This course focuses on both eagles and seabirds, what they are doing and why San Juan Island is a favorable locality for them. This weekend course features lecture/slide presentations, and an all-day field trip. Instructor: Dennis Paulson, PhD. February 5-7; fee of $98 includes lodging and several meals.

VEGETATION DESIGN. This course will provide land use managers, landscape architects, resource managers, planners, ecologists, teachers and students with an ecological basis for planning design and management of vegetation in plant-dominated landscapes. Instructor: Dr. Roger del Moral. Tuesdays, January 5-March 9; $105.

THEMES IN PACIFIC NORTHWEST HISTORY. In this course, experts will lecture on major themes of regional history, from minority groups and women through concerns of the environment to controversies of labor and energy. Coordinators: Dr. Howard Droker and Dr. Robert E. Ficken. Mondays, January 11-March 8; $35.

EXPERIMENTING WITH SCIENCE. General science activities include balances, electrical circuits, pendulums and magnets; for third and fourth graders. Saturdays, January 23-February 27; $28.

Pacific Science Center School for Science

The Pacific Science Center features many courses for young people. To register and to receive information about these and other classes, call 382-4412, or 625-9333.

Classes for children 4 to 5 years old.

BIGGER THAN LIFE. Have you ever tried to count the legs on a centipede? Join us in this exciting class where you can explore through a magnifying glass the miniature world of things and beings around us. Instructor: Susan Wood-Megrey. February 13 and 20, 11 AM-noon, Fee $10-13.

SUPER SLEUTHING. How would you go about finding a squirrel's nest? Come to a nature detectives' class and learn to use the wealth of clues around you to uncover nature's mysteries. Instructor: Betty Berreth. February 27 and March 6 and 13, 9-10 AM. Fee $15-18.

Classes for children 6 to 8 years old.

BIONIC ME. Listen to your heartbeat and examine your tongue! Instructor: Jeanne Falkin. February 13 and 20, 10:30 AM-noon. Fee $12-15.

DINOSAURS. Come learn about the many kinds of dinosaurs, what they looked like, what they ate and how they protected themselves. Instructor: Scott Horton. February 27, and March 6 and 13, 9-10 AM Fee $14-18.

Classes for children 9 to 12 years old.

MODEL ROCKETRY, ADVANCED. This class is for those who have taken a beginning rocketry course. Instructor: Harlan Jensen. March 6 and 13, 1-3:30 PM; March 20, 11:30 AM-1 PM. Fee $35-43.

Classes for those 12 to 16 years old.

PLANETS, STARS AND GALAXIES. Look at constellations, learn about star life-cycles, and learn about recent space exploration. Instructor: Michael Shanahan. February 27 and March 6, 13 and 20, 9-10 AM. Fee $15-19.

Family classes.

MODEL ROCKETRY. As a team build and fly rockets. Ages 6 and above, please. Instructor: Harlan Jensen. March 17, 6:30-9 PM, March 20, 10-11:30 AM.

Book Reviews

TREES AND SHRUBS HARDY IN THE BRITISH ISLES, by W.J. Bean, Vol. IV, Ri-Z, 8th edition, revised. Chief Editor, D.L. Clarke; General Editor, Sir George Taylor. John Murray, London, 1980. 808 pages, illustrated. Price 40.00 pounds.

Finally, the fourth volume of what, in the reviewer's opinion, is the finest work of its type on ornamental trees and shrubs, has been printed. This volume completes a classic reference work which, in its entirety, starts with *Abelia* and ends with *Ziziphus* and in between contains a remarkable collection of information on woody plants. Admittedly, there is a bias toward British gardens and gardening; this, of course, is evident from the title. Since the climatic conditions of the Pacific Northwest are so similar to those of the British Isles, we here may use the set with few reservations.

