



ARNOLDIA

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Cover: *Styrax japonica*. Specimen grown from seed collected by C. S. Sargent in
Japan, 1892. Photograph: Chvany.

The Ornamental Birches

by RICHARD E. WEAVER, JR.

The genus *Betula*, the birches, includes perhaps forty to fifty species restricted to the cooler regions of the northern hemisphere. The species vary greatly in their habit, from low alpine shrubs to tall forest trees. The latter species are those most commonly cultivated as ornamentals, and they will be the subject of this article.

Here in New England, birches are familiar native trees. While four species are common, the Canoe Birch, *Betula papyrifera*, with its striking white bark, is the most conspicuous one in the landscape. This species and its closest Eurasian relatives are also the most common in the urban and suburban landscape because of the unique and striking color of their bark. Unfortunately these species are susceptible to several devastating insect pests. Other species of equal ornamental value are available to replace them but are practically unknown to gardeners. One purpose of this article is to give exposure to some of these alternative trees.

The collection of birches here at the Arnold Arboretum has deteriorated for one reason or another over the years. Many of Ernest Wilson's Asiatic introductions did not prove reliably hardy and have long since disappeared. And the location of the collection itself — a dry, gravelly hillside — is not ideal for plants that prefer a cool, moist soil. As a result, many of the trees lack a certain vigor, rendering them susceptible to the ravages of the Bronze Birch Borer. Yet, the collection contains about forty-five species, varieties, hybrids and cultivars, and some exceptionally fine specimen plants. Most of the personal observations recorded in this article were based on the Arnold Arboretum's collection and I wish to thank Mr. Kenneth Shaw, Assistant Supervisor of the Living Collections, for his tutoring on the insect pests and their control, as well as Mr. Henry Goodell, Assistant Superintendent, and Mr. James Nickerson, Arboretum pruner, for measuring the trees.

The classification of the genus is somewhat confused, and many of the species are difficult to distinguish without the use of technical characters. All, however, have simple, alternate leaves with toothed edges, shape varying from triangular to elliptic at least in the arborescent species, which usually color yellow in the fall. The bark is marked with conspicuous horizontal lines — breathing pores or lenticels — and these are persistent even on the old trunks of most species. The flowers are unisexual, borne in separate "male" and



Leaves and fruiting catkins of representative Betula species. Clockwise from top right, Betula pendula, B. pendula 'Gracilis', B. albo-sinensis, B. populifolia, B. lenta, B. alleganiensis, B. ermanii, B. schmidtii, B. papyrifera.

Photograph: R. Weaver.

“female” catkins on the same tree. The males of most species are formed in the fall, but they elongate and open, exposing the copious wind-borne pollen as the leaves are unfolding in the spring. The females are formed in the spring; after they are pollinated they expand and become quite stout. As is obvious when they mature and fall apart in the late summer, they are composed of numerous three-pronged scales each with three seeds, the latter actually tiny flattened nutlets with a thin, membranous wing on each side that allows them to be dispersed by the wind.

NOTES ON GENERAL CULTURE

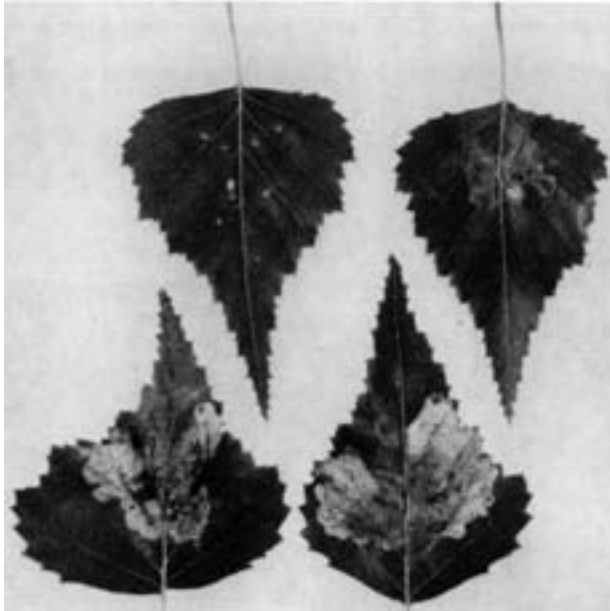
Birches are fast growing, and many are short-lived. Although there are several exceptions, most do best in a cool, relatively moist situation. At least the white-barked species are weak-wooded, and their twiggy crowns collect and hold ice and snow. Therefore they are subject to damage from winter storms. Because of these characteristics, few birches would be recommended as street trees. For

home plantings, they are probably most useful when placed in groves with other trees, although a few are most effective when planted as specimens. Care should be taken to prevent the outer bark of the white-barked species from being stripped or marred since the injured area will always remain black.

INSECT PESTS

Birches are susceptible to attack from several insects, but only the two discussed below are generally serious.

Birch Leaf Miner (*Fenusa pusilla*). This small black sawfly is native to the Old World. Entomologists first reported it in Connecticut in 1925, but it has spread rapidly and is now common throughout New England and the Mid-Atlantic states. The adults overwinter in the soil in the pupal stage. They emerge and lay their first batch of eggs directly on the birch leaves sometime during May, with later batches in July and August. If the leaves are young and tender enough, white, maggot-like larvae, upon hatching, burrow into the leaf tissue and eat their way through it. The infested areas first



Leaf miner damage in Betula populifolia. Above, early damage, the eggs just hatching on right; below, full extent of damage. Photograph: R. Weaver.

appear papery and finally brown. The effects are at least unsightly, but repeated, severe attacks cause the trees to decline and make them susceptible to other pests, particularly the Bronze Birch Borer.

In general only the species in the *Betula papyrifera* — *pendula* — *populifolia* alliance are highly susceptible to the leaf miner, although other species may show some damage from the spring brood. The later broods, incidentally, are seldom serious since only leaves on sucker shoots are generally tender enough to be damaged. The leaf miner can be kept under control by spraying with Malathion early in May, with two subsequent sprayings at ten-day intervals. To control the second brood, the trees should be sprayed around the first and tenth of July.

Bronze Birch Borer (*Agrilus anxius*). This is a native beetle widely distributed in the northern United States and southern Canada. Although it occurs in natural stands of birches, it is usually only devastating to those trees planted as ornamentals. Again, the white-barked species related to *Betula papyrifera* and *B. pendula* are most susceptible.

Adult beetles emerge and are active for a long period during the summer. They lay their eggs in cracks in the bark, particularly in new wounds. Upon hatching the white, grub-like larvae tunnel into the cambium which they feed upon one to two years, and in the process make long, winding channels between the bark and the wood. If a limb is girdled, it of course dies. The first obvious signs of damage are sparse and chlorotic foliage, particularly high in the crown of the tree. By this time, unfortunately, there is little to do except to remove the infested branches if possible and preferably burn them.

Like many other insect pests, the Bronze Birch Borer is only seriously damaging to the trees that already have been weakened by disease, other insects, or unfavorable growing conditions. Healthy trees can usually recover from attack, with no outward damage except for lumpy areas on the bark where the borers were active.

The susceptible white-bark birches are plants of northern latitudes and high elevations — areas with cool, moist summers and a good snow cover in the winter. The warmer and drier the site in which they are grown as ornamentals, the less vigorous in general they will be. For this reason these trees are not satisfactory in the southern United States. In other areas, regular watering and annual fertilization will help maintain vigor, as will a heavy mulch to retain moisture during the growing season and to protect the roots in the absence of a snow cover during the winter. Spraying the trunk and major branches with Lindane, where this is permissible, will give some measure of control as well. A recommended schedule would be to apply the spray late in May, with two subsequent applications at two-week intervals.

PROPAGATION

Fresh seeds from birch species germinate readily without pretreatment; older seeds germinate more uniformly if stratified for three months at 40°F. However, because most species hybridize readily, seed is a satisfactory means of propagation only if it is collected from wild sources or isolated cultivated specimens. Unfortunately many birches root poorly from cuttings, although here at the Arnold Arboretum we have succeeded with softwood cuttings of the hybrid *Betula* × *jackii*, *B. davurica*, and *B. maximowicziana*. Best results were obtained with 1% IBA or a mixture of .8% IBA and 15% Thiram. Most species are propagated commercially by grafting, basically any species serving well as understock for any other.

SELECTED SPECIES

The species discussed below are grouped according to their natural relationships since closely related species have more or less the same horticultural attributes.

