

JAPAN

GENERAL DESCRIPTION

The four main islands of Japan, Hokkaido (Yezo) in the north, Honshu (Hondo), much the largest, in the centre, with Shikoku and Kyushu to the south-west, are almost entirely mountainous or hilly, the only plains being along the lower reaches of the large rivers. The mountain backbone of the islands is of ancient hard gneisses and schists, broken by vast masses of granite: such as the mountains of the upper Kiso river, much of the Nikko mountains, and most of the highlands of south-west Honshu (the Chugoku district) and north Kyushu. More recent still are four arcs of volcanoes, some active, that of the Kuriles to the north ending in north-east Hokkaido, a great chain down the north-west of Honshu, another crossing that island at its broadest part and including Fujiyama, the highest peak in all Japan, and the southernmost, stretching from Kyushu into the Ryuku islands. The lavas and ashes of these volcanoes bury much of the older rock in northern Honshu except along the east coast. The volcanic rocks are largely Quartz-Trachytes (Rhyolites and Liparites) and Trachytes, with some Andesites and small areas of Basalt in the north-west.

There is very little limestone in all Japan, and other more recent sedimentary rocks (mostly shales and sandstones) are not widespread. These ancient hard rocks have been worn down till the mountains are rounded and seldom craggy, with peaks separated by fairly low passes. Most of the loftier mountains are between 5,000 and 7,000 feet high, with some rising to 10,000 feet in central Honshu (the highest, the volcano Fujiyama, to 12,388 feet).

The climate

The climate of the islands, which stretch some 850 miles from north-east to south-west, is much influenced by the surrounding seas and is more equable and wetter than the mainland of Asia. A warm current, the Black Stream (Kuroshio), flows from the tropics as far as central Honshu where it meets a cold current from the Bering Sea, causing the lowlands of southern Japan to have an almost subtropical climate with hardly any frosts, while the north is much colder with deep snow. In the two larger southern islands, Kyushu and Shikoku, and in the south-western part of Honshu, the climate of the lowlands has oppressively hot summers (especially July and August) and short and mild winters (only January and February). In northern Honshu and in Hokkaido the winters last at least four months, and are very cold with deep snow, but mainly clear skies. There are frequent fogs along the south and east coasts of Hokkaido in the summer, which is cool. The mountains also cause differences in the climate, especially in central Honshu, where on the Japan Sea side (west) the prevailing winds out of Asia in winter deposit heavy snow which lies for months,

while on the Pacific side in the same latitudes it is seldom more than a few inches deep and soon melts.

The rainfall (including snowfall) everywhere is heavy, falling in all seasons. Over much of northern Japan it ranges between 40 to 60 inches, while between 60 and 80 inches falls along the coasts of the south and even more in certain districts. The weathering of the predominant rocks under such high rainfall yields soils mostly of a sandy texture on the hills and mountains from which the finer erosion materials are washed down. The soils are also generally acid, and may contain much humus, but peat is only formed in the colder climate of the high mountains and in the north.

Summary of the plant communities

The natural vegetation of nearly all of Japan is forest, both very varied and rich in species, as the glaciers and ice-sheets of the last Ice-ages did not cover much of the land. In the south-west the forests are of an evergreen, almost subtropical character, passing northward through temperate leaf-losing woods into cold Coniferous ones in the north-east of Hokkaido. The same changes occur on climbing the higher mountains.

The remainder of the country where forests cannot grow is (or was before cultivation) occupied by various maritime communities of the immensely long and indented coasts and on its many small islands; marshes and water-meadows along rivers (though many rivers rage down when the snows melt and in periods of heavy rain, but are reduced to small streams in the middle of boulder beds at other times); areas of more or less temporary tough grass, Bracken and scrub on hill and mountain slopes cleared of forest by natural causes as well as by man. There are no wide, permanent natural grasslands. In the high mountains above the forests are elfinwoods and scrub, heaths and moors with some Sphagnum bogs (which also occur much lower in the north of Hokkaido), but stretches of Alpine tundra are limited and exist on the highest peaks only.

The types of forest and their limits

The forests of the warm wet lowlands, on good soils, of south-west Honshu, Shikoku and Kyushu are dominated by large evergreen Oaks and other broad-leafed evergreen trees, many of which, such as the Camphor trees (*Cinnamomum*), belong to the Sweet Bay or Laurel family (Lauraceae). Smaller evergreen trees, and a few leaf-losing ones, crowd beneath this fairly open high canopy, and below them an underwood of shrubs, also mainly evergreen, and tall Bamboos. Woody lianes rope themselves high into the crowns. Epiphytic Ferns and Orchids perch on the trunks and boughs, and many other Ferns and plants grow on the damp leafmould of the forest floor. Tree-ferns of the genus *Cyathea* can be found in the far south.

After a transition stage of mainly evergreen Oaks mixed with deciduous lower trees these evergreen forests begin to give way northward, and ultimately disappear on the lowlands of both coasts of central Honshu at about 38° N latitude, their place being taken by Summer-green forests, of which the main trees are deciduous Oaks, Chestnut (*Castanea*), Magnolia, and further north, Beech. These forests are also luxuriant, with many species of subsidiary trees, including Cypresses and other Conifers, both in the irregular upper canopy and in the second storey. Big lianes climb and hang in the trees, and the bush underwood is very rich wherever there is an opening. Many trees and bushes bear a wealth of blossom and the foliage of many colours brilliantly in autumn.

Willows and Alders line the rivers throughout Japan, joined by tall Poplars and Ashes in the north, and often in the south colonies of high Bamboos. On windswept, rocky or sandy shores, and on nearby sandy foothills in the warm and temperate parts of the islands, Pines become the predominant trees, supplanting both the evergreen and leaf-losing forests.

The Summer-green forests occupy only the south and west lowlands of Hokkaido, and in their turn are supplanted by Mixed or Conifer forests of Silver-Fir and Spruce on the mountain-sides and in the north and east. These forests are much poorer in species, there are few lianes and not much underwood, except for wide stretches of yard-high Bamboo, or Bracken in open places. The plants in the needle-litter of the forest floor are largely those widespread in the Northern Coniferous forests of Asia.

The mountains

Similar changes occur on ascending the mountains. In Kyushu and south Shikoku the Basal and Montane slopes bear Warm-temperate Evergreen Forest up to 3,300 feet (and even 5,000 feet on south slopes), though the evergreen Oaks become predominant at higher elevations and the more warmth-loving trees drop out. Scattered tall Silver-Firs and Hemlocks appear and overtop the woods, but they are not the same species as grow in the high mountains. Above this height the Summer-green trees, which have been increasing in the upper part of the evergreen forest, supplant the evergreens to form the higher woods. There is no cold Coniferous forest in Kyushu and only a small area on the Tsurugi mountains (peak 6,414 feet) in Shikoku. But on the great mountain massifs of central Honshu, the Summer-green forests give way to subalpine woods of Conifers at around 5,000 feet. In north Honshu the altitude of this change drops to 3,300 feet, and reaches sea-level in northern and eastern Hokkaido. The Conifer woods themselves reach up to a timber-line at 6,600 feet in central and 5,000 feet in northern Honshu, and even lower in Hokkaido.

