DAVIDSONIA

VOLUME 3 *NUMBER 1* *Spring 1972*

Cover

Flowering branches of 'Mock orange', *Philadelphus lewisii*

Delicate foliage and pink flowers of 'Bleeding heart', *Dicentra formosa*

DAVIDSONIA

VOLUME 3 NUMBER 1 Spring 1972

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Acknowledgements

The scanning electron microscope photographs found on pages one to three were prepared by Laszlo L. Veto of the Electron Microscope Laboratories, Biological Sciences, The University of British Columbia. The photograph of *Rhododendron ciliatum* on page one was contributed by Dr. C.J. Marchant.

The article on *Philadelphus* was researched and prepared by Mrs. Sylvia Taylor. Pen and ink illustrations throughout this issue are by Mrs. Lesley Bohm.

Rhododendron Pollen

ROY L. TAYLOR

Spring is the time of year we associate with the flowering of the many fine rhododendrons in the Pacific Northwest. The special development of flowers signifies that important period in the life of a plant when pollination may take place leading in most instances to successful fertilization and development of seeds – the promise of a new generation.

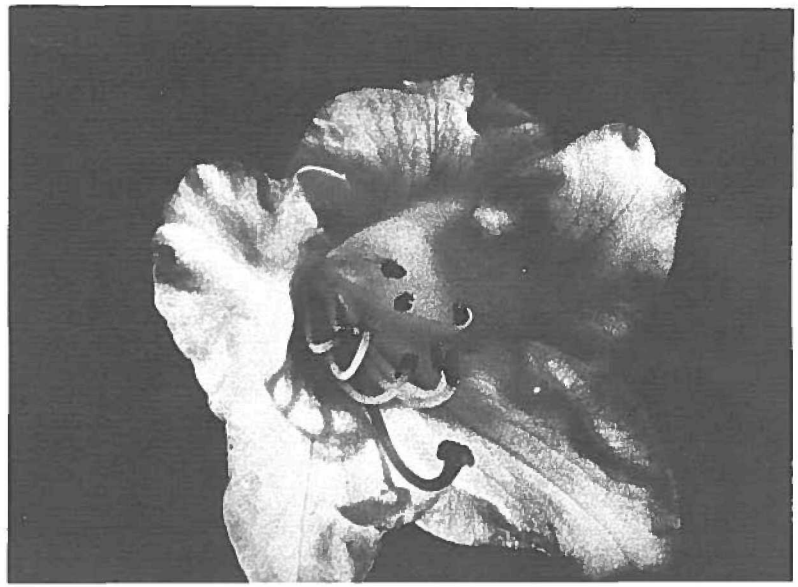
Most plants shed their pollen from the anthers of the stamens as individual units. The pollen grains are often highly ornamented. Rhododendrons are somewhat different than most flowering plants as they shed their pollen in groups of four or tetrads. The tetrads are loosely associated with one another by the presence of special thread-like structures called viscin. The name viscin is applied to these thread-like structures because it is so similar to the birdlime prepared from the berries of the mistletoe, *Viscum* (Meeuse 1961). Viscin is apparently derived from substances lining the inside of the pollen sacs of the anthers (Erdtman 1952). Viscin is also found in the anthers of the evening primrose, fuchsia and fireweed.

The pollen of rhododendrons is not elaborately sculptured as can be seen in the microphotographs. Each pollen grain has a modified tetrahedral outline and possesses three germinal furrows. Each germinal furrow is contiguous with a germinal furrow in a neighboring pollen grain of the tetrad (Wodehouse 1959). A single pore is found in each germinal furrow or colpus, hence the pollen is classified as 3-colporate.