Birches With White Bark

Betula papyrifera

Canoe, Paper, or White Birch

This is the most widespread of the American birches, its distribution stretching almost across the continent in the north. It is basically a plant of the cool north woods, and it grows almost to the Arctic treeline in eastern Canada. Although its wood is not as valuable as that of the Sweet or the Yellow Birch, various parts of the tree were put to good use by the Indians and the early European settlers and explorers. Now it is widely grown as an ornamental, its white bark comparing favorably with that of the European White Birch, although neither its crown nor its foliage is as graceful as in its European relative. Over its wide geographic range the Canoe Birch is extremely variable, and its bark is not always white. The types that range through New England and around the Great Lakes make the best ornamentals.

At least in the Northeast, this species reputedly suffers less from the Bronze Birch Borer than other commonly grown white-barked species. However, many of the specimens at the Arnold Arboretum have shown slight to heavy borer infestations, and recently several have been removed. Our finest specimen is growing in the yard at 163 Walter Street on Peter's Hill. We do not have any records for this plant; it is somewhat atypical for the species and perhaps represents a hybrid with the Canoe Birch as one parent. To me it is one of the most beautiful trees in the Arnold Arboretum. It is 60 feet tall with a spread of 68 feet — the largest birch in our collections. It is completely free from borers. We hope to propagate the tree and further test it for borer resistance.



Betula pendula 'Youngii'. Photograph: D. Wyman.

Betula pendula (formerly *B. alba* or *B. verrucosa*)

European White or Silver Birch

This native of northern Europe, with its glistening white bark and gracefully drooping branchlets, is one of the most striking and beautiful of hardy shade trees. It is unfortunately among the shortest-lived, weakest-wooded, and most susceptible to leaf miner and borer of all the birches. With proper care it can be a satisfactory plant, and the elegance of a mature specimen, particularly of one of the selected clones, is certainly worth a lot of trouble. The following clones, many of which are considerably more attractive than the species, are available in the American nursery trade.

'Fastigiata' — Columnar European Birch. An upright form, densely branched from the base, this can be a beautiful tree. The slender twigs impart a feathery appearance to the plant, particularly in the

Betula pendula 'Tristis'

winter. Unfortunately it is extremely prone to damage from snow and ice. Even if the branches do not snap, those that are bent seldom return to their former upright position, and the trees eventually come to look a bit monstrous. The winter of 1976–1977 was a particularly bad one for the specimens of this clone in the Arnold Arboretum's collection, and nearly all of them were ruined.

'Gracilis' — Cutleaf European Birch. Often referred to in nursery catalogues as 'Laciniata', this is the most commonly grown of several clones with finely cut leaves and long, wispy, pendulous branches. It is perhaps the most graceful of the European White Birches, but it is unfortunately prone to the problems common to the rest.

'Tristis' — Slender European Birch. This is similar to 'Gracilis' in its long, drooping branches, but the leaves are not finely cut, and the crown is usually very slender and graceful.

'Youngii'. This clone is characterized by small size, stiffly drooping branches, and rather irregular growth without a central leader. It is best grafted onto a high standard.



Betula populifolia

Gray Birch

This small tree is common throughout southern Canada and the adjacent United States south to Ohio and Virginia. It is a somewhat weedy tree, one of the first to appear in pastures, along roadsides, or other disturbed areas. Unlike our other native arborescent birches, it would never be a component of a mature forest.

Like most weedy trees, the Gray Birch is quick-growing and short-lived, and it grows well on poor, dry soil. Its ornamental uses are not quite comparable to those of other white-barked birches but it does have its place in the cultivated landscape. The bark is slightly grayish with conspicuous dark lenticels and rather numerous black areas — all in all not nearly so distinguished as the bark of the Canoe Birch or the European White Birch. And even under the best conditions, the trees develop a slender twiggy crown — graceful but a bit skimpy. Because of this habit of growth, however, they are excellent for planting in clumps. The species is poorly represented in the collections of the Arnold Arboretum, but one twenty-seven-year-old specimen is 32 feet tall, with a spread of 16 feet.

The Gray Birch is susceptible to the Bronze Birch Borer and highly susceptible to the Birch Leaf Miner, so much so that the foliage of unsprayed trees is often quite brown and unsightly by midsummer. Its twiggy crown collects snow and ice to a greater extent than that of most other deciduous trees, and it is common in New England to see large patches of these trees bent nearly to the ground after a winter storm. They are amazingly pliable, however, and healthy trees will usually return to their more or less upright stature.

Birches With Whitish to Reddish Bark***Betula ermanii***

This species, in its finer forms, is probably the best white-barked birch theoretically resistant to the Bronze Birch Borer. It is common throughout much of temperate eastern Asia, often at high elevations. In Japan at least, it ascends to the treeline. The plants from high elevations are shrubby in nature, and probably would remain so in cultivation. Those from lower elevations are graceful trees, often with several trunks. The color of the bark varies greatly, from silvery gray-brown to white, so for ornamental purposes seed-grown material should be avoided in favor of clonally propagated plants. The oldest specimen presently among the Arnold Arboretum's collections has many desirable ornamental qualities. At twenty-five years it is 25 feet tall with a spread of 28 feet. Its trunk divides into three near the ground. The bark is lustrous white with a creamy to pinkish tinge, and long, narrow, pale-colored lenticels. It is mostly tight on the trunk, looking almost stretched, although there are areas where it shreds off in thin strips. Very few large, black areas are evident. The tree is completely free from the borer.



Winter aspect of various birch species. Left, part of the birch collection at the Arnold Arboretum showing *Betula ermanii* in the center, *B. populifolia* just to its left, and several specimens of *B. papyrifera*; right, a specimen of *B. pendula* 'Fastigiata' showing the bent branches caused by snow and ice.

Photographs: R. Weaver.

Although the Arnold Arboretum introduced this species into cultivation in the United States in 1881, it is still rare in this country and it has never been pushed as a nursery item. Perhaps its main drawback is that the white color of the bark does not develop as early as in some other species, but its resistance to the ravages of the Bronze Birch Borer should be ample compensation.

Betula albo-sinensis

Chinese Paper Birch

This native of western China was introduced by Wilson when he was collecting for Veitch, but it is rare in cultivation at present. I have never seen a truly good specimen, but from descriptions this must be a beautiful tree. Typically, the peeling, orange-brown bark is reminiscent of that of the celebrated Paperbark Maple (*Acer griseum*), although it does vary in color to orange-gray or nearly white.

The two specimens at the Arnold Arboretum are very different in appearance. They are about the same age (twenty-five years), but



one is low, sparse and generally undistinguished although the bark is an attractive yellowish-white peeling to reveal an orange-brown layer. The other has a tall slender crown, 39 feet tall by 29 feet wide, and is a lovely tree. The bark is basically a lustrous white, peeling to buffy orange-brown. This species is not closely related to the Canoe or European White Birch, and should be borer-resistant. However, the finest of our two specimens has recently shown serious borer damage.

Birches With Dark Bark

Betula lenta

Sweet, Black, or Cherry Birch

This species is an important component of rich deciduous forests in the eastern mountains from southern Maine to northern Georgia. It is a favorite and familiar native tree, and the three common names have almost equal popular usage. "Cherry" Birch refers to the general resemblance of this tree to various species of cherries, particularly with regard to the foliage and the mahogany to almost black bark with conspicuous lenticels; "Black" Birch recalls the color of the bark on mature trunks; and "Sweet" Birch is probably the commonest name among rural children, who delight in chewing the bark of the twigs for its sweet wintergreen taste.

To me it is a great mystery why this tree is not more commonly cultivated, because as a shade tree it is certainly as ornamental as most lindens or ashes or many maples. The male catkins, though not spectacular, are attractive in the spring, the smooth, lustrous bark of the branches is always ornamental, and the golden autumn coloration is magnificent. Add the aromatic and tasty twigs, the sturdy wood that holds up well in storms, and the lack of messy fruits, and all characteristics combine to make a very fine tree.

Although forest specimens are often tall and slender, grown in the open this species usually forms a broad, rather low arching crown. As a point of reference, a year-old specimen at the Arnold Arboretum is 47 feet tall with a spread of 61 feet.

A very close relative, *Betula grossa*, the Japanese Cherry Birch, is rare even in botanical gardens. It was introduced into cultivation by Professor Sargent in 1892, and an original plant from this introduction still survives in our collections. It is only 30 feet tall with a spread of 38 feet. It is almost equivalent horticulturally to *B. lenta* except that it is slower growing with a much lower ultimate height.

Betula alleghaniensis (formerly *B. lutea*)

Yellow Birch

Similar and closely related to the Sweet Birch, this species is common in mixed hardwood-coniferous forests of the Northeast, the Great Lakes states, and the Appalachians, occupying higher elevations the further south it ranges. It is one of the most important timber trees of the eastern forests, and the wood is a favorite for furniture and cabinetry.