All along the Japan Sea side of the high mountains of central and northern Honshu, where the snow lies deeply for long periods, the timber-line is considerably lower, and there is not much Coniferous forest. In the woods most of the under-shrubs are low and spreading due to their weight of snow covering. But several broad-leafed evergreen bushes are found here, protected by the snow, which are absent from regions on the Pacific side at the same latitude. Some plants are endemic to these western coasts and mountain-sides of central Japan, and it is the home, especially in the valleys, of a number of giant herbaceous plants and giant races of more widely distributed ones.

THE COASTS AND COASTAL PINE WOODS

Japan has a very long coast-line and a great many small rocky islands. There are numerous wind-swept rock headlands and cliffs, and also long stretches where the sand brought down from the granite, volcanic, and hard metamorphic rocks of the mountains is blown into dunes along the shore. Behind these in many parts of Japan are sandy foothills exposed to the sea winds on which the soil dries quickly. There are also salt-marshes along the estuaries of the rivers, which in the extreme south become overgrown by low Mangrove trees.

The Evergreen forests, and further north the Summer-green ones, descend to the sea in sheltered inlets, but where the sea-winds are strong, and on poor sandy soil, they give way to woods predominantly of Pines.

On the innumerable small islands, and steep rocky sea-coasts, groves of the rugged Japanese Black Pine *Pinus Thunbergii* are characteristic, especially in mid-Japan, as it does not extend so far north as the Red Pine (which reaches Hokkaido), and is also replaced in the far south. It has dark grey fissured bark, and horizontal branches, and its wind-bent trunks and crooked boughs, with their clusters of dark needles, overhanging the seas, are much loved and used by Japanese artists. As its wood is valuable, it has been much felled, and it was probably commoner inland on sandy soils, often in combination with the open-growing Daimyo Oak *Quercus dentata*, than it is now.

This Oak frequently also accompanies the Japanese Red Pine *Pinus densiflora*, which becomes predominant, and sometimes the only tree, on sandy sea-coasts, and further inland on sandy foothills. It has reddish, flaking bark like the Common Pine (*Pinus sylvestris*), but its needles are green. It is also one of the first trees to colonize cleared ground in the hills, but does not ascend above them into the mountains.

The Pine woods do not generally cast dense shade, and thickets of many bushes grow among the trees, some being the more light-demanding and drought-enduring ones of the predominant Evergreen or Summer-green forests of the district, and others which are more characteristic and seldom found far from the sea. Several maritime plants also grow on the ground among them. Further from the shore on the sandy hills, tall, tough grasses form the main ground cover between the shrubs and trees. In the far south where the Pines are absent, some subtropical trees and shrubs appear, such as a Cycad, and groves of Palms, including the Chusan Palm (*Trachycarpus fortunei*) which can be grown outside in Britain in warm districts.

There is usually a belt of even more wind- and salt-resistant shrubs between the sea-dunes and the Pine woods, some of the bushes confined to these sandy sea-side thickets.

In the north of Hokkaido both Pines are absent, northern bushes take the place of most of the southern ones, and in crevices on the coast rocks and cliffs several plants can grow, due to the cool, foggy summers, which otherwise are found only in the Alpine zone.

The dunes

Over most of Japan the seaward dunes are first colonized by a Lyme-grass (*Elymus*), among the runners of which a few other dune plants wide-spread in temperate Eurasia are scattered. Further back, where the dunes become more stable, a number of other grasses and plants help to bind the sand, but many of those of the south are different species to those of the north. In the far south the Bindweed *Ipomaea pes-caprae*, common all over the tropics, spreads its nets over the loose sand.

The salt-marshes

Apart from the Mangrove swamps in the extreme south, most of the plants of the Salt-marshes are those spread world-wide in temperate regions on salt mud within reach of the tides.

The trees

Pinus densiflora Japanese Red Pine. Resembles the Common Pine (*Pinus sylvestris*) with reddish bark, but green, not grey needles.

Pinus thunbergii Japanese Black Pine. Dark grey fissured bark, horizontal boughs and stiff, short needles.

Bushes growing best in open woods and thickets near the sea

Camellia japonica Prefers woods near the sea. Not in Hokkaido.

Eleagnus macrophylla Evergreen shrub, silvery and rusty-scaly on leaves, twigs, and little white flowers. In sandy thickets of the south-west half of Japan.

Euonymus japonicus Glossy evergreen of all Japan. Much planted in Britain. In the thickets fronting the sea.

Eurya emarginata Low, dense, flat-spreading evergreen of the south. Yellow-green flowers, purple-black berries.

Fatsia japonica In woods along the Pacific, but not the far north. Big, glossy evergreen palmate leaves, balls of ivy-like white flowers, black berries.

Hibiscus hamabo T Of sea-side sandy thickets in the south. Shrub with hairy deciduous leaves and yellow flowers with dark red eyes.

Hydrangea macrophylla normalis (*hortensis asizai* or *maritima*) The wild main parent of the round-headed, sterile-flowered garden plants. Evergreen big bush with flat heads of fertile florets and a few large pink sterile ones round the edge. In open sunny places on the Pacific coast of central Honshu only.

Ilex integra Large evergreen Holly without prickles. Red berries. In woods near the sea in all Japan but Hokkaido.

Juniperus chinensis Dense small tree with both dark green, scale-like adult needles and awl-shaped juvenile ones. Not in Hokkaido.

Juniperus chinensis procumbens On sands of Kyushu only. Horizontally spreading, grey awl-needles. Grown in gardens as *Juniperus procumbens*.

Juniperus conferta Also mat-forming, with bright green needles. On the sea-sands of nearly all Japan.

Lactuca sororia 2½ to 3¼ feet, pinnately cut leaves, tall sprays of rayed, purple daisies. 3 southern islands.

Ligustrum ovalifolium The evergreen hedging Privet, with its variegated forms, especially the Golden Privet, much used in Britain.

Litsea japonica T Evergreen glossy bush of the Laurel family. Yellowish velvety twigs and leaf-backs, small white flowers, blue-purple berries. Of the far south-west only.

Paliurus ramosissimus Buckthorn family. Leaf-losing small tree, its zigzag shoots and buds of tiny flowers covered in brown down. Curious lidded vase-shaped fruits. Only in the south.

Pittosporum tobira T Of sunny thickets near the sea. In the south only. Large shrub with whorls of glossy evergreen leaves and handsome cream flowers. Good on warm walls.