For example, volume four begins with *Ribes*, the currants and gooseberries, and among the species discussed are *Ribes aureum, bracteosum, cereum, lacustre, lobbii, niveum* and *sanguineum*. These are all native to this part of the world and yet with the exception of *R. sanguineum*, red flowering currant, are seldom seen in local gardens. The parade of genera continues through *Rosa* which rates a large section (270 pages) divided into species roses and Roses for the Garden, the latter by Graham Thomas; willow (Salix) with 127 species descriptions; *Sorbus*, the mountain ashes and white beams; *Spirea; Syringa*, lilacs; lindens *(Tilia)*; *Ulmus*, elms; and *Viburnum* (36 pages). Of course the above are only the major groups. There are equally comprehensive treatments of small or monotypic genera such as *Sinowilsonia henryi* and *Vestia foetida*.

Each plant, as in previous volumes, receives an adequate description, technical enough for a botanist but not so difficult that the informed amateur cannot make use of it. The description is followed by cultural information, comments on the usefulness of the plant in gardens, and often an interesting short history of the plant's introduction, with note of especially fine specimens in British gardens. All of this information does not make for dry reading; indeed, we have here one of the few handbooks of its type that one can sit down with and read for sheer enjoyment. To pick a random example, under *Tsuga heterophylla*, western hemlock, we find that it was first described in 1832 from material collected by Lewis and Clark, and was introduced into Scotland

in 1852 by John Jeffrey who only collected a "small bag" then but did better in 1861. It is a tree obviously well thought of since, to quote: "Few conifers combine elegance and usefulness to such a degree as the western hemlock." In Britain it succeeds wherever the soil is not chalky or heavy but it does best in areas of humid climate. There follows a list of large specimens from various locations such as a 152 foot tall tree at Benmore, Scotland.

The test is illustrated with about 75 line drawings, but there are also 111 black and white photographic plates which are grouped together at the beginning of the book. Incidentally, our Director Emeritus, Brian O. Mulligan, is responsible for nine of these.

One hesitates to criticize such a masterful work as this but, perhaps, *sotto voce*, one could wish the authors had done a few things differently. For instance, keys to some to the more important genera would have improved the book's usefulness. As it is now, there is discussion of how to differentiate between some closely allied species, which is helpful but does not really function as a key would.

Another minor annoyance is that, while most species discussed are arranged alphabetically under their generic headings, certain ones which the authors consider of less importance are placed under a related species. It is necessary to look under the treatment of *Vaccinium caespitosum* in order to find the description of our lovely mountain huckleberry, *V. deliciosum*. This arrangement requires that one use the index for any species which does not appear alphabetically in the text.

One last complaint—the price of 40 pounds (more or less $80)—is very large, especially when one considers that the first volume cost 8 pounds. this is a five-fold increase in ten years, which seems somewhat steep.

Whatever its problems, this volume completes a set which will be invaluable to anyone seriously interested in woody plants—and which will remain so until the next revision.

JOSEPH A. WITT

BOTANICAL DETERMATOLOGY: PLANTS AND PLANT PRODUCTS INJURIOUS TO THE SKIN, by John Mitchell and Arthur Rook. Lea and Febiger, Philidelphia, 1979. 787 pages. Price $39.50.

Editor's note: While this volume may not be one which the average gardener would wish to purchase, it is certainly valuable as a reference work and may be of interest to many persons who work with or have interest in plants. A copy is available for perusal in the library at the Arboretum administration building.

This is the first comprehensive reference work on plants which cause contact dematitis or other types of injury to the skin. The subject of botanical dermatology affects many areas, such as phytochemistry, immunology, toxicology, pharmacy, forestry, perfumery and cosmetology.

The authors are esteemed dermatologists in Canada and England and they have elicited additional contributions from authors in Europe and the United States. To readers in the Pacific Northwest, it is relevant that John Mitchell studied botany at the University of British Columbia in Vancouver.

Research in the last decade has increased our knowledge of the chemistry and pathology of plants, and of human allergic and immunological response to them. The authors have analyzed and documented reports of the dermatological reactions caused by 1400 genera and thousands of species. The plant taxa are listed alphabetically according to plant families. Common causes of dermatitis such as *Primula*, primrose and *Toxicodendron (Rhus)* poison ivy, which have been thoroughly investigated, receive greater attention than plants which are encountered less frequently.