The bark is a lustrous yellow-gray, peeling and curling in thin strips. On mature trunks it is darker and thicker, with a tendency in some individuals at least to become furrowed. Horticulturally this species is nearly equivalent to the Sweet Birch. Its bark, however, is paler and shreddy, and the twigs have at most a very slight winter-green taste. At the Arnold Arboretum we have a fine grove of six seventy-eight-year-old trees. The largest is 55 feet tall with a spread of 47 feet.

Betula schmidtii.

Native to Japan, Korea, and Manchuria, but rare in the wild at least in the first two areas, this exceptionally fine plant unfortunately will never be able to compete in popularity with its spectacular white-barked relatives. Yet, hopefully it will be able to rise above the complete obscurity with which it is saddled at present because it is one of the most graceful of medium-sized trees. The finest specimen at the Arnold Arboretum, representing the original introduction of the species into the United States in 1896, is planted near the top of Bussey Hill. It is 40 feet tall with a spread of 36 feet, the thirteen gracefully arching trunks forming a broad, almost hemispherical crown. The bark is steely-gray, but cracking and peeling off in stiff plates to reveal an almost black layer embossed with peculiar, circular, resinous lines. The bark is particularly striking when wet. Sharing a characteristic of its close relative, our native Sweet Birch (*Betula lenta*), the foliage turns a brilliant golden yellow in the fall. It is one of the best of our trees for this particular foliage color. Dr. Stephen Spongberg, my colleague here at the Arnold Arboretum, and I observed this species in its native habitat in the mountains of north central Korea. It was a rare component of a beautiful, rich, nearly virgin forest. One specimen was about the finest wild tree we saw in Korea.

Betula nigra

River Birch

Although the color of its autumn foliage is a bit dull in comparison to most of its relatives, this is the most striking of the dark-barked birches in many respects. The bark is unique. On young trunks and branches it is pale brown, exfoliating in thin flakes. On mature trunks it is very dark, and the flakes are large, thick, and irregular. The effect looking into the leafless crown is one of winter's finer pictures — the almost but not quite unkempt bark of the trunks passing into the paler and softer bark of the branches and, finally, the very numerous fine twigs forming a delicate tracery against the sky. The irregularly rounded, somewhat drooping crown, and the fine, gray-backed foliage are distinguished in the summertime as well.

The Arnold Arboretum's collection features a fine group of these trees on either side of the main road just before the drive up Bussey Hill. The trees are one hundred years old and the largest is 56 feet tall with a spread of 57 feet and a DBH of 3 feet.



Birch trunks. Left, the main trunk of Betula albo-sinensis, showing the whitish exfoliating bark; right, looking from the main trunk into the crown of B. nigra. Photographs: R. Weaver.

In the wild a tree of lowlands, flood plains and streamsides, this species ranges into eastern Texas, further south than any other native birch. It grows best in moist soils, but it will succeed in drier situations as evidenced by the fine trees at the Arnold Arboretum described above.

Betula davurica

This native of Manchuria, northern China, Korea and Japan is somewhat reminiscent of our native River Birch, particularly when young, but in our climate does not grow nearly so tall. The oldest specimen at the Arnold Arboretum (sixty-eight years old) is 35 feet tall with a spread of 40 feet. The bark of this particular tree is exceptionally handsome; on the main trunk a patchwork of ashy gray flakes in thick spongy masses interspersed with buffy brown areas of lower relief. The bark on the branches looks like a thick mat of corn flakes, varying in color from a lustrous pearly buff to cinnamon. The habit of the tree is unexceptional, the crown being low and irregularly rounded. It is, however, decidedly ornamental in the winter, and it does better on poor dry soils than most other birches. It is resistant to the Bronze Birch Borer.



Winter aspect. Above, Betula davurica: below B. schmidtii, showing the dark bark and the multiple trunks. Photograph: R. Weaver.

Other Birches***Betula maximowicziana***

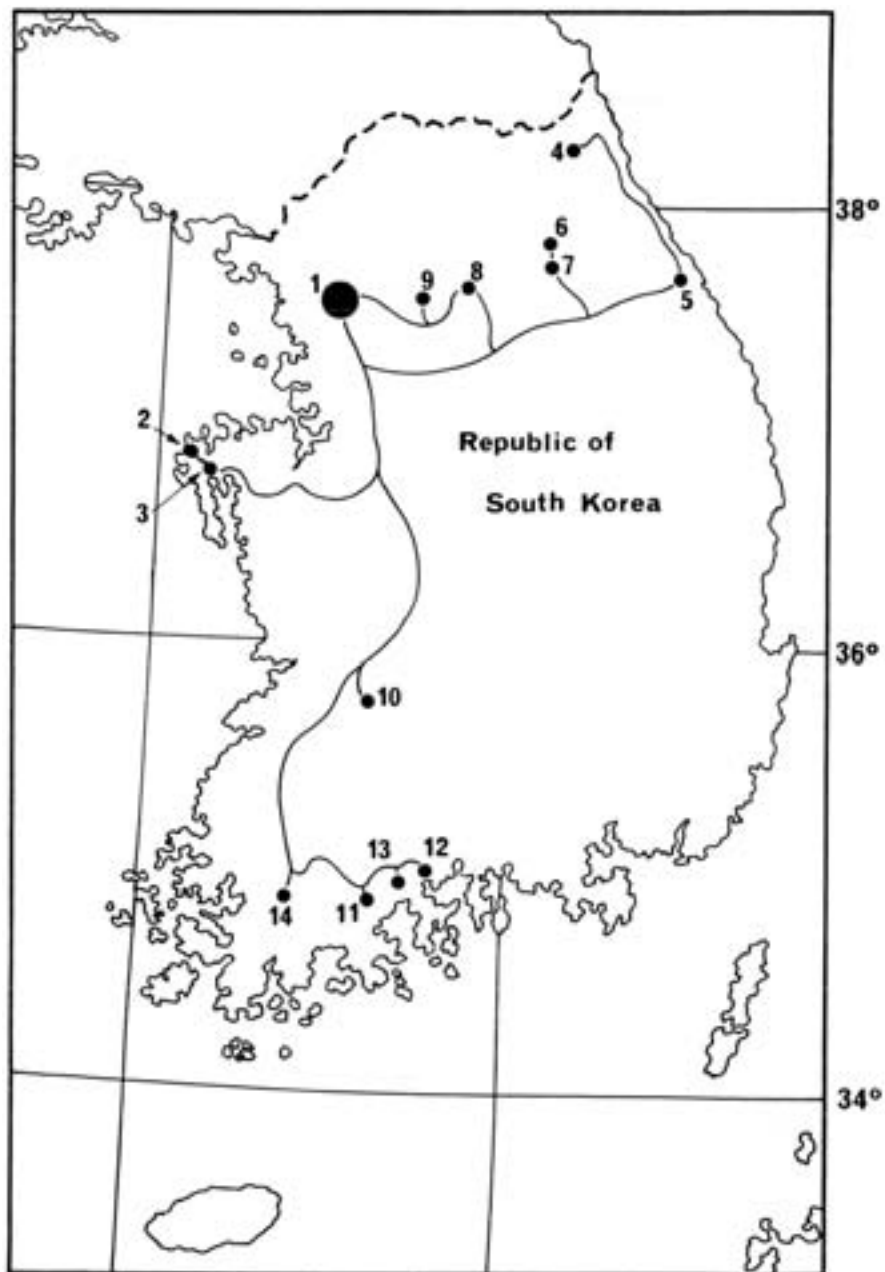
Monarch Birch

This rather atypical birch looks like a cross between a linden and an aspen. With its large, yellowish-green heart-shaped leaves, and its female catkins borne in clusters rather than singly, it is one of the most distinctive and easily recognizable of the arborescent birches. Yet most of the trees grown under this name in the United States have turned out to be something very different. This became apparent during a study by Drs. Santamour and Meyer of the United States National Arboretum, prompted by widespread publicity touting the Monarch Birch as a white-barked species resistant to the Bronze Birch Borer. This species is probably resistant to the borer, but it does not have white bark. The birches that received the publicity are not *Betula maximowicziana*, although they may be hybrids with this species as one of the parents.

The Monarch Birch was introduced into cultivation from its native Japan by Charles Sprague Sargent in 1892, but at present there are no mature specimens in the collections of the Arnold Arboretum. The species was observed several times during our expedition to Japan and Korea in the fall of 1977. The color of the bark is variable in the wild, but it is usually a lustrous orange-gray. One particularly good group cultivated at the Tokyo University Forest in Hokkaido, near the town of Yamabe, did have bark that approached white, and trees such as these may have considerable potential in a breeding program to develop a truly white-barked, borer-resistant birch.

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Sketch-map of routes and principal localities visited in Korea. Localities are numbered in the approximate order in which they were visited. 1, Seoul; 2, Chollipo; 3, Taean; 4, Sorak-san National Park; 5, Kangnung; 6, Changchon; 7, Kyebang-san, Undugol Pass; 8, Hongcheon; 9, Yongmun-san; 10, Forest Research Station, Chonju; 11, Sonam Temple, Chogyo-san; 12, Kwangyang; 13, Sunchon; 14, Mudung-san near Kwangju.