Quercus phillyraeoides Dense small evergreen Oak of open woods in the south, with small shining leaves.

Raphiolepis (Raphiolepis) umbellata RT Dense stout evergreen bush with leathery leaves and spikes of white, Cherry-like flowers. Pear-shaped blue-black fruits. Of sea-side thickets in most of Japan (not Hokkaido).

Rosa rugosa Big stout bush with rose-red flowers and large flattened red hips. On sandy shores of north Japan only, Sakhalin and Kamchatka. Widely grown in Britain and also used as a root-stock.

Rosa wichuriana One of the main parents of many Climbing Roses of gardens. Its long semi-evergreen shoots scramble over thickets (except in Hokkaido) from the shore to the foothills, showing trusses of small white flowers and little red hips.

Rubus trifidus Semi-evergreen thornless Bramble shrub. Lobed Maple-like glossy leaves, rosy-white flowers, edible red fruits. Only on the Pacific coast of central Honshu.

Rubus other species Apparently not cultivated.

Senecio scandens RT Evergreen climber over sea-side thickets on the Pacific side of Kii Peninsula and Shikoku. Clusters of yellow daisy-flowers.

Stachyurus praecox matsuzakii and *Callicarpa japonica luxurians* are larger and stronger-growing varieties of their species, of the warm and wet climate of the southern coastal thickets. Allied to

Callicarpa and growing with it near the southern shores are the big, leaf-losing bushes of *Premna japonica*, dense and twiggy, and producing dark purple berries.

Ternstroemia gymnanthera (japonica) T Evergreen stout bush of the Tea family. In sea-side woods of the south. Leathery foliage, small cream-white flowers, Cherry-like fruit.

Viburnum awabuki (odoratissimum) RT Large, glossy-leaved evergreen bush. Big pyramids of white flowers, fruits turning from red to black. Of the south.

Vitex rotundifolia (trifolia ovata) NH In sandy thickets except in the far north. Sprawling grey-leaved shrub on the *Verbena* family. Dense pyramids of lilac or purple flowers.

Weigela (Diervilla) coreensis (grandiflora) Stout deciduous shrub. Bell-shaped flowers white, ageing to deep red. Thick shining leaves. Thickets near the sea over all Japan.

Sand-dune plants

Arabis stelleri 6 inches high. Heads of many quite large white flowers. Widespread.

Artemisia stelleriana North only, to Kamchatka. Half-woody up to 3 feet. Lobed downy-white leaves, slim spikes of yellow buttons. Also common in N.E. America.

Arundo donax Giant Reed of the southern dune-slacks only.

Calystegia soldanella The pink Sea Bindweed of Eurasia. Difficult.

Crinum asiaticum japonicum NH Long strap-shaped leaves. Heads of spidery white flowers on 2 foot stems. Of the south.

Dianella ensifolia NH Clumps of very long hard leaves on trunks. Little blue stars, purple-blue berries. Southern seashores.

Elymus mollis (arenarius mollis) Tall running grey Lyme-grass.

Hemerocallis littorea (aurantiaca littorea) Orange-yellow Day Lily of southern seashores. (*H. aurantiaca* is Chinese.)

Heteropappus hispidus arenarius Sprawling, leafy stems, narrow leaves, large lilac daisies. Japan Sea side of Honshu, Kyushu.

Ixeris repens Thick, rounded, angled leaves, creeping stems, large yellow daisies on short stems in small clusters. All Japan on sandy beaches, common. Taiwan, Ryukyus, China, Korea, Manchuria, Kamchatka.

Lathyrus maritimus The purple-flowered Sea Pea of Eurasia.

Linaria japonica A foot high. Grey-leaved, spikes of pale yellow and orange spurred "snapdragons". Widespread.

Mertensia asiatica (maritima asiatica) In the north only. Sea-green juicy foliage, purple-blue fiddle-necks.

Saccharum spontaneum arenicola NH A wild Sugar-cane of southern dunes. Silky-grey leaves, silky-white plumes. 4 feet tall.

Thermopsis lupinoides A foot high. Silky trifoliate leaves, Lupin-like yellow spikes.

Composites (*Ixeris*; *Wedelia*, south; *Matricaria*, north).

Grasses (*Imperata*, tall; *Zoysia*, low, both wide-running; *Ischaemum*)

Sedges Long-creeping, including the curious *Carex kobomugi* of the south, and *Carex macrocephala* of the north, both with dense, oval heads, the spiky female ones of the former sulphur, of the latter chestnut-brown.

Umbellifers; Borages (*Messerschmidia*); a Skullcap (*Scutellaria strigillosa*); Oraches (*Atriplex*); etc.

Only in the southern sands are the twining and sprawling plants of *Canavalia lineata* showing its spikes of large purplish pea-flowers among its three-leafed foliage; and the wide-spreading stems, rooting as they run, of the Composite *Wedelia (Verbesina) prostrata*, which sends up tufts of bristly leaves topped by solitary, yellow, rather Dandelion-like blooms. In the extreme south only, the long-creeping Bindweed *Ipomaea pes-caprae*, characteristic of tropical sandy shores all over the world, stabilizes the dunes with its nets.

Plants of sea-cliffs and rocks

Artemisia schmidtiana Northern sea-cliffs and alpine rocks. Wide mounds of finely-cut silvery-white foliage. Yellow button flowers.

Aster spathulifolius On sea-rocks of far south-west. Thick rosettes of leaves, withering before flowering. Solitary blue-purple blooms.

Chrysanthemum yezoense (arcticum) Of northern sea-rocks. Spreading clumps of purple, 4 to 18 inch stems, fleshy, lobed leaves, white daisies.

Chrysanthemum weyrichii Similar. Flowers sometimes pink. Of Hokkaido and Sakhalin.

Lilium maculatum Seashore rocks of Honshu and Shikoku. Stout 1 to 4 foot stems. Heads of upright, vase-shaped orange-red flowers. Synonyms, *Lilium thunbergianum* or *Lilium elegans*. Crossed with *Lilium concolor* of east Asia, and *Lilium bulbiferum* and *Lilium bulbiferum croceum* of Europe, it has produced Lilies know as *Lilium x hollandicum*, or *Lilium umbellatum* of gardens.

Lilium maculatum davuricum (or Lilium dauricum) Of Hokkaido to Kamchatka on sea-sands and rocks. Woolly stems. Scarlet-red flowers.

Lysimachia mauritiana A common and widespread biennial. Dense sprays of little white flowers stained pink.

Polygonum weyrichii On gravelly mountain slopes and shores of the north to Sakhalin. Stout stems with smooth Dock-leaves. Big plumes of creamy blossom. 4 feet.

Potentilla megalantha (fragmiformis) Sea-rocks from Hokkaido to Kamchatka. Silky, broad trifoliate leaves, open clusters of large yellow flowers.