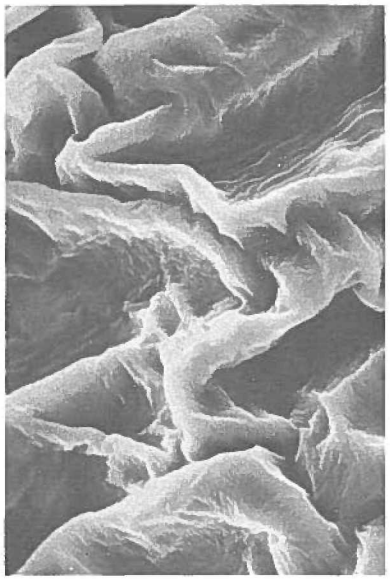
The pollen grain of a rhododendron is extremely small. Each individual grain is approximately 50 microns in diameter – you would need 40 pollen grains laid end to end to stretch across the head of an ordinary straight pin! It is estimated that each anther (each anther has two pollen sacs) contains about 250,000 pollen grains. Each rhododendron flower would produce about two and one-half million pollen grains, each with the potential of producing two male gametes to effect fertilization of the eggs in the many ovules in the pistil. The detailed microphotographs of the anther and pollen were taken with a Mark IIA Cambridge Stereoscan Scanning Electron Microscope.

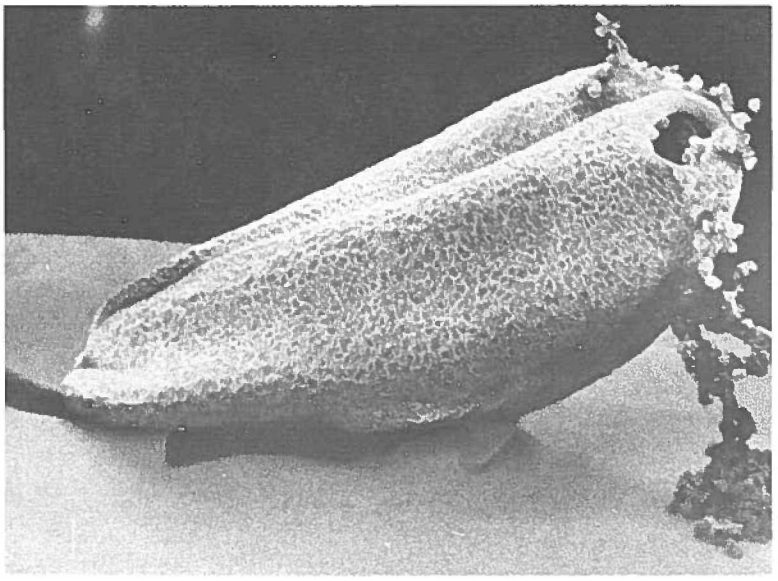
To effect the transfer of pollen to the stigma of the flower, a process known as pollination takes place. The prominent exsertion and position of the anthers, plus the open nature of the corolla, indicates the rhododendron flower may be wind pollinated. However the anthers are not versatile (swinging back and forth like a seesaw on the filament or anther stalk) and the pollen, dispersed in tetrads is held together loosely by viscin. Rhododendrons are best adapted to pollination by hawkmoths (Meeuse 1961, p. 188), bumblebees, hummingbirds and butterflies. Darwin (1888) records the visitation of the bumblebee to a

Continued on Page 3



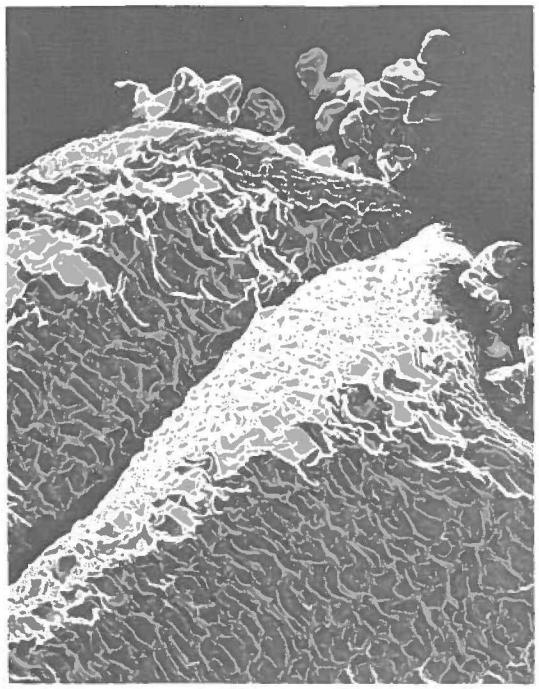
The flower of Rhododendron ciliatum Hook. f. showing the open corolla, stigma and style, and the ten stamens with prominent anthers.