Korean Adventure

by STEPHEN A. SPONGBERG

Author's Note: This article chronicles some of the Korean portion of the Arnold Arboretum's collecting trip to Japan and Korea in the fall of 1977. The goals of this trip have been outlined in *Arnoldia* 38: 28–31. 1978, while Richard Weaver's *Japanese Journal* appeared in *Arnoldia* 38: 82–101. 1978, and described many of the events and plants encountered in Japan. As in that article, space here allows for the description of only the most memorable days and events. A detailed itinerary, however, with a list of the plants collected appears at the conclusion of this article.

I should like to express my deep thanks to Dick Weaver and my wife, Happy, for help in remembering all the details of our trip during the preparation of this article, and my warmest and deepest thanks are extended to Carl Ferris Miller, whose most generous help and hospitality made our trip in Korea possible.

On the afternoon of September 30, after having spent the morning on an excursion to the island of Miyajima in the Inland Sea (where we explored the beautiful temple there, famous for its offshore *tori* or gate), Dick Weaver, my wife, Happy, and I tried to express our deep thanks to my old graduate school friend, Katsuhiko Kondo, for his generosity and overwhelming hospitality during our travels in Japan. Back in Hiroshima, we left Katsu on the platform and boarded a Shinkan-sen or bullet train destined for the city of Fukuoka on Kyushu, the southernmost of the four major Japanese islands, where we were to spend our last night in Japan. Our trip from Hiroshima was comfortable and pleasant as we felt well accustomed to the extraordinarily efficient Japanese train service, and as darkness fell, we saw extensive plantations of tea from the train windows and were aware that we were traveling into an even more tropical climate and vegetation than we had left in Hiroshima.

Early on the morning of October 1 we taxied to the Fukuoka International Airport for our China Airlines flight to Seoul and the beginning of our Korean adventure. While we were not anxious to leave Japan, feeling as we did that we had only begun to sample its extremely rich flora, we were nonetheless expectant and excited to be headed for the Asiatic mainland. We also were particularly anxious to be able to make comparisons between the Japanese and Korean floras and to learn more of the plants of the Korean peninsula.

We arrived in Seoul in the middle of the afternoon after an easy but crowded flight, and as our plane made its descent on its approach to Seoul, I was immediately surprised by the dry and dusty aspect of the landscape, a decided change from the verdant green

and humid countryside we had left in Kyushu. After a long, hot wait standing in line, we finally cleared through customs and were able to pass into the terminal waiting room where we immediately spotted and were spotted by our host in Korea, Carl Ferris Miller.

Through our mutual friends, Admiral and Mrs. Harry Hull, we had briefly met Carl at the Arnold Arboretum almost a year before. On that visit Carl's great enthusiasm for, and knowledge of plants, particularly woody plants, had been obvious, and he had described his plans for the arboretum he is developing in Korea while convincing us that the native Korean flora, which includes many species of horticultural value, has been largely ignored by western botanists and horticulturists. Unlike the flora of Japan, which has been under scrutiny and investigation by western as well as Japanese botanists since the time of Linnaeus, the first collections of Korean plants were made as late as 1854 when Admiral B. A. Schlippenbach of the German ship "Pallada" sent a party ashore to collect specimens during his survey of the eastern coast of Korea. One of their discoveries was the beautiful pink-flowered azalea, *Rhododendron schlippenbachii*, named to honor the Admiral by the botanist Maximowicz.

Our decision to include Korea on our itinerary was largely due to Carl's convincing arguments, our desire to see Carl's Chollipo Arboretum, and the fact that the climate of Korea is more similar to that



of New England than is that of Japan. With hot summers and very cold winters, plants growing in Korea are adapted to a continental climate, and we were anxious to collect seeds of species hardy in Korea for trial at the Arnold Arboretum.

After spending a relaxing hour or two at Carl's Seoul townhouse discussing plans for the upcoming two weeks, sipping iced tea, and then quickly rearranging our luggage, we left Seoul with Carl and Chin-su, one of Carl's adopted Korean sons and also an avid plantsman. In Carl's version of a Ford Pinto station wagon, we drove south and then, after exiting from the Seoul-Pasan Expressway, proceeded in a westerly direction. Our destination was Chollipo, as the crow flies about seventy miles southwest of the capitol city, and during the trip we were delighted to be talking plants and to be observing the Korean countryside at eye-level. Unfortunately, the sun had set by the time we were far into our journey, and most of the countryside was driven through unobserved. However, the trip was not without memorable incidents, partially due to the fact that the station wagon was loaded with luggage and supplies for Chollipo. We made a quick stop in a small town for last minute supplies and were delighted to see a small farmers' band playing homemade instruments and parading down the road in the twilight to celebrate the completion of the harvest. Before reaching the last turnoff for Chollipo, the car was hitting bottom along the rutted road, and on taking the last turnoff, the underside of the vehicle took a horrendous beating that culminated in the loss of the muffler as we drove onto the beach of the Yellow Sea (it was low tide) and up the steep drive to the main house at Chollipo Arboretum. After a late dinner, we headed by flashlight to our beds in different guest houses, not knowing what view would meet our eyes in the morning.

The following morning, lying on *tatami* (Japanese bed mats placed on the floor), Happy and I opened our eyes and were stunned momentarily by the magnificent sweep of the Yellow Sea in front of and below us. Our guest house was perched above the beach with a breathtaking view of the coast and an offshore island, which we learned later was a part of the Arboretum property and accessible by foot at low tide. The tides in this area are notable in and of themselves as the second highest in the world and second only to those in the Bay of Fundy between New Brunswick and Nova Scotia, where the tides sometimes rise between 40 and 50 feet. At Chollipo on the Yellow Sea, 30-foot tides occur, and the beaches of white sand make swimming a delight.

The Arboretum property comprises about three hundred acres along the coast of the Yellow Sea and includes the low-lying mountains that curve inland at this point to form a small basin with the fishing village of Chollipo (located adjacent to the Arboretum pro-

perty) on the beach itself. Because of the varied topography, exposures, and soil types, the site is ideally suited to development as an arboretum, and its location near the Yellow Sea has the added advantages of the moderating influences of the sea in extending the growing season as well as providing occasional fogs and mists and tempering the extremes of day- and night-time temperatures.

After breakfast, we spent the morning walking around the nursery areas, which are located adjacent to the main and guest houses at Chollipo, and we were overwhelmed by the vast numbers of plants as well as the diversity of the collection (in excess of four thousand species) that Carl has brought together within the last seven years. I can only liken the experience to walking around the Hillier Garden and Arboretum in Hampshire, England, and it is obvious the Chollipo Arboretum will soon be among the foremost Temperate Zone arboreta in the world. We made numerous collections of seed, our first in Korea, from the plants in the nurseries and growing in permanent plantings. I was particularly interested in studying Carl's collection of Magnolias, which includes upwards of sixty taxa, and we were fascinated by the diversity of the *Ilex* collection that includes upwards of three hundred taxa. Species of both of these genera hold a special fascination for Carl, and his collections are certainly the most comprehensive I have seen. At every turn Dick, Happy, and I were aware





The rugged coast of the Yellow Sea at Chollipo Arboretum. Note the compound leaves of Platycarya strobilacea in the foreground. Photograph courtesy of C. F. Miller.

of our ignorance and at the same time we were delighted to be seeing either completely new plants or others we had only known by reputation. Carl estimates that the climate at Chollipo is comparable to that of Zone 8 (USDA map), and he is attempting to grow all species from both the northern and southern hemispheres that might prove hardy at Chollipo.

After lunch and a swim in the Yellow Sea, we continued our survey of the plant collections in the Arboretum nurseries, and late in the afternoon we walked down to the sandy beach adjacent to the fishing village of Chollipo, where Carl was anxious to show us and have us collect seed from an extensive population of *Vitex rotundifolius*. Unlike other species of *Vitex*, which are either trees or upright shrubs, this species is prostrate and creeping, and at the collection site served as a sand binder on the low dunes.

On October 3, another clear, beautiful day, we continued our investigations of the plantings at Chollipo, and spent the better part of the afternoon exploring the native vegetation both on Carl's offshore island and along the coast north of Chollipo at Uihang-ni.

The Yellow Sea, terraced rice paddies, and pine forests at Chollipo. Photograph courtesy of C. F. Miller.



The cone-like infructescence of Platycarya strobilacea on a plant growing in the Chollipo Arboretum. Photograph. S. A. Spongberg.