Sedum kamschaticum Mountain rocks all over Japan and sea-cliffs in the north. Flat juicy green leaves, flat heads of yellow and orange stars, sometimes 9 inches high.

Sedum roseum (Rhodiola rosea) Northern mountain rocks and sea-cliffs in Hokkaido. The Rose-root of northern and Arctic regions.

Thalictrum foetidum Of mountain and sea cliffs of the north. Much divided leaves, yellowish tassels. Like a small *Thalictrum minus*.

Trifolium lupinaster Grassy and rocky mountain and sea slopes and cliffs in the north. A Clover with strong tufts of leaves of 4 to 7 leaflets, heads of large deep red flowers.

Plants of salt marshes

Aster tripolium Sea Aster —

Glaux maritima Sea Milkwort or Black Saltwort —

—Cosmopolitan

Kandelia (Rhizophora) candel A low Mangrove tree of tidal mud in the far south.

Salicornia europaea Cosmopolitan Marsh Samphire. Earliest colonist of tidal mud.

Suaeda species Seablites.

Triglochin maritimum Sea Arrowgrass. Cosmopolitan.

Sedges (*Carex*; *Fimbristylis*)

No Sea Lavenders (*Limonium*) or Thrifts (*Armeria*)

Plants of grassy places near seashores

Chrysanthemum nipponicum Like Ox-eye Daisy but branched and shrubby, to 2 feet. Sea-shores of the north.

Chrysanthemum pacificum Creeping, sprawling, leafy stems 1 foot long, oval, lobed, white-margined, silvery-hairy leaves, dense heads of yellow or white button-flowers. Seashore slopes, central Pacific Honshu.

Cirsium nipponicum comosum Long, thick, pinnately cut, spiny leaves, large clusters of many, nodding, small, rose-lilac thistly flowers in dense, short-stalked heads. South Kanto, Honshu.

Cirsium maritimum Sprawling stems 6 to 24 inches long, large, spiny, pinnately cut leaves, loose clusters of few rose-lilac to white thistle-heads. West Honshu, Shikoku, Kyushu.

Crepidiastrum lanceolatum Clumps of lance-shaped leaves, dense heads of many little rayless yellow daisies. On coastal rocks, west Honshu, Shikoku, Kyushu, Korea, Taiwan, Ryukyus.

Crepidiastrum platyphyllum Rosettes of oval, thick leaves, very dense, short-stalked heads of many small, yellow, rayless daisies. East-central Honshu, south Korea. Rocky shores.

Farfugium japonicum (*Ligularia kaempferi*) RT Big kidney-shaped leaves. Loose heads of light yellow daisies on 2 foot woolly stems. Near the sea from central Honshu south-west.

Geranium erianthum Of the north. Many blue-purple flowers. 12 to 16 inches high. Deeply lobed leaves.

Geranium yezoense (*dahuricum*) *pseudopalustre* Also of the north. 18 inches. Rosy-purple flowers with white-downy centres, veins and edges.

Hemerocallis yezoensis (*citrina*) Seashores in Hokkaido. Lemon-yellow flowers, arching leaves. Not "*Hemerocallis citrina baroni*".

Primula modesta faurei Allied to Birdseye Primrose (*Primula farinosa*). Trusses of purplish-pink flowers on mealy stems, 4 inches high, from rosettes of leaves on long, winged stalks. On mountain and seacoast rocks, N. Japan, S. Kuriles.

Saxifraga bracteata Related to *Saxifraga cernua*. Creeping, fleshy rosettes of kidney-shaped leaves, small spires of few white flowers. Hokkaido, Kuriles, Sakhalin, Kamchatka, Okhotsk, Alaska.

Sand plants of the northern coasts

With the sand and dune plants common throughout Japan, new northern ones appear on the shores of central and north Honshu and Hokkaido. The beautiful *Mertensia asiatica* (*Maritima asiatica*) sprawls its long fleshy stems and juicy, sea-green leaves, and raises fiddle-neck heads from which unroll the clear purple-blue blooms; the creeping, sappy-leaved mats of the Sea Purslane *Honckenya peploides*, studded with little white stars; and the handsome, wide-spreading colonies of *Artemisia stelleriana*, their foot-high stems and pinnately cut leaves as well as their nodding trusses of tiny blossom nearly white with down, are all abundant in the sand dunes of the northern coasts, as are the finely cut foliage and white daisies of the annual Mayweeds *Matricaria matricarioides* and *Matricaria tetragonosperma*.

Subtropical plants of the extreme south

In the far south of Kyushu, on coasts washed by the warm Black Stream and exposed to the wet south-east Monsoon in summer, a number of typically subtropical plants appear. The low palm-like *Cycas revoluta* spread their long, hard, pinnate leaves in big rosettes on short trunks in the brush-wood on precipitous stony hillsides which drop into the sea. In spite of their appearance, they are more closely related to the Conifers than to the Palms, are of an ancient race, and bear cone-like inflorescences in the centre of their rosettes. The tall-trunked true Palm *Livistona chinensis sub-globosa*, which is also found on the south coast of Shikoku, but is rare, and the Chusan Palm *Trachycarpus fortunei*, form groves on steep, rocky slopes over the sea. Both are fan-leaved and make straight trunks fifteen feet high or more, those of *Livistona* being smooth, those of *Trachycarpus* encased in its fibrous old leaf-bases, and growing rather taller. The Chusan Palm, though coming (in Japan) only from the subtropical southern coasts of Kyushu, is nevertheless the only Palm which is hardy in many parts of Britain.

THE EVERGREEN FORESTS

I. THE EVERGREEN OAK-LAUREL FORESTS

The forests on the better soils of the warm lowlands of Kyushu, Shikoku and south-western Honshu are predominantly of evergreen trees with broad, leathery, often glossy, Laurel-like leaves. The biggest trees rise well above the general canopy, which itself is not continuous, but consists of trees and large bushes of varying heights forming two or more storeys. There are a few warmth-loving, usually smaller, deciduous trees in the woods also, and some Yew-like subtropical Conifers (*Podocarpus*).

Many epiphytes grow on the boughs and trunks of the trees in the always humid and warm atmosphere, which becomes oppressively hot in summer. They are mostly Ferns, including many species of Filmy-Ferns, and in the south the big Birdsnest Fern *Asplenium antiquum* like a huge shuttlecock, and there are also Orchids, but few of these are in cultivation. As well as the epiphytes, many lianes climb and festoon the trees and bushes, a lot of them evergreen, such as the aerial-root-climbing Figs (*Ficus*), but there are also leaf-losing ones, and some can be grown outside in Britain.

Large bushes, most of them evergreen, form a third storey wherever there are gaps in the canopy. Several of these, though rather tender, are valuable in British gardens, especially the Camellias. Also some of the large Bamboos, which are most common on sandy, shady river banks when

growing wild, are useful and handsome. Alders and Willows are their neighbours, but occupy mud-dier sites.