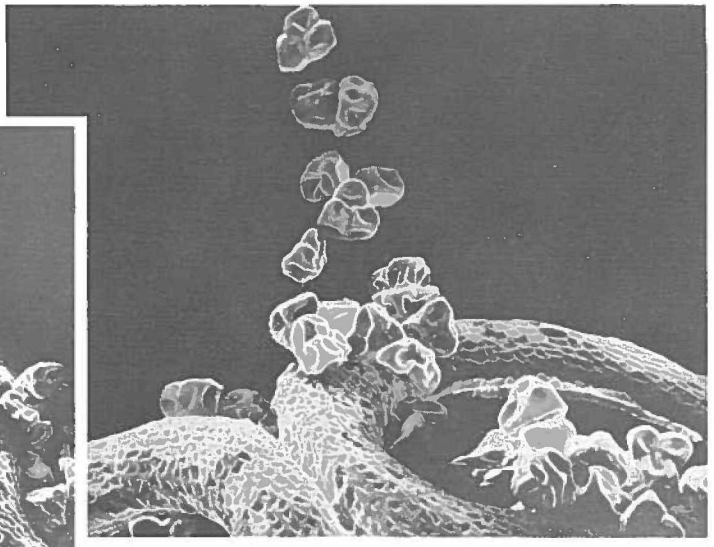




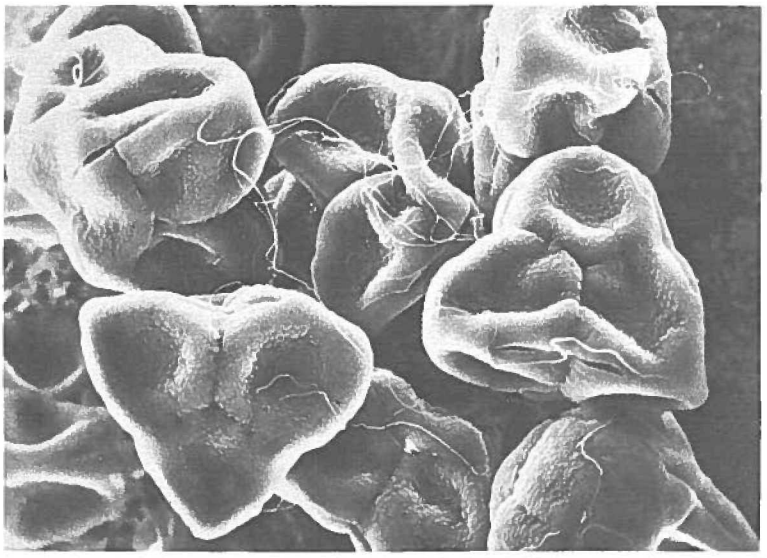
Left: Details of the external wall structure of the anther. ×800. Right: The anther of a rhododendron showing the two pollen sacs and filament or stalk. Pollen tetrads are dispersing from the terminal pores of each pollen sac. ×21