Pine forests cover the low-lying mountains along the coast and the dominant species are *Pinus densiflora*, a species common everywhere in Korea, *P. thunbergii*, and in the Chollipo area the hybrid between the two species, *P. densithunbergii*. Another common conifer in the Chollipo area is *Juniperus rigida*, while common deciduous species in the scrub along the coast and in the forested areas include *Platycarya strobilacea*, an unusual monotypic genus of the Juglandaceae, *Kalopanax pictus*, *Zanthoxylum piperitum* and *Z. schinifolium*, *Elaeagnus umbellata* and *E. macrophylla*, *Vaccinium oldhamii*, *Sorbus alnifolia*, *Euodia Daniellii*, *Carpinus koreana*, *Rhododendron mucronulatum* everywhere in pine forests, and *Quercus dentata*, *Q. mirabilis*, and *Q. acutissima*. Two lindens, *Tilia mandshurica* and *T. amurensis*, are common, while the unusual *Grewia biloba*, also a member of the Tiliaceae, is a frequently encountered shrub.

At Pang-jik-kol, Carl took us to see one of the few known native occurrences of *Koelreuteria paniculata* in Korea, and we were amazed to find this species, which we tend to think of as a tree from 30 to 60 feet in height, growing in sandy soil as a shrubby plant only approaching 12 feet in height. Needless to say, we are hopeful that

the shrubby habit of these plants is genetic and not environmentally induced, as we made a collection of seed and can visualize the horticultural and landscape use of a dwarf, shrubby golden rain tree. Carl also took us to collect seed from another plant, *Viburnum bitchiuense*, that was growing in an unexpected habitat. We found a large population of this low-growing shrub growing in almost pure sand, where, like the *Vitex*, it was serving as a sand binder on the low dunes behind the beach of the Yellow Sea.

We spent the better part of the next day, October 4, back in the nurseries at Chollipo Arboretum, and by mid-afternoon, after lunch and a refreshing swim, had packed and were ready for our return trip to Seoul. Before leaving the topic of our stay at Chollipo, however, note should be made of the wonderful hospitality there and of the superb meals, a blend of western and Korean cuisines, and largely dependent upon the fresh fruits and vegetables grown on the arboretum property. *Ajumoni* (the Korean term applied to housekeeper and/or cook) was responsible for these delightful meals, and special mention must be made of the featured botanical hors d'oeuvres. These included roasted ginkgo nuts, pine nuts, *Tagetes* leaves *tempura-fried*, two species of seaweeds (one prepared rather like Doritos or potato chips, the other with sesame seeds), and popcorn. Other specialities included *kimchi*, the famous Korean hot relish, and a wonderful pie made from the fruits of *Elaeagnus umbellata* that were collected from shrubs growing in the arboretum.

We departed from Chollipo by mid-afternoon leaving vast areas of the arboretum unexplored, but we were able to make several stops to collect en route to Seoul. We were delighted to find a magnificent old specimen of *Gleditsia japonica* var. *koreaiensis*, and stopping in the town of Taean, not far distant from Chollipo, we made what to me was one of the most exciting discoveries of the trip. While Carl took us to an old garden to see an exceptionally fine specimen of an unexpected North American native, *Taxodium distichum*, we spotted a large magnolia nearby. At first glance, we assumed that this tree was a fine, old specimen of the Japanese white-bark magnolia, *Magnolia hypoleuca*, a species that is not an uncommon cultivated tree in Korea. On examining the tree more closely, however, we were astounded to notice that many of the large leaves were deeply lobed at the apex, a characteristic of the Chinese species, *M. officinalis*. This latter species is exceedingly rare in cultivation in North America and is represented primarily by its variety, *M. officinalis* var. *biloba*. While the taxonomic status of *M. officinalis* and its relationship with *M. hypoleuca* remain unclear, we were able to collect numerous seeds from the Taean tree with the use of a ladder loaned to us by the kind but rather mystified owner of the garden.

The fact that this Chinese species was growing in Korea is a reminder of the long history of Chinese influence in Korea. Taean, located near the Yellow Sea, was once the Korean terminus of a trade

route to China across the Yellow Sea, and we speculated that it may have been over this old sea trading route that seed or perhaps plants of *Magnolia officinalis* were introduced into Korean gardens. Chinese influence was evident again the next day in Seoul when Mr. Nam, Carl's driver, took us to the campus of a private school for girls to see the finest specimen of the lace-bark pine, *Pinus bungeana*, that I have ever seen. Like *M. officinalis*, *P. bungeana* is native to China, but despite that fact, the beauty, large size, and great age of the tree we saw growing in Seoul had merited its designation as a living national monument in Korea.

During the afternoon of our day in Seoul on October 5 we were able to visit the Forest Research Institute of the Korean Institute of Science and Technology where we met briefly with the director and then spent a couple of hours with Mr. Cho, a staff member, in the arboretum he has established on the grounds surrounding the administration building. Mr. Cho was most hospitable and allowed us to make numerous valuable collections, including a large collection of the seeds of *Firmiana simplex*. This tree proves perfectly hardy in the Institute's arboretum where winter temperatures fall to -5°F . and the snow cover is light as the winters are generally very dry. Before leaving the Institute, Carl had arranged for us to meet Mr. Cho on the evening of October 7 at the village of Changchon, where we would join him on a collecting expedition in that vicinity on October 8.



On the next day, October 6, we left Seoul and traveled on the Seoul-Kangnung Expressway to the eastern seacoast of the Korean peninsula, stopping once en route to do some roadside collecting. The weather, unfortunately, began to deteriorate rapidly, and to our disappointment we drove through the mountainous terrain in dense fog and rain. We finally arrived at our destination after dark and luckily found rooms in the Sorak-san Hotel, within the limits of the beautiful and mountainous Sorak-san National Park. After getting settled in our western-style rooms, we made a brief excursion into the market and shop area outside our hotel where we were fascinated by the snake and curio shops, many of which were festooned with dried octopus and squid that hung down from the shop doors and walls like curtains. Soon, however, despite the fine drizzle, we were collecting seeds of *Acer triflorum* by flashlight.

The next morning the rain had let up slightly, our spirits were high, and we followed the well-worn path along a rain-swelled mountain stream to a temple on the mountainside; in the rich forests above was a famous area where the mountain stream courses through an extensive cataract. The temple, like others subsequently visited in Korea, was a beautiful old structure, and unlike the temple buildings we had seen in Japan, was wonderfully ornamented and decorated with painted murals. Moreover, the ridge poles of the roof, which extended to form broad eaves, had been painted in intricate patterns in wonderfully bright, primary colors.

Among the seeds we collected along the trail were those of *Sapium japonicum*, a member of the Euphorbia family with magnolia-like leaves, which turn crimson in fall, that is not included in Rehder's *Manual*, and *Hovenia dulcis*, the unusual raisin tree, of the Rhamnaceae. We also were able to locate a few seeds in last year's pods on an old specimen of *Paulownia koreana* that had apparently not flowered during 1977. Despite that fact, the year-old seeds have proven viable and at the time of this writing seedlings are growing in the Arnold Arboretum's Dana Greenhouses.

As we left Sorak-san it was still raining, but we made several stops, one to collect fruits of *Diospyros lotus*, and another at Naksan Temple, which is located directly on the coast above the Eastern Sea (or Sea of Japan), where we collected fruits of *Tilia megaphylla*, another species not listed by Rehder. We retraced our route for a considerable distance, again in rain, and then in pitch darkness headed north to Changchon and our rendezvous with Mr. Cho. After driving over poor roads that had been soaked by rain through sparsely settled, mountainous country, we finally arrived at the village and to our delight found Mr. Cho and several of his colleagues waiting for our arrival. They escorted us to our inn, our first experience with a traditional Korean inn, where we soon had our evening meal and fell into discussion with Mr. Cho over plans for the morning.

We occupied three rooms at the inn, each small and square with sliding rice paper doors that faced out onto an open courtyard and the communal washing place. The rooms are entered off an elevated platform or deck, and one leaves one's shoes on the ground below. Most of the inns are rectangular or L-shaped, only of one storey, and a chimney is located at one end of the building. The area beneath the building is essentially a crawl space in which a fire is built at the end opposite the chimney. The floors are like adobe, and heat from the fire beneath them warms those of the rooms above. A very strong mulberry paper made from local trees covers the floors; the paper is very smooth with a polished surface somewhat like linoleum.

Due to the heavy rains, our schedule was left tentative and it wasn't until late that evening that Happy and I returned to our room to find that several layers of brightly decorated quilts had been spread on our warm floor. We slept soundly with only minor disturbances caused by an occasional rat running on the roof. The next morning we woke to fog and were astounded to see our surroundings in daylight. The small village with its one muddy thoroughfare was undergoing complete renovation of *all* its buildings simultaneously.