Under this varied growth of predominantly evergreen trees and bushes the forest floor is deeply shady and rich in ever damp and warm leaf-litter. The most abundant and characteristic plants growing on it are numerous species of Ferns. Again many are evergreen, some very large (even including species of Tree-fern in the south), some small such as the delicate Filmy-Ferns, and species of *Selaginella*, some with finely divided fronds and some with simpler leathery ones. A number are cultivated in British glasshouses. Running among the Ferns are colonies of the rounded leaves of a number of species of *Asarum*, and rising above them, of *Arisaema* with their curious hooded flowers, in both of which Japan is rich, and which perhaps are developing new races, as many are of very limited range.

Most of the forests are now destroyed on the lowlands and hills, having been cleared for cultivation wherever possible, but remnants remain in the grounds of temples and on some of the many small islands.

Trees and bushes of wet stream-sides

Alders and Willows, many of them rather small trees or large shrubs, often form thickets in wet soil edging the rivers and streams. The big bushes of the Alder *Alnus sieboldiana* (*firma*) with their stout yellowish-brown branches, produce their thick catkins held stiffly, and small clusters of cone-like fruits. It is common in the lowlands and foothills especially near the sea, in south-central Honshu. Growing with it along the rivers, but extending further west, are the small trees of *Alnus serrulataoides* (*maritima obtusata*) and *Alnus trabeculosa* which is not very common.

Some of the Willows grow into medium-sized trees along the water-courses. *Salix chaenomeloides* bears narrowly oblong foliage which is smooth and red-brown when young and grey-white beneath. *Salix eriocarpa* is a narrow-leafed tree of wet lowlands, also of the southern islands, not reaching Hokkaido. *Salix serissaefolia* is more upright-growing, with short twigs and narrow, glossy, long-pointed foliage and with slender catkins.

Other Willows are not so tree-like. Spreading along the river banks of Honshu and southward are the large bushes of *Salix integra*, the smooth and glossy branches of which are slender and rather weeping, and on which the slim catkins appear before the foliage. Related and similar is *Salix gilgiana*.

Trees forming the canopy

Cinnamomum camphora NH Yields camphor from its bark —

Cinnamomum japonicum NH —

—Big evergreen trees of the Laurel family.

Machilus japonica NH —

Machilus thunbergii NH —

—Also large evergreen trees of the Laurel family, with writhing, smooth-barked boughs. Common.

Quercus acuta The commonest. Wavy-edged, dark green glossy leaves —

Quercus gilva Leaves yellow-woolly beneath. Much branched —

Quercus glauca Leaves grey-silky beneath —

Quercus myrsinaefolia (*vibrayana*) Narrow pale green leaves, purple-red when young. Stout boughs —

—Not very tall evergreen Oaks (30 to 60 feet in Japan, but large, glossy-leaved bushes in Britain).

Castanopsis (*Quercus*) *cuspidata* (*Pasania glabra*) RT Drooping boughs, brown backed leaves. Glossy, dark green bush in Britain, 30 to 40 feet in Japan. Evergreen.

Pasania (*Lithocarpus*) *edulis* RT Glossy, yellow-green leaves. Stout-branched tree in Japan, bushy in Britain. Evergreen.

Smaller evergreen trees and bushes of lower storeys

Actinodaphne longifolia Small stout tree. Thin narrow leaves, black fruits. Laurel family.

Camellia (*Thea*) *japonica* Red-flowered in the wild. Most common near the sea. The parent of many garden varieties.

Citrus tachibana (*aurantium tachibana*) A wild Bitter Orange of the far southern woods with yellow fruits. Spiny, round-headed.

Cleyera japonica (*Eurya ochracea*) T Of the Tea family. Large spreading bush with small white flowers, filled with white stamens.

Daphniphyllum macropodum Large handsome shrub with red twigs and red-veined, Rhododendron-like leaves. Flowers inconspicuous, green.

Distylium racemosum RT Low glossy-leaved tree related to *Hamamelis*, but its petal-less flowers show only conspicuous red stamens. A bush in Britain.

Eleagnus pungens Of sandy thin woods, especially near the sea. Glossy and spiny. Yellow-variegated varieties usually grown in Britain.

Eriobotrya japonica T Japanese Loquat. Large crinkled leaves, Hawthorn-like flowers, yellow fruits, but only on the warmest walls in Britain.

Eurya japonica A tree in Japan, a low bush in Britain. Inconspicuous flowers, purple-black berries on females. Tea family.

Gardenia jasminoides grandiflora NH Of the far south. Once much cultivated for its fragrant white blooms in British glasshouses. Flowers large, salver-shaped; dark, glossy, lance leaves.

Ligustrum japonicum Large bush of open woods. Camellia-like foliage, large pyramids of white.

Michelia compressa T Rather small yellow-white Magnolia-flowers with purple centres. Tree with glossy foliage.

Myrica rubra T Low tree with edible red fruits, related to the Bog Myrtle of Europe.

Neolitsea sericea (*Litsea glauca*) T Of the Laurel family. Tree or big bush. New leaves soft silky brown, turning dark shining green. Flowers inconspicuous.

Photinia glabra T Large bush with bronze young foliage. Hawthorn-like blossom and red fruits.

Sapium japonicum RT Of thin woods. Small tree of the Spurge family. Leaves turn deep red in autumn. Catkin-like flower and Pea-like fruits. Large, leathery, dark-green leaves.

Summer-green small trees and bushes

Albizia julibrissin T Common on shady river-banks. Big doubly pinnate leaves. Clusters of fluffy pink stamens.

Alnus firma hirtella Common in wet places in Honshu. Small dense tree with leaves like a Hornbeam and short stiff catkins. Variety *yasha* in Kyushu only.

Alnus other species Of river-sides. Not cultivated.

Aphananthe aspera RT Tall tree of Elm family with tapered rough foliage and purple-black fruits.

Broussonetia papyrifera The Paper Mulberry. Much cultivated for paper, but also wild. Small tree with large woolly leaves and heads of orange-red fruits.

Caesalpinia japonica RT Fairly common on wood edges and in glades. A thorny shrub with soft green pinnate leaves. Yellow open flowers with long scarlet stamens. Pea family.

Celtis sinensis (japonica) A common Nettle-tree with handsome polished foliage and purple-black berries.

Diospyros kaki sylvestris The wild form of the Chinese Persimmon. A tree with shining leaves turning orange and purple. Edible orange-yellow fruit (on warm walls in Britain).

Ehretia dicksonii japonica RT Tree with large shining but hairy leaves. Pyramids of small white flowers. Borage family or family of its own. Yellowish, dry, beaked fruits.

Evodia glauca Tree related to Amur Cork Tree with grey-backed, pinnate leaves and flat heads of greenish flowers.