Right: Detail of the terminal pore of the anther. ×94

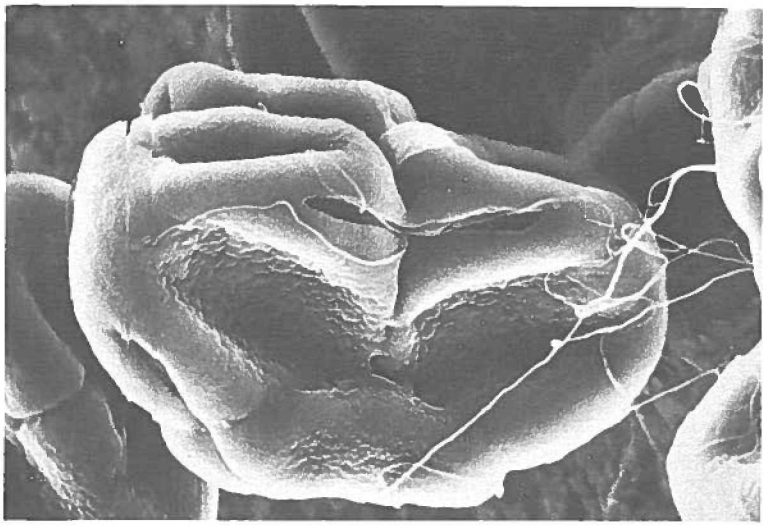




Left: The upper portion of the anther showing the two sacs with their terminal pores. ×64



The arrangement of the pollen grains in a tetrad. The attachment of three of the four grains can be clearly seen in the lower left portion of the tetrad. X434



A single pollen tetrad. Germinal furrow or colpus can be seen in the central portion of the tetrad where two of the grains are attached. The thread-like material called viscin can be seen in both photographs on this page. X865

hybrid rhododendron effecting pollination by entering the flower by the corolla throat; but, also acting as a 'burglar', cutting through the base of the corolla to collect nectar and thus not effecting pollination. In addition to natural pollinators man has carried out extensive pollination of the species. Such pollinations have produced the many new hybrids and cultivars that are so widely used and admired in our parks and gardens.

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Philadelphus lewisii Pursh

'MOCK ORANGE' *or* 'SYRINGA'
Member of the Family Hydrangeaceae

Natural Distribution

Philadelphus lewisii occurs from British Columbia southwards to northern California, and eastward through southern B.C., Washington and most of Oregon to the continental divide in Montana, and from the Snake River north to Idaho. In British Columbia there is sporadic occurrence of the species through the Fraser Valley and into the Fraser Canyon. There is local occurrence in the Okaganan and Similkameen Valleys and at Shuswap Lake in the Kootenays.

Habitat

The habitat is characterised as the Arid Transition Zone. *Philadelphus lewisii* tolerates greatly varied ecological conditions ranging from gullies, watercourses, rocky cliffs, talus slopes and rocky hillsides of sagebrush desert and ponderosa or lodgepole pine to coastal Douglas fir and redwood forests, from sea level along the coast to 7000′ on the east side of the Cascades. In B.C. it is more common at low elevations on dry hillsides east of the Cascades, whereas to the west of them it occurs sporadically at the borders of woods near streams and lakes.

Description

Philadelphus lewisii is extremely variable in vegetative and floral characteristics and appears to be particularly responsive to local ecological conditions.

Rounded to erect deciduous shrub, 5 - 8 (10) feet tall, loosely branched.

The root system is fibrous.

The bark is red brown or yellowish brown on new twigs becoming gray and transversely cracked with age and eventually exfoliating.

Twigs are erect to pendulous, glabrous to markedly hairy. Pith is solid, white and of moderate texture.

Buds are less than 0.7 cm in diameter, solitary, sessile with 2 nearly valvate, mostly hairy scales. End bud mostly absent.

Leaf scars are opposite, half round with a thin membrane more or less covering the bud.

Leaves opposite, light green, thick, (1) 2.5 - 7 (9) cm long, (0.5) 1 - 4 (6) cm broad on floriferous branches, sometimes slightly larger on new growth, ovate to narrowly ovate to narrowly elliptic, acute or rarely obtuse at apex, obtuse or acute at base, entire to remotely denticulate on the older branches, often strongly but remotely serrate dentate on vigorous new shoots, from rather strongly strigose or strigose villous on both surfaces to glabrous above and sometimes also below except along the veins and vein angles, 3 (5) veined with the strongest pair not arising from the base giving a very characteristic appearance, petiole 3 - 8 mm long.