Our plans for the day were finalized with Mr. Cho and a modified climb of Kyebang-san was decided upon due to the uncertain weather. We started our climb several miles from the village and it was necessary for Mr. Nam to relay us in shifts to the jump-off point. Our party had increased in size because Mr. Cho had hired several village boys to accompany us as his collectors.

As we left the farmyard, amidst mats spread with drying chili peppers, corn, and thinly sliced squash and the avidly curious stares of several children, the sun began to shine and the day, after all, became one of the most beautiful we had in Korea. We walked through fields where giant radishes (upwards to 3 feet in length with a diameter of a loaf of bread) had been harvested. We passed by fields of millet and stood to the side of the trail as women laden with firewood of large logs and branches in *chiega* on their backs came down the mountainside. One side of the valley had been totally denuded of its forest and Mr. Cho's mission that day was to collect seed for use in reforestation programs across Korea. The forest on the opposite side of the valley, through which we climbed, was exceedingly rich in species composition and was very reminiscent of a well developed deciduous forest of mountainous eastern North America.

We were to make numerous collections as we climbed the easy trail, and in a thicket along a small stream we located one plant of *Magnolia sieboldii* with fruit aggregates, the follicles of which had dehisced to disclose numerous bright red seeds. While we had seen this species at Sorak-san, none was found there with fruits, and we had almost despaired of bringing home to Boston reliably hardy

strains of this wonderful plant. Later, we were to collect a large number of seed of this species from plants in cultivation, but seeing the plant in its native habitat and securing its seeds there was a highlight for me. Several species of maples grew in this beautiful forest, and one, *Acer pseudosieboldianum*, gave us our first encounter with spectacular fall color. Its leaves had turned to a brilliant crimson where the plants were growing in exposed areas along the edges of the forest, while plants of the same species growing in the forest had turned a warm golden-yellow. Another maple, *A. mandshuricum*, one of the trifoliolate maples, had not yet assumed its fall color, but its fruits, high up in the crowns of the trees, were abundant. Dick was able to climb high into one of these trees and shook the keys to the ground where Carl, Happy, and I gathered them into envelopes. Huge specimens of *Kalopanax pictus* grew in close association with the maples, and the young boys were dispatched by Mr. Cho to collect their fruits. In a couple of instances the boys failed in their attempts to shimmy up the tall trees. It was amusing to watch and listen as one boy, high up in his tree, obviously urged and then heckled his cohort who was unsuccessful in getting far off the ground on his tree due to the great girth of the trunk and the lack of foot- and hand-holds. As we continued our climb, the dappled sunlight played on the beautiful white bark of *Betula ermanii*, and we were astounded to find huge specimens of *Juglans mandshurica* and another birch, *B. schmidtii*. One specimen of the latter with its peeling, shingle-like, dark gray bark, was perhaps the most magnificent tree we had seen, and I estimated its height at about 60 feet.

Our goal the following day was to visit the temple grounds at Yongmun-san, specifically to see the giant *Ginkgo biloba* tree that grows on the mountainside just below the temple. While the forest trees at Kyebang-san that we had seen on the previous day had been impressive in their size, the Yongmun-san ginkgo dwarfed them by comparison and is probably the largest individual tree any of us had seen previously. The interpretive sign near the tree was in both Korean and English, and according to the information given, this ginkgo, towering to a height of 200 feet, is thought to be the oldest living ginkgo in all of Asia. Unfortunately, the data given did not include the diameter (dbh) of the tree, but we estimated that this would exceed 15 feet. While we scurried from one vantage point to another in an attempt to photograph the tree in its entirety, we were somewhat less than completely successful, yet the accompanying photograph taken from above in the precincts of the temple, gives some idea of the enormous size of this ancient tree.

After leaving the temple we made several interesting collections along the trail to the small village at the base of the mountain, and along the main street of the village we were able to supplement our collections through purchases in the market there. This market



The base of the giant 200-foot, 1100-year-old Ginkgo at Yongmun-san Temple, Kyonggi-do Province, Korea. Photograph: S. A. Spongberg.

Women in the market at Yongmun-san. Note the slabs of acorn curd in the dishpan in the foreground. Photograph: S. A. Spongberg.

reminded me of the open air markets in villages in Mexico, and the diversity of plant materials offered for sale, many collected from the wild, made for a colorful botanical shopping spree. Among the plant materials for sale in the market were cones of *Pinus koraiensis* (for the edible pine nuts), the small red drupe-like fruits of *Elaeagnus umbellata*, *Vitis coignetiae* with its bunches of small, purplish-black berries, the sweet green berries of *Actinidia arguta*, and the small, oblong red drupes of *Zizyphus jujuba*, the jujube, which tasted much like apples. Spread out on mats to dry in the sun were quantities of acorns of *Quercus aliena* and close at hand were water-filled dish-pans in which slabs of acorn curd, prepared from the acorns, were floating. Other mats were spread with chilies and thinly sliced squash, while the small, grayish-brown seeds of *Perilla fruticosa* were piled on others. A member of the mint family, *Perilla* is grown for its seeds that are an important source of oil that is used in cooking and for water-proofing paper. Other, more commonplace vegetables and fruits included chestnuts, several varieties of corn, tomatoes, and pumpkins, while crates of apples and apple-shaped yellow pears were displayed along with the tempting, orange fruits of *Diospyros kaki*, the oriental persimmon. Carl also showed us the roots of *Platycodon grandiflorum*, the balloon flower, which are commonly prepared and eaten in soy sauce; there were numerous other roots with Korean names that Carl was unable to translate into Latin ones.

✧



I was particularly anxious to buy several persimmons or kakis, both to eat and to obtain seeds for trial at the Arnold Arboretum. Carl persuaded me that we would have better chances of obtaining hardy strains if we purchased fruits from local farmers, inasmuch as the market fruits may not have been grown locally. He had no problem in convincing me not to buy persimmons, but he was unsuccessful in tempting the three of us to try the delicacies of the several snake shops in the market area. These establishments were clearly recognizable by the cages with live specimens of both venomous and non-venomous snakes, and earlier, on the trail to the temple, we had seen a father and son collecting snakes for the local shopkeepers. After a customer selects the snake of his choice, the proprietor kills, cleans, and prepares a hot snake stew for consumption on the premises, a culinary treat apparently very popular with Korean tourists. We disappointed Carl as we preferred to satisfy our appetites with jujubes and other vegetable produce.

En route from Yongmun-san to Seoul we did stop and buy persimmons of two varieties that were growing in a farmhouse dooryard. One variety was large-fruited, deep rich orange in color with four longitudinal grooves that divided the fruits into quadrants, while the second produced smaller, less attractive, ungrooved fruits of a pale orange color. As luck would have it, the larger more beautiful kakis contained no seeds, but several seeds were found in the less attractive fruits. If we were successful in obtaining a hardy strain we will, unfortunately, have to be content with the less attractive, smaller-fruited form.

After spending a day in Seoul exploring the business and market districts and shopping for souvenirs, we left on the morning of October 11 on our last collecting foray. On this trip we headed south on the Seoul-Suncheon Expressway, and after a brief stop for collecting at the Forest Research Station at Chonju, we continued southward where our objective was Sonam Temple, located about six miles northwest of the town of Sunchon on the mountain Chogye-san at about three hundred meters above sea level. Once again, we arrived at our destination in darkness and we were forced to stop as the road came to a seemingly abrupt dead end on the forested slope of the mountain. While Carl assured us that there had been an inn there on his last visit to the area four or five years previously, we saw no signs of life. Carl, however, set off on foot, flashlight in hand, while Happy, Dick, Mr. Nam, and I waited by the car.

When Carl reappeared he had two young boys with him from the hidden inn, and he greeted us with the news that the Ajumoni was preparing our evening meal. After dinner, which was served in Carl's room, we headed to our rooms and bed, and once again fell asleep not knowing what view would meet our eyes in the morning. At three o'clock, however, we were awakened by the sounds of drums and cymbals and we realized that our inn was, indeed, on temple grounds.



Carl Ferris Miller and the author purchasing persimmons from a Korean family at Yangpyong Myon. Photograph: R. E. Weaver, Jr.

Early the next morning Happy and I had a quiet, pre-breakfast walk around the then seemingly deserted temple. Large, leafless persimmon trees laden with fruits were silhouetted against the blue of the early morning sky, and we discovered on an adjacent hillside numerous ancient burial urns. After breakfast we explored the forest around the temple and located beautiful specimens of the native Korean *Stewartia* that grow in this region, but unfortunately, we were unable to locate capsules with seed. We did make several additional collections in the area, and during the afternoon, after lunch at the inn, we visited other areas in the vicinity, including the Seoul National University Forest at Kwangyang. We also made a stop at the private garden of a Mr. Kim, an old friend of Carl's, to see his exceptionally fine persimmon trees. Mr. Kim kindly showed us through his garden and then gave us enough ripened persimmons so that even I could satisfy my appetite for these delicious fruits. Included among these kakis was a variety unlike any I had ever seen or heard of, inasmuch as it is sweet and non-astringent when still apple-hard.