Ficus erecta NH A leaf-losing Fig of the southern hill woods.

Ficus wightiana NH Low Fig tree with unlobed leaves, rounded fruits, yellow stained red. Characteristic of the southern forests, especially near the sea.

Helicia cochinchinensis Small evergreen tree, the only member of the *Protea* family in Japan. Leathery leaves, flowers are slim white tubes with lobes turned back at the mouth, collected in short, dense spikes, purple-black berries.

Itea japonica T Large shrub with long catkin-like strings of tiny white blossom. Of southern woods.

Mallotus japonicus T Stout shrub of Spurge family, common at wood-edges. Large yellow-green leaves. Pyramids of greenish small flowers.

Melia azedarach T Small tree of open places and thickets. Big, doubly pinnate foliage, loose heads of violet-centred, lilac flowers, yellow oval fruits.

Meliosma myriantha RT Small tree with big *Spiraea*-like panicles of white flowers and undivided leaves. Dark red berries.

Meliosma oldhamii RT Much taller, with pinnate foliage. Confined to Kyushu and south-west Honshu. Rare.

Morus tiliaefolia A low Mulberry tree of the south.

Rhus javanica (*semi-alata osbeckii* or *chinensis*) —

Rhus succedanea RT Wax Tree. Yields wax from its white fruits —

Rhus sylvestris —

—Rather gaunt small trees with pinnate leaves colouring red. Pyramids of little yellowish flowers.

Salix integra Small tree with rather drooping branches, slender catkins before narrow leaves —

Salix other species Both low trees and large bushes —

—All of wet places. Most not in cultivation.

Growing in the southern woods, the little shrubs of *Damnacanthus indicus* can be found. They are often less than a yard high, but widespreading, with many very slender shoots armed with needle-spines among their small shining leaves, from the axils of which they produce little white, scented trumpet-flowers in pairs. They are allied to the Bedstraws. *Damnacanthus major* has shorter spines but larger leaves, and *Damnacanthus macrophyllus*, confined to Shikoku and Kyushu,

sometimes lacks spines altogether, or has very short ones. All have bright red round fruits. Related to them, and also growing in the foothill woods of the warm and humid south-west are a few species, closely resembling each other, of *Lasianthus* (*Mephitidia*). The long slender branches of *Lasianthus japonicus* bear, among their narrow, long-pointed leaves, clusters of a few small white flowers which set attractive little dark blue fruits. *Ligustrum japonicum*

Only found in Japan, and there confined to the warm and wet lands of south-central Honshu, Shikoku and Kyushu, is *Platycrater arguta* (*serrata*), a low, sometimes prostrate, leaf-losing bush, allied to *Hydrangea*, producing loose pyramids made up of rather large central fertile flowers with many yellow stamens, and marginal sterile ones both white.

The bamboos

Arundinaria chino Very common in Pacific mid-Honshu. 4 to 6 feet stems, green stained purple. Rather narrow leaves —

Arundinaria pumila Very slender canes, 1 to 3 feet, hardly branched. Leaves small. Of the south-west —

Arundinaria simonii 10 to 20 feet. Green canes. Leaves narrow, grey below on one side. Central Honshu southward —

Arundinaria virens Very common in north-central Honshu. 6 to 12 feet, slim. Narrow, long-pointed leaves —

Arundinaria or *Sasa japonica* (once *Bambusa* mistake) Of all Japan except Hokkaido. Commonest Bamboo in Britain. Green canes, 6 to 15 feet, branched above. Rather narrow, smooth, deep green leaves clustered near top —

—Clump-forming by creeping rhizomes. Usually much branched, 1 or 2 per node. Inflorescence in stalkless bundles.

Sasa nipponica All Japan but Hokkaido. Rampant. Widely spaced slender canes of 1 to 3 feet, with few branches at base, much swollen nodes —

Sasa ramosa Honshu. Purplish canes of 3 to 6 feet, branched above, thin leaves white-edged in winter —

Sasa veitchii South-west only. 1½ to 3½ feet. Loosely branched above. Rampant. Broad leaves with wide white margins in winter —

—Long-creeping and rampant. Usually low growing with big broad leaves, slim stems. Inflorescence stalked panicles. One branch per node.

Semiarundinaria (Arundinaria) fastuosa Central Honshu and south-west. Open clumps of thick, purple-tinged canes from 15 to 30 feet tall, sparsely branched. Narrow leaves. Hardy in Britain.

It is said that when they flower they die, but this is not true of all. Another belief is that all the plants of one species, no matter whether they are wild or cultivated, or in which country they are growing, all come to bloom in the same year. This may be true.

The conifers

Cephalotaxus harringtoniana (drupacea) Plum-fruited Yew. Scattered singly. Yew-like low tree, but with longer bright green needles and green or brown seed-bases.

Pinus densiflora The Japanese Red Pine. Pioneer tree of cleared forest which holds its own for a time as the Oaks and Camphors grow up to maturity again.

Podocarpus macrophyllus RT Small spreading dense tree with very long narrow needles and purple seed-bases—

Podocarpus nagi RT Tall trees scattered singly in the south only. Smooth purplish bark, hanging twigs, wide needles, bloomy purple seed-bases—

—Both Yew-like trees.

The lianes and epiphytes

Anodendron affine Related to *Trachelospermum*. Woody evergreen scrambler, broad-ended dark green leaves, pale beneath, small pale yellow flowers in flattened pyramid.

Bauhinia japonica A woody member of the Pea family climbing by tendrils. Long-stalked leathery leaves in two rounded heart-shaped lobes, spikes of small red-brown-downy flowers pale green inside. Usually in woods near the sea, but rather rare.

Clematis apiifolia Leaf-losing, woody-stemmed, to 15 feet. Many small dull-white flowers in sprays. Hardy but not showy. Central Honshu and south-west.

Clematis uncinata Dark green glossy, leathery leaves doubly divided into threes, many inch-wide flowers of four narrow white segments, feathery seed clusters. Only in Kyushu and south Kinki.

Clematis uncinata ovatifolia T South Pacific Honshu and Kyushu only. To 15 feet, evergreen much divided leaves, clusters of large white flowers and feathery seed-heads.

Ficus pumila T With clinging aerial roots. Central Honshu south-west. Glossy, small, heart-shaped evergreen leaves. Large foliage on erect fruiting wood. Fruits very small.

Hedera rhombea Less vigorous than the common Ivy, with oval leaves slightly lobed. Common everywhere (not Hokkaido).

Hoya carnosa NH *Asclepias* family. Creeping over rocks and twining up trees in Kyushu only. Almost succulent dull leathery leaves in pairs, rounded umbels of pale pink stars centred by smaller, paler pink stars so wax-like as to appear artificial. Often grown as a house plant in Britain.