Flowers are usually produced over a two week period, in June in B.C., from May – July in other parts of the range. The inflorescence is a determinate terminal raceme on lateral branches with 3, or very rarely 1, terminal flowers and several pairs of axillary ones, the lower 2, 4 or 6 arising from the axils of gradually reduced leaves, the upper ones inconspicuously bracteate or even bractless, 3 - 11 flowers in each. Flowers are 2 - 2.5 cm across, white, slightly fragrant to very fragrant, perfect and regular. Calyx is turbinate and campanulate, glabrous to sparsely strigose, the lower 6 mm adnate to the ovary up to the level of the lobes which are 5 - 6 mm long, narrowly ovate to ovate, more or less acuminate and 4 (5) in number. Corolla cruciform, petals 4 (5), white, ovate to nearly obovate, (5) 10 - 20 (25) mm long, obtuse or rounded and often emarginate. Stamens 25 - 40 (50), unequal, the longest about half the length of the petals, filaments

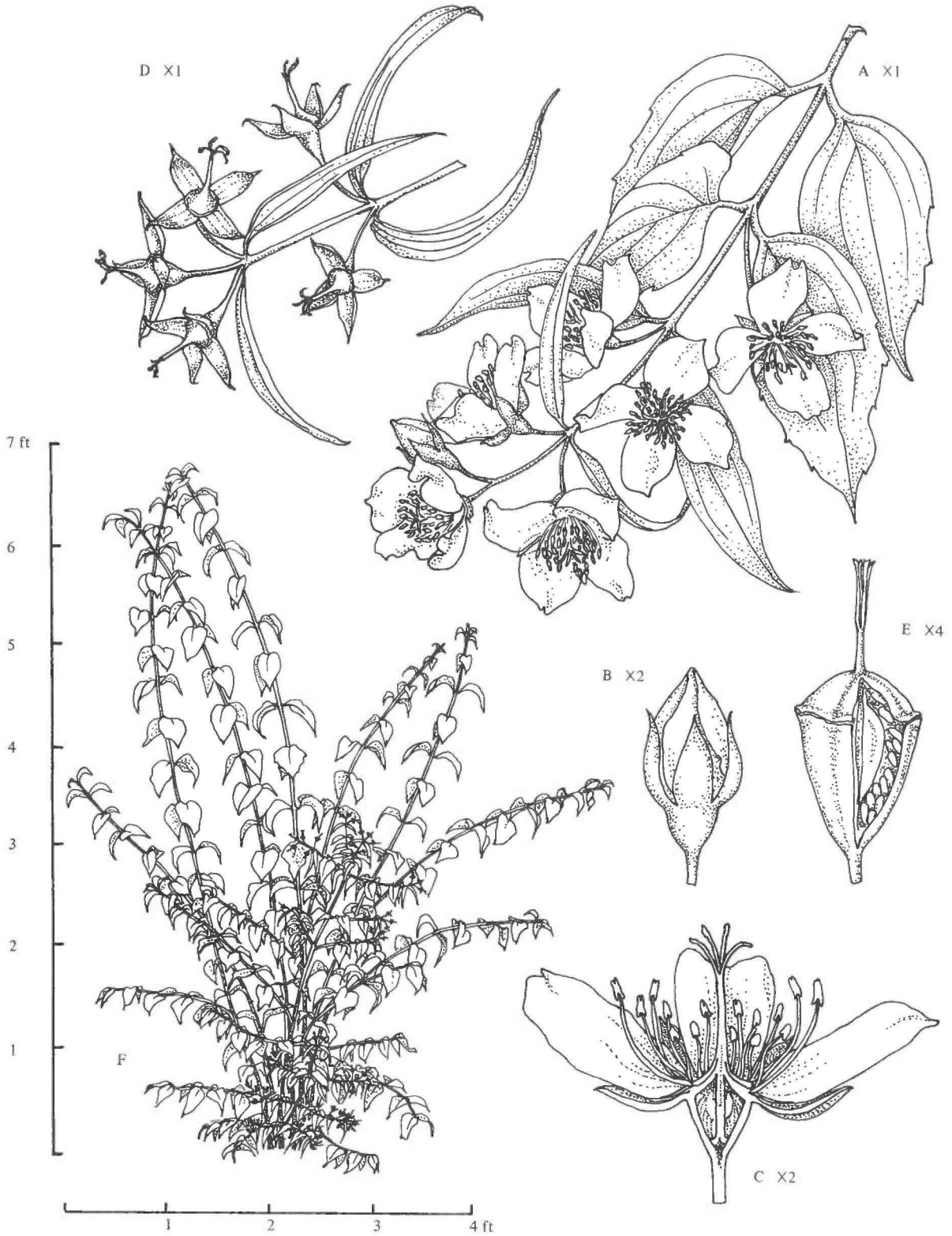

FIGURE 1. *Philadelphus lewisii.* A. floral raceme and detail of leaf venation, B. individual flower bud, C. vertical section of individual flower, D. mature fruits, E. cut-away view of mature capsule, F. typical habit of shrub.

glabrous or occasionally with 1 or more hairs above, anthers ovate-oblong, glabrous or with 1 to several straight to crisped hairs. Styles 4 (5), about as long as the longest stamens, from nearly fully connate to distinct for half their length, glabrous, branches often stigmatic on the inner surface for the full length. Ovary nearly completely inferior at anthesis, the top glabrous to hairy, at first rounded, becoming enlarged and more pointed in fruit, 4 locular with numerous ovules. Pedicels glabrous to pubescent, 2 - 7 mm long, lower ones always in the axils of normal leaves.

Fruit a rather woody capsule, ovoid-elliptic, pointed at the ends, (5) 6 - 10 mm long, 4 - 5 mm diam., loculicidal, 3 - 5 valved, calyx persistent. Seeds brown, numerous, 1 - 3 mm long, linear-fusiform, tip finely pointed and with an unequal erose-coronate caruncle about twice as long as the cylindrical embryo at the funicular end, testa membraneous.