Burial urns on the forested slope of the mountain at Sonam Temple. Photograph: S. A. Spongberg.

The next day, after spending a second night at the inn, we reluctantly started back in the direction of Seoul, stopping at another locality in search of *Stewartia* seeds. Although our search for capsules of *Stewartia* was again unsuccessful, we were able to go over the five hundred mark for total collections during our travels in Japan and Korea. We made these last collections with the realization that our Korean adventure was fast coming to a close, and on the long drive back to Seoul our conversation turned to plans for the future and our itinerary for our hoped-for next trip to Korea.

On the morning of October 14, Dick left Seoul on an early flight to return home via the Philippines, while Happy and I ran an errand to the post office to mail off our last collections to the Arboretum and bought a bouquet as a parting gift for Ajumoni. Later in the day after attempting unsuccessfully to express our deep thanks, we left Carl and Ajumoni, and Mr. Nam drove us to the airport for our flight home via Honolulu and San Francisco. While the tangible results of our travels in Korea can be seen in the Arboretum's Dana Greenhouses, and hopefully will be obvious in the Arboretum's living collections in the years to come, for Happy, Dick and me, one of the greatest rewards of our trip was intangible — the opportunity to meet and learn to know and love an astounding and generous man, Carl Ferris Miller.

Itinerary in Korea with Plants Collected at Each Locality

1 October — Departed Japan and arrived Seoul. Met Carl Ferris Miller. Departed Seoul and traveled to Chollipo Arboretum, Sowon-Myon, Sosangun, Province of Chungchong-Namdo.

2 October — Studied and made collections at Carl Ferris Miller's Chollipo Arboretum.

* <i>Alnus maximowiczii</i>	* <i>Magnolia kobus</i>
* <i>Berberis poiretii</i>	* <i>Platycarya strobilacea</i>
* <i>Clerodendron ugandense</i>	* <i>Quercus dentata</i>
* <i>Cornus walteri</i>	* <i>Raphiolepis ovata</i>
* <i>Cotoneaster wilsonii</i>	* <i>Ribes fasciculatum</i> var. <i>chinense</i>
* <i>Desmodium racemosum</i>	* <i>Salvia guaranitica</i>
* <i>Indigofera potaninii</i>	* <i>Sollya fusiformis</i>
* <i>Lindera glauca</i>	* <i>Viburnum setigerum</i>

Walked on beach around the village of Chollipo.

Vitex rotundifolius

3 October — Collected in secondary woodlands at Uihang-ni, near Chollipo, Chungchong Namdo Province.

<i>Euonymus</i> sp.	<i>Symplocos chinense</i> var. <i>pilosum</i>
<i>Lespedeza</i> sp.	<i>Viburnum bitchiense</i>
<i>Platycarya strobilacea</i>	<i>Viburnum koreanum</i>
<i>Quercus variabilis</i>	<i>Vitis</i> sp.
<i>Smilax china</i>	<i>Zanthoxylum piperitum</i>
<i>Smilax</i> sp.	<i>Zanthoxylum schinifolium</i>

* Cultivated material.

Collected in secondary scrub near the Yellow Sea at Pang-jik-kol.

Grewia biloba

Rhamnus koraiensis

Koelreuteria paniculata

Walked at low tide to Carl's Island.

4 October — Made additional collections at Chollipo Arboretum.

♂ *Carpinus coreana*

♂ *Indigofera pseudotinctoria*

* *Hemiptelea davidii*

* *Pyrus calleryana* var. *fauriae*

♂ *Ilex serrata* var. *sieboldii*

♂ *Setaria*-like Grass

♂ *Indigofera cylindrica*

Departed from Chollipo to return to Seoul, making stops en route for collections.

Dooryard garden near Sowon, Chungchong-Namdo Province.

Gleditsia japonica var. *koraiensis*

Visited old garden in town of Taeon, Chungchong-Namdo Province.

* *Acanthopanax* sp.

* *Magnolia officinalis*

5 October — Day in Seoul.

Residence of Carl Ferris Miller.

* *Diospyros kaki*

Visited campus of private girls' school to see remarkable specimen of *Pinus bungeana*.

Visited Forest Research Institute.

* *Abelia coreana*

* *Ligustrum foliosum*

* *Acer barbinerve*

♂ *Ligustrum insularis*

* *Alnus japonica*

* *Ligustrum salicinum*

♂ *Berberis amurensis* var. *quelpartensis*

♂ *Lindera glauca*

Photinia koreana

♂ *Betula chinensis*

♂ *Pterocarya stenoptera*

♂ *Boehmeria spicata*

♂ *Pterostyrax corymbosa*

Campylotropis macrocarpa

♂ *Rhamnella franguloides*

♂ *Corylopsis coreana* var. *coreana*

* *Ribes fasciculatum* var. *japonicum*

♂ *Diplomorpha trichotoma*

* *Rosa koreana*

♂ *Disporum sessile*

* *Sapium japonicum*

♂ *Euodia officinalis*

* *Ulmus parvifolia* var. *coreana*

* *Exochorda serratifolia*

♂ *Zanthoxylum coreanum*

* *Lespedeza cuneata*

6 October — Departed Seoul and traveled to Sorak-san National Park, Kangwon-do Province, stopping en route for collections.

Roadside near Myonon, along Seoul-Kangnung Expressway, Province of Kangwon-do, elevation 500–600 m.

Aristolochia sp.

Symplocos chinensis var. *pilosa*

Rhamnus davurica

Tripterygium regelii

Spiraea sp.

Viburnum sargentii

Sorak-san National Park, near hotel, elevation ca. 100 m.

Acer triflorum

* Cultivated material.

7 October — Collected along trail from Sorak-san Hotel to temple and cataract, elevation 100–300 m.

<i>Acer mono</i>	<i>Malus baccata</i>
<i>Acer pseudosieboldianum</i>	<i>Paulownia koreana</i>
<i>Clerodendron trichotomum</i>	<i>Rhus chinensis</i>
<i>Diospyros lotus</i>	<i>Sapium japonicum</i>
<i>Hovenia dulcis</i>	<i>Securinega suffruticosa</i>
<i>Lindera obtusiloba</i>	<i>Staphylea bumalda</i>

Departed Sorak-san National Park and drove to village of Changchon with collection stops en route.

Roadside below Sorak-san Hotel.

Diospyros lotus

Naksan Temple on the eastern Sea, Kangwong-do Province.

**Tilia megaphylla*

Dooryard garden, city of Kangnung.

~*Cedrela sinensis*

8 October — Collected at Kyebang-san at Undugol Pass between Sogsa and Changchon, Province of Kangwon-do, with Mr. Cho and colleagues, elevation 700–1000 m.

<i>Acanthopanax sessiliflorus</i>	<i>Magnolia sieboldii</i>
<i>Acer barbinerve</i>	<i>Neillia sinensis</i>
<i>Acer mandshuricum</i>	<i>Philadelphus</i> sp.
<i>Acer tegmentosum</i>	<i>Rhamnus yoshinoi</i>
<i>Alangium platanifolium</i>	<i>Rosa davurica</i>
<i>Euonymus oxyphylla</i>	<i>Tilia amurensis</i>
<i>Lonicera</i> sp.	<i>Weigela</i> sp.
<i>Maackia amurensis</i>	

Left Kyebang-san and drove to Hongcheon for the night, stopping en route for collections.

Between Undugol Pass and Sogsa, roadside scrub.

<i>Berberis amurensis</i>	<i>Lonicera subsessilis</i>
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Private garden, town of Hongsong, Kangwon-do Province.

**Betula davurica*

9 October — Traveled to the temple at Yongmun-san, Province of Kyonggi-do, to view giant ginkgo and to collect along trail.

<i>Acer pseudosieboldianum</i>	<i>Hydrangea macrophylla</i>
<i>Albizia julibrissin</i>	<i>Quercus aliena</i>
<i>Carpinus cordata</i>	<i>Rhamnus davurica</i>
<i>Carpinus laxiflora</i>	<i>Smilax sieboldianus</i> var. <i>inermis</i>
<i>Clematis apiifolia</i>	<i>Styrax obassia</i>
<i>Clematis maximowicziana</i>	<i>Weigela</i> sp.
<i>Deutzia glabrata</i>	<i>Zelkova serrata</i>

Explored market area below temple trail-head.

**Zizyphus jujuba*

Stopped at private garden below temple area.

**Magnolia sieboldii*

* Cultivated material.