Kadsura japonica T Evergreen slender twiner of central Honshu and south-west. Thick glossy leaves, solitary, small, nodding, cream Magnolia-flowers of many sepals and petals.

Lygodium japonicum Climbing Fern. Twines glossy brown stems (which are enormously extended central axes of fronds) forming netted tangles ten or more feet high of fresh green in sunny places. The secondary divisions from the climbing stems are cut and recut till each resembles a complete delicate frond in itself. Common in the south, needs glasshouse in Britain.

Marsdenia tomentosa Similar to *Stauntonia*. Large round leaves, rounded, densely downy groups of small white bells.

Millettia japonica Related to *Wisteria*. Woody climber, pinnately cut deep green, conspicuously veined leaves, dense hanging trusses of small greenish-white flowers.

Piper kadsura (futokadsura) RT Climbing by aerial roots. Leaf-losing Japanese Pepper. Narrow, long-pointed dark green leaves, dangling red berries. Central Honshu and south-west.

Psychotria serpens (scandens) Bedstraw family. Only in the far south-west. With aerial roots, thick, small leathery leaves, clusters of little white trumpets, small white fruits.

Rosa luciae Hardy. Very like *Rosa wichuriana* of seaside thickets. Scrambles and trails long runners over bushes in sunlit gaps. Small white flowers, dark red hips.

Sabia japonica T Related to *Meliosma*. Of Shikoku and Kyushu only. Leaf-losing with solitary, cup-shaped, small yellow flowers, small bright blue double fruits.

Sinomenium acutum Tall twiner of central Honshu and south-west. Allied to Moonseed. Varied-shaped glossy leaves, little yellow flowers in long slim spires. Bloomy black berries.

Stauntonia hexaphylla T Central Honshu and south-west. Twiner related to *Akebia*. Big evergreen leaves divided into stalked leaflets. Open sprays of white bells. Large purple edible fruits.

Stephanotis lutchuensis japonica T Evergreen twiner of central Honshu and south-west. Rounded clusters of large funnel-shaped white flowers.

Trachelospermum asiaticum T Self-clinging, glossy-leaved dense evergreen. Jasmine-like, creamy, yellow-eyed flowers ageing yellow. Common in all Japan except Hokkaido.

Trachelospermum jasminoides T Less hardy, with larger leaves and flowers, white ageing creamy-yellow. Central Honshu and south-west.

Wisteria brachybotrys Closely related to *Wisteria floribunda* (or a synonym). Larger, darker flowers in shorter strings. Of the southern lowlands.

Asplenium antiquum Birdsnest Fern. Shuttlecocks of yard-long, wavy-edged fronds.

Hymenophyllum species —

Mecodium species —

—Moss-like Filmy-Ferns.

Pleopeltis thunbergiana (Polypodium lineare) Foot-long sword-shaped, leathery fronds —

Polypodium niponicum Foot-long pinnate fronds, velvety beneath —

—Creeping evergreen Ferns.

Many others.

Epiphytic orchids

Aerides japonicum T Rather rare. Long dangling aerial roots from short stems. Drooping sprays of small white flowers barred, ribbed and spotted purple.

Dendrobium (Epidendron) moniliforme (monile) Few white butterfly-flowers with lip purple-spotted, on old leafless stems from clusters of pseudobulbs. Leafy younger ones.

Others are species of *Bulbophyllum*, *Luisia*, *Saccolobium*, *Sarcanthus*, *Sarcochilus*.

Ground plants of the southern evergreen lowland forests

The seasons are not well-marked within the Oak–Laurel forests of the lowlands and hills of the south. The trees of the high canopy and much of the underwood are evergreen, rain is frequent and heavy, and the plants of the forest floor grow in more or less permanently warm and humid shade. Many are evergreen also, flowering at various seasons from earliest spring to latest autumn, and there are no general spring flushes of bloom as in more northern forests.

The luxuriant foliage of Ferns is everywhere, and they are the most abundant and characteristic plants in the forest, varying in size from the Tree-Ferns to the moss-like Filmy-Ferns, and growing as clumps, or running through the leafmould to form patches and colonies.

The ground plants – the Ferns

Many grown in glasshouses.

Angiopteris lygodiifolia (evecta) NH Evergreen, short-trunked with fleshy frond-bases. Fronds 4 by 2 feet, twice pinnate. Kyushu, Shikoku, to Kii Peninsula.

Arachniodes (Polystichum) amabilis NH Evergreen, leathery, broad-based, spine-tipped, pinnate fronds.

Arachniodes (Polystichum) aristata NH Evergreen, creeping. Long-stemmed, broad, twice or thrice cut, tailed, leathery fronds.

Asplenium incisum NH Tall erect much-cut fertile fronds —

Asplenium unilaterale NH Widely creeping. Long-pointed fronds —

Asplenium varians NH Also with erect fertile fronds —

—Small evergreen narrow and hard ferns, simply pinnate fronds. Often on shaded rocks.

Asplenium other species, some with divided fronds and some 2 feet 6 inches tall.

Athyrium species Many, some evergreen, some not. Most with twice pinnately cut fronds of medium size.

Coniogramme (Gymnogramme) japonica T Simply pinnate, 2 foot long, firm, dark-green fronds, dying off in spring as new ones appear.

Cyathea (Alsophila) fauriei NH Tree-fern. Twice divided fronds 6 feet long from top of 10 feet high trunk. Shikoku and Kyushu only. In damp sheltered gullies.

Cyrtomium macrophyllum (falcatum) NH The Holly Fern. Evergreen, rigid, shining pinnate fronds 2 feet long, shaped like a *Mahonia*.

Dennstaedtia scabra NH Evergreen, running. Triangular fronds 2½ feet long, twice pinnately divided.

Diplaziopsis cavaleriana (javanica) NH Running in damp dark places. Evergreen, simply pinnate, tailed, bright green fronds, 2 feet long.

Dryopteris erythrosora Hardy. Evergreen, rather triangular, twice pinnately divided, 2 foot fronds, bronze when young on 2 foot stems. Common over much of Japan.

Dryopteris sieboldii T Evergreen, simply pinnate, tailed, 2 foot fronds on tall stems, the end division the longest.

Dryopteris varia NH Evergreen. Resembles *Dryopteris erythrosora*, but fronds more triangular and denser, the divisions often overlapping.

Dryopteris several other species, some frond-losing.

Hypolepis punctata NH Frond-losing, running. Broad-based fronds 4 feet high, pinnately divided 3 or more times.

Microlepis (Davallia) marginata NH Common running evergreen. Firm, narrow, upright fronds, simply pinnate, on 2 foot stems.

Onychium japonicum T (almost hardy) Running evergreen. Light triangular fronds cut several times into triangular divisions like a Maidenhair, on foot-high stems.

Plagiogyria (Lomaria) euphlebia NH Evergreen, yard-long, simply pinnate fronds in clumps. Only some fronds, usually taller, are fertile.