Propagation

Seed can be sown as soon as ripe or stored dry in airtight containers in a cool place for periods up to a year and then sown.

The usual method is to root either softwood or hardwood cuttings 3" - 4" long in shady soil in a closed cold frame outdoors. Softwood cuttings should be rooted in early summer or September, hardwood cuttings in early spring or in November.

Removal of rooted suckers from the base of old plants is an easy way of obtaining new plants.

Old plants may be divided by using a sharp spade or even chopping through the centre with an axe in early spring before growth starts.

Transplantation

Fibrous rooted and therefore easily transplanted in spring at any size, bare rooted.

Conditions for cultivation

The shrub is very slow growing. The recommended hardiness zone in Canada is 4 (K. Wilson personal communication) although the cultivar *P. lewisii* 'Waterton' is hardy to zone 2b (Sherk and Buckley 1968). The shrub will grow well in any ordinary well drained soil with a minimum amount of attention and is equally well at home in full sun or partial shade in the border. If the plant is healthy with sufficient water a large number of flowers per branch will develop. If pruning is necessary it should be done immediately after flowering since the flowers appear on wood formed the previous year. The wood should be cut back to where new shoots are showing. Usually a small amount of renewal pruning every few years is sufficient, especially when flowering branches are removed for house decoration, to maintain a balance of old and new wood.

Landscape Value

Philadelphus lewisii is a member of a group of shrubs which are chiefly valued for the short period during which they are in flower, because the foliage and fruit are not very interesting. It is well adapted for a shrubbery where other species will hide the foliage and branches during the non-flowering season. The shrubs are dense in habit and may be used as a screen or hedge. Some of the hydrids of other species in the group may be used as specimen shrubs because of their more attractive growth habit.