Returned to Seoul stopping at Yangpyong Myon, Ibin Iri, Province of Kyonggi-do, collecting in private dooryard gardens.

**Diospyros kaki*

**Magnolia sieboldii*

10 October — Day in Seoul exploring business and market districts and buying souvenirs.

11 October — Departed Seoul for Sonam Temple in southern Korea, stopping en route at the Forest Research Station at Chonju, Province of Cholla-Pukto.

† *Acer buergerianum*

† *Lindera glauca*

* *Alnus firma*

* *Magnolia kobus*

* *Diplomorpha trichotoma*

* *Syringa dilatata*

† *Grewia biloba*

* *Zizyphus jujuba* var. *jujuba*

Arrived at Sonam Temple for the night.

12 October — Explored forest surrounding Sonam Temple, on the mountain Chogyo-san, ca. 10 km. NW of Suncheon, Cholla-Namdo Province, elevation ca. 300 m.

Boehmeria spicata

Rhododendron mucronulatum

Carpinus laxiflora

Rhus sylvestris

Celtis aurantiaca

Viburnum cf. *erosum*

Celtis koraiensis

Viburnum cf. *koreanum*

Lindera glauca

Spent afternoon collecting in the vicinity of Kwangyang and Suncheon, Province of Cholla-Namdo.

Visited Seoul National University Forest, Kwangyang.

* *Abelia mosanensis*

* *Euscaphis japonica*

* *Aphananthe aspera*

* *Photinia glabra*

* *Chionanthus retusus*

* *Rhus succedanea*

Visited private garden of Mr. Kim in Kwangyang.

* *Diospyros kaki*

* *Gardenia jasminoides*

Visited old private garden, Suncheon.

* *Aphananthe aspera*

* *Cephalotaxus koreana*

Visited Forestry & Agricultural Technical School, Suncheon.

* *Quercus phillyreoides*

* *Ulmus parviflora* f. *lanceolata*

Returned to inn at Sonam Temple for second night.

13 October — Collected at Mudung-san, mountainous area near the city of Kwangju, Province of Cholla-Namdo.

Cudrania tricuspidata

Platycarya strobilacea

Euscaphis japonica

Rhamnella franguloides

Ilex macropoda f. *pseudomacropoda*

Viburnum cf. *wrightii*

Meliosma myriantha

Vitis thunbergii

Miscanthus sinensis

Returned to Seoul.

14 October — Departed from Seoul for return to Boston.

* Cultivated material.



Hydrangea anomala subsp. petiolaris. Photograph: G. Wadleigh.

NOTES FROM THE ARNOLD ARBORETUM

New Directions for Richard A. Howard

On June 30 Richard Alden Howard stepped aside from administrative duties as the fourth Director of the Arnold Arboretum to devote more of his time to research, writing, and teaching as Professor of Dendrology at Harvard University.

During the nearly twenty-five years of his stewardship, drastic social and economic change has taken place in the United States. For the Arnold Arboretum it has been a momentous time; a period of physical and philosophical growth during which the institution expanded its role in the public domain, strengthened its scientific programs, and developed new activities in its Jamaica Plain, Weston and Cambridge locations.

Howard's administration began with the implementation of the transfer of a portion of the Arboretum staff and research materials to the Harvard University Herbaria in Cambridge. Later the Dana Greenhouse complex was built, becoming a horticultural feature of the grounds in Jamaica Plain; a service area for equipment also was constructed and the Administration Building renovated. Major changes in the collections on Bussey Hill improved the appearance of this area, and the Case Estates of the Arboretum in Weston were opened to the public and developed as a teaching and display site, while continuing to function as a nursery and holding area for living plants of the collections.

In 1972 botanists and horticulturists throughout the world joined in the observance of the Arboretum's centennial which focused on the basic and applied research and contributions of the staff. Simultaneously, a volunteer training program was launched, and the role of the Arboretum in the community began to grow in scope and significance. Of particular note is the collaboration with medical experts at the Boston Poison Information Center who refer calls relating to potentially poisonous plants to Arboretum staff on a twenty-four-hour basis. This vital service has been implemented by an educational film on the subject, as well as a widely distributed handbook; both part of an expanding multi-media public information effort.

Scientific achievements during the past quarter-century have included the initiation of a generic flora of the Southeastern United States, a revision of a manual of cultivated trees and shrubs, and Howard's own study of the vegetation of the Caribbean area, which is being published in parts as a flora of the Lesser Antilles.

Now that his administrative responsibilities have been lifted, Richard Howard will have scant leisure to contemplate past accomplish-



Photograph · P. Chvany

ments. For the next year he will enjoy his first sabbatical leave of absence, aided by a Guggenheim Fellowship to complete manuscript for the remaining volumes of his flora. Ahead is the completion of another project of long development: the studies of the nodal-petiole vascular patterns of families of the Dicotyledoneae. He also plans further studies leading to the typification of the West Indian plants described by Jacquin and by Plumier, studies basic to the characterization of plants of the Caribbean area.

In his post as director during an era of increasing world complexity, Howard has had to wear many hats and serve many constituencies, trying to balance progress with fiscal responsibility and respond to pressures from within the Arboretum and without. Indefatigable and articulate, he has represented it at home and abroad, a facet of his responsibilities he has found particularly rewarding "because of the high regard in which the Arnold Arboretum is held."

Reflecting on the institution to which he has devoted nearly all of his professional career, Richard Alden Howard sees reasons for additional satisfaction — past and future:

"I have been fortunate to be able to build on the strong foundations created by my predecessors and to do this with the support of an excellent staff. To them I owe a great debt gratefully acknowledged. I hope that in my new role I can continue to contribute to the work and reputation of the Arnold Arboretum in equally dedicated support of the leadership of the new director."

Richard Howard's colleagues and friends around the world wish him well in his new directions.

ARNOLDIA REVIEWS

What Can I Grow in the Shade? Suzanne Warner Pierot. New York, N.Y.: Liverright. 221 pages, illustrated. \$9.95..

The garden with more than half to full shade qualifies as a shade garden in this book. The major portion of the text is devoted to a description of, and growing information for, approximately one hundred and seventy plants and shrubs (trees are omitted). The remainder of the book includes a short section on general shade gardening techniques together with an index and five informative appendices. Especially useful in the last are the lists of shade-loving plants by region, the sources for shade plants, and the names and addresses of specialized plant societies.

While no claims are made by the author for the completeness of her list, it should be noted that some fine plants are missing. Surely *Cornus mas*, *C. kousa*, *Deutzia*, *Enkianthus*, *Prunus laurocerasus*, and possibly *Franklinia* could be grown in a shade garden where azaleas are flowering successfully. Some *Lilium* and *Sedum*, *Cornus canadensis*, and *Phlox divaricata*, among others, will bloom happily where hyacinths and hemerocallis thrive.

The gardener who is building his library and his gardening expertise may find this book a useful investment, however, for the initiated shade gardener, *What Can I Grow in the Shade?* will not offer anything new.

B. JUNE HUTCHINSON

Wildly Successful Plants. Lawrence J. Crockett. New York: Macmillan Publishing Co., Inc. 268 pages, illustrated. \$12.95.

Books on weeds have become popular of late, perhaps due to an upsurge of interest in urban ecology and in eating "nature foods." This is a good book, but hardly of the calibre of some of the older, standard works on the subject. The identification guide is basically a summary of the diagnostic features of the plants included, organized more or less in the form of a key. It seems to me a bit cumbersome and overly technical, although the glossary certainly helps to overcome this latter objection.

Each plant is illustrated by a somewhat stylized line drawing that is obviously meant to be more interesting than diagnostic, although most of them are good enough to allow for identification of the plant depicted. The whimsical figure of a human included with each of the habit sketches is a clever means of indicating scale. The text is both interesting and useful. Included are items of folklore and often the derivation of the Latin and common names. Potentially useful are the tips for eradicating each of the plants, although I suspect that most of the people who would buy this book would not be interested in this aspect of weeds.

RICHARD E. WEAVER, JR.

Edible and Useful Plants of California. Charlotte Bringle Clarke. Berkeley, Calif.: University of California Press. 280 pages, illustrated. \$5.95 paperback.

This volume aims to acquaint the average person with the many uses of plants found in California. The author describes both present and past uses, and also gives recipes that utilize many of the plants listed; each, "not just edible, but palatable."

The plants discussed are arranged by ecological communities, making this an excellent pocket guide for campers, backpackers, and scavengers. Although a glossary is provided, the novice will find the plant descriptions a little too technical. There are some very good color plates, but the line drawings are not readily adapted to plant identification.

On the whole, the book is very informative, and a good collection of plant lore and plant utilization. Highly recommended.

ALLAN NASH



Rosa rugosa. Photograph: G. Wadleigh.

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