Emphasis is place upon accurate identificaton of suspected plants. A number of medical reports have been rendered worthless due to lack of correct identification. As is true in many disciplines, common names can be a significant source of confusion. For example, *Pseudotsuga menziesii* is called Douglas fir, although it is not a true fir. Moreover, it is also known as Oregon pine, Columbia pine, Douglas spruce or red fir.

More than 11,000 naturally occurring plant compounds exist. Certain irritating chemicals can be found in totally unrelated plants. The chemical alantolactone, present in the liverwort *Frullania*, is also found in various members of the Compositae. This chemical causes some persons to develop a rash. It was John Mitchell who first published work implicating species of *Frullania*, common on trunks of coniferous trees, in the "cedar poisoning" of wood workers in the forests of the Pacific Northwest.

An extensive list of references documents the 755 pages of text, and the volume is well-indexed. *Botanical Dermatology* may well become the standard reference work not only for dematologists, other physicians, perfumers, and botanists, but also for gardeners, those who suffer from dermatitis, and amateurs interested in botany.

LOIS FRAYSER, M.D.

New Members of the Arboretum Foundation

We are pleased to welcome the following new members (June 1, 1981 through August 31, 1981): *Sustaining*—Barbara A. Knight. *Family*—Mr. & Mrs. William Collins, Mr. & Mrs. John Coughlin, Louise Incze, Lynetta Sacherek. *Annual*—Linda Alband, Marjorie Anderson, Rodger Brauer, Jestena C. Broughton, Katherine Bryce, Karolyn Burdick, Rebecca Joan Crichton, Martha F. Gies, Mrs. Fendal Glenn, Mrs. Benjamin S. Hibschman, Velma Johnston, Holly Kennell, Barbara A. Knight, Susan Lambert, Genevieve Laurence, Nancy Lin Mar, Mark McCormack, Mrs. Pattie McDougall, Jackie McGowan, Mrs. T. A. McGrath, LaBelle Prussin, George Ridderbusch, Mary Lou Rolseth, Charles W. Schmidt, William Smith, Mrs. Roger Tilbury, Mrs. Helen Tukey, Burke Walker, Dorothy Waterman.

CALENDAR OF EVENTS

Arboretum Foundation:		Regularly Scheduled:	
Executive Committee	February 10	Greenhouse Day	Every Tuesday
	April 14	The Mae Granston	
	May 12	Rhododendron Study Group	1st Monday
Board of Directors	March 11	Northwest Natives	
		Study Group	3rd Monday
Unit Council:		Rock Garden	
Governing Board	March 4	Study Group	3rd Wednesday
	April 15		
Quarterly Meeting	March 18		
	May 20		

EXPLORERS' WALKS are scheduled for February 24, March 24, and April 13 and 28.

ARBORETUM FOUNDATION HORTICULTURAL EXHIBIT
March 20 and 21 (see page 18)

NOHS LECTURES (see page 18)
Things You Never Knew About Trees, February 9
The Eye of the Designer, May 4

ARBORETUM LECTURES (see page 18)
Hamamelis and Its Relatives, February 17
Rhododendron Classification, March 17

TRAINING FOR GENERAL ARBORETUM GUIDES
February 17 and into April (see page 18)

FOURTH THURSDAY WEEDING PARTY (see page 18)
February 25 and thereafter

For further information call 325-4510

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Arboretum Units, Garden Clubs and small groups are welcome to tour the Garden and Nursery.

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Arboretum Bulletin

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Time Value Mail—Please Expedite

Hamamelis japonica var. *arborea* flowering in the winter garden. Photo: William Eng

VISIT YOUR ARBORETUM IN WINTER

Two faces of winter—
the architecture of unclad trees,
yet the fragrance of delicate blossoms.

Find them both in the Arboretum.

Join the Explorers' Walks, meeting at 10 AM, February 24, March 24, and April 13 and 28, in the Arboretum Administration Building Parking Lot. PLEASE WEAR BOOTS.