Availability

Philadelphus lewisii is not available from B.C. suppliers because of lack of demand. *P. lewisii* 'Waterton' may be obtained from some nurseries in B.C. but is more readily available from sources outside the province.

Varieties and Ornamental Cultivars

Plants west of the Cascades are often cited as *Philadelphus gordonianus* or *P. lewisii* var./ssp. *gordonianus* because the leaves are much more hairy and/or the styles are more completely connate than in forms from

east of the Cascades. There may be statistical analysis to support this but it is doubtful whether separate specific rank is justified in view of the extreme variability of *P. lewisii*. It is also possible that plants of the dry interior lowlands may constitute an ecological race with smaller more elliptic leaves. One cultivar is known – *P. lewisii* 'Waterton' was selected from plants in the Waterton Lakes area of Alberta where it is native. It has a neat bushy habit with flowers well spaced over the shrub and is considered one of the hardiest Mock oranges, growing to a maximum of 6′ in height. The hybrid *P.* × *splendens* may have been produced by hybridization between *P. grandiflorus* and *P. gordonianus* = *P. lewisii* (see Hilliers' Manual).

Other Uses

The slender shoots were used as arrow shafts for war and hunting by the native tribes in the area of its distribution. Cut flowering shoots are much used for home decoration. Flowers of *P. coronarius* have been used in perfumery and to flavour tea; the leaves are said to impart a cucumber flavour to summer drinks.

Diseases and Problems of Cultivation

Mock oranges as a group are mostly free from injurious insect and disease pests.

Nectria cinnabarina – 'canker' may occur on the stems followed by dieback of the distal portions. Prune and burn affected branches. Two species of aphids and an undetermined species of leaf miner also attack Mock oranges but usually result in little injury.

H.N.W. Toms (1964) lists only two diseases which have been found on wild *P. lewisii* in B.C. – *Phyllactinia guttata* – 'powdery mildew' and *Septoria philadelphi* – 'leaf spot', which is occasionally serious in very rainy seasons. Pick off and burn all infected leaves as soon as they appear.

The generic name is derived from the Greek word *philos* for love and *delphos* for brother, indicative of the closely approximated opposite shoots, and is said to commemorate Ptolemy Philadelphus, King of Egypt 285 – 247 B.C. The specific name *lewisii* recognises the collection of the first specimen by Captain Meriwether Lewis on July 4, 1804 'on the waters of Clark's River, Montana' i.e. Clark's Fork of the Columbia River, Montana.

The common name Syringa is derived from *syrinx* a panpipe and is identical with the generic name for the lilac – this arises from the use of Syringa by the old herbalists for 3 completely separate plants, a Lilac, a *Philadelphus* and a *Jasminum*. The confusion arose because Lilac and *P. coronarius* (the commonly cultivated Mock orange of the Pacific Northwest) were introduced together in 1562 into Europe from Turkey, where the wood of both had been used to make pipes.

In the Language of Flowers the Mock orange signifies Memory because 'when we inhale this penetrating odour, it seems to follow us everywhere for a considerable time'.

The Mock orange is the State Flower of Idaho.

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Botanical Garden News and Notes

Rhododendron Species Collection – A grant of monies from the Vancouver Chapter of the American Rhododendron Society was recently made to the Botanical Garden. The grant will provide for additional species to be added to the collection now established in the nursery.

Local Initiatives Program – This spring program is operated by the Botanical Garden under the Federal assistance program. Work has nearly been completed on the installation of the drainage and irrigation system in the nursery. Work has been initiated on the selective clearing and preparation of a portion of the Marine Drive Garden for establishment of Asian tree and shrub species. The principal display garden for rhododendrons will be developed in this garden area.

Acquisition of Special Collections – The Botanical Garden has been fortunate to obtain the complete nursery stock of two well-known Vancouver Island nurseries during the past six months. Bulbs of Crocus, Narcissus and Tulips were obtained from the Beaumaris Bulb Farm on the Saanich Peninsula, owned and operated by Mr. and Mrs. G.M. Owen. The collection has been planted and is now growing in the new nursery of the Botanical Garden. The other collection purchased represents a nursery of international reputation owned and operated by Mr. and Mrs. E.L. Lohbrunner. The Lohbrunners have accumulated a worldwide collection of alpine plants, in particular plants of the Cordilleran region of North America. In addition an outstanding collection of conifers including many exotic dwarf types are in the material to be transferred to the Botanical Garden at The University of British Columbia. These collections will provide an important foundation for the new rock and alpine garden development.

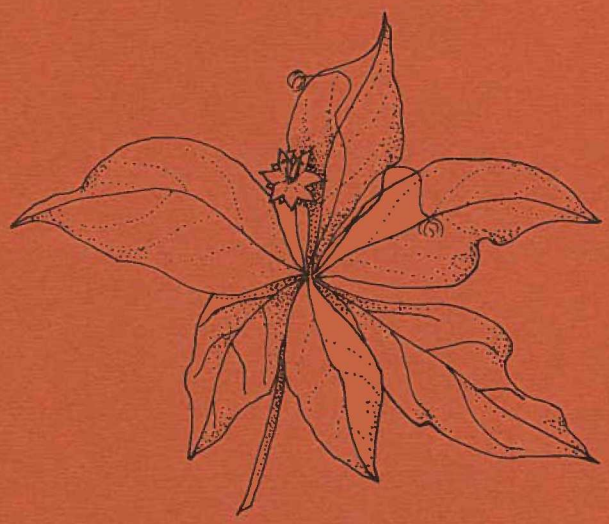
The Alpine and Rock Garden Development – The first major garden component of the new Botanical Garden at The University of British Columbia will be started late this spring. The landscape architects for this project are the firm of Justice and Webb of Vancouver. At the March meeting of the Board of Governors of The University of British Columbia formal approval was given to Stage I development of the Botanical Garden. It is anticipated that the working drawings for this stage will be completed in the fall of 1972.

Staff News – Dr. John W. Neill was recently elected president of the British Columbia Society of Landscape Architects. Miss Evelyn Jack, associated for many years with the Botanical Garden program on the campus, has transferred to a full time position with the Department of Physical Plant. Her activities with the Botanical Garden, particularly those associated with the Index Seminum and the propagation of rhododendrons, will be missed by the department. The staff of the Botanical Garden wish her well in her new position. Mr. Ken Asano, gateman at the Nitobe Memorial Garden, has retired. Mr. Patrick Griffiths of the University of Bath horticultural program will be spending the summer with the Garden.

CLIMATOLOGICAL SUMMARY *

Data *1972*	*January*	*February*	*March*
Mean temperature	33.65°F	39.40°F	44.4°F
Highest temperature	48°F	54°F	61°F
Lowest temperature	14°F	20°F	31°F
Grass minimum temperature	6°F	10°F	22°F
Total rainfall/No. days with rainfall	2.53"/16	5.37"/23	8.14"/21
Total snowfall/No. days with snowfall	7.7/9	trace/1	1.0"/1
Total hours bright sunshine/possible	59.2/265.39	71.3/278.24	75.8/361.15
Max. wind speed for 1 hour/direction	20/N	15/SE	13/SE & NW
Mean mileage of wind at 3'	87.4	81.9	80.5
Mean mileage of wind at 40'	123.3	117.7	114.8

** Site: The University of British Columbia, Vancouver, B.C., Canada*
Position: lat. 49° 15'29"N; long. 123° 14'58"W. Elevation: 342.6'



Trientalis latifolia, the 'Star flower' of moist coastal woodlands

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Spring male catkins and old female cones of 'Red alder', *Alnus rubra*

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