Plagiogyria other species, mostly smaller.

Polystichum species Many; mostly evergreen, stiff-fronded, medium-sized ferns.

Pteris cretica NH The Ribbon-Fern. Common. Wiry, erect, foot-high stems. Evergreen fronds of a few ribbon-like but firm divisions.

Pteris multifida NH Spider-Fern. Few evergreen paired divisions, cut again. Long end one.

Pteris quadriaurita (biaurita quadriaurita) NH Evergreen. 2 foot stems. Fronds a yard long. Divisions cut into many narrow lobes, end one the longest, lower ones forked.

Pteris wallichiana NH Frond-losing. Stems 5 feet tall. Soft green fronds divided 3 times, central division 2 feet long and side ones nearly as big.

Selaginella species Low creeping plants allied to the Clubmosses.

The rhizomes of *Lastrea (Dryopteris) pozoi* also creep to form colonies of white-downy fronds, held on foot-high, pale brown, densely downy stalks in the hill and lower mountain forests of all Honshu, Shikoku and Kyushu, and it is common. The fronds are about eighteen inches long, nar-

row and pointed, with narrow pinnae, themselves cut into many lobes. Also common and forming colonies from long-creeping rhizomes is *Lastrea (Dryopteris) laxa*, also downy, but with broader based fronds up to two feet long, the narrow pinnae divided again into regularly toothed pinnules.

A large number of species of *Athyrium*, which are related to the Lady Fern (*Athyrium filix femina*), a northern fern in Japan, inhabit the southern woods, though many extend also throughout Honshu. Some are evergreen and most are bigger ferns than the Spleenworts, often with fronds two or three feet long. Some grow in clumps but many form colonies by running rhizomes from which the fronds arise at rather wide intervals on long stems, and most are twice pinnately divided.

Only a few of these Ferns are hardy outdoors in Britain, but many are grown in glasshouses, and are very decorative.

The delicate mats of a few species of *Selaginella*, related to the Clubmosses (*Lycopodium*) of very ancient race, compete with the mosses on the always damp leafmould on the forest floor. The branches of *Selaginella nipponica*, which hug the ground, are much forked and densely leafy, with tiny bright green leaves in four rows, the two upper pressed closely to the stem and the lower spreading. The spores are borne in conical groups on the end of upright branches, and are 2 to 4 inches high. The stems of *Selaginella remotifolia japonica* creep more widely, are more loosely leafy and less forked, and are prostrate with ascending tips, their spores being borne on slender stems in squared heads. Both are common in moist places in the forests on the hills and lower mountains of the south, *Selaginella remotifolia* extending further north.

Very beautifully cut are the evergreen fronds of *Cheilanthes chusana (mysurensis)*, their glossy, wiry purple-brown stems densely clustered together, bearing fronds a foot long or so, divided pinnately three times. Related is *Aleuritopteris (Cheilanthes) argentea*, also with evergreen fronds about a foot long, and growing on rocks on the Pacific side of most of Honshu as well as in Kyushu and Shikoku. Its fronds also are in dense tufts, are cut twice or three times, and are of a greyish-green colour above and covered with waxy white powder beneath. In sunny hillside thickets the clumps of dull grey-green fronds of *Polystichum lepidocaulon* are common locally. Their leathery fronds are simply pinnate with narrow arching pinnae and often root at the tips. Also abundant in sunlit bushy places of the south are the long, bright yellowish-green deciduous fronds of *Lastrea (Dryopteris) oligophlebia*, three or four times cut nearly to the midribs, while in crevices in the rocks the smaller *Lastrea decursivepinnata* with simply pinnate, downy fronds, also deciduous, is common.

Where such thin open woods are near the sea in the warmest and wettest parts of Honshu and the southern islands, the long wiry rhizomes of *Nephrolepis auriculata* produce clusters of simply pinnate fronds which arise at intervals. They are arching and drooping, 2 feet long, with their lobed pinnae closely arranged, often overlapping.

There are a large number of species of *Arisaema* growing in the Japanese woods, especially in the south, where many are confined to very restricted areas – to certain districts or islands – and where they appear to be evolving into separate races. They are members of the *Arum* family and show strange inflorescences, consisting of a stem bearing a tubular cup, the upper part of which opens on one side as a leaf-like hood (the spathe), which may stand nearly upright behind, or arch forward over, a club-shaped spadix. On the lower part of the spadix, within the tubular cup, the tiny flowers are borne, and later spikes of berry-like fruit. Most of them grow up quickly from their tubers, and flower from March to May.

Also coming into bloom in April and May are wide patches of the fans of dark green sword-leaves of *Iris japonica* which have stood all winter on the upturned, almost trunk-like ends of their creeping and branching rhizomes. Their broad sprays of rather small flowers, recalling those of an Orchid, rise to a height of some 18 inches, their flat-spreading standards being pale lilac-blue, as are their falls which are wavy-edged and fringed, marked with yellow spots on a white centre, and with a fringed crest. They are common on the wooded hills, reaching to the north of Honshu, but though reasonably hardy in Britain, do not always flower freely.

Forming spreading colonies of rounded, heart-shaped, or pointed leaves, glossy or dull, from running rhizomes, several species of *Asarum* of the *Aristolochia* family, are common on the forest floor. Their dingy purple or brown cup-shaped flowers are produced below the leaves at ground level to be pollinated by beetles.

Ground plants – flowering plants

Alpinia (Globba) japonica NH Ginger family. Central Honshu and south-west. Creeping. 18-inch, lance-shaped leaves on 2 foot stems. Broad spires of lipped, white flowers lined red.

Alpinia (Globba) intermedia (chinensis) NH Of far Pacific south-west. 6 feet tall, branched sprays of small white flowers tinged red.

Asarum asaroides (thunbergii or japonicum) NH Far south-west. 6 inches high. Greenish-purple drooping flowers —

Asarum blumei (albivena) South-central Honshu. Leaves white-veined —

Asarum kiusianum NH Of Kyushu only. Erect, dull or pale purple, or sometimes white flowers —
—Creeping colonies of mostly evergreen, heart- or kidney-shaped leaves on long stalks. Nearly round flowers under the leaves near groin.

Asarum Many other species, mostly of small districts, some with glossy foliage, others with dull.

Arisaema japonicum RT South-west Honshu, Shikoku and Kyushu. Two leaves of 4 paired leaflets and an end one. 2 feet tall. Spathes green or purple, white-striped.

Arisaema ringens RT Coastal woods, central Honshu and south-west. One foot tall. Two leaves of 3 shining, long-pointed leaflets. Spathe green or deep purple.

Arisaema sikokianum Hardy. Of Shikoku and Kyushu. 10 inches high. Two leaves of 3 or 5 leaflets. Spathe dark purple lined green. Shikoku, Kyushu, west-central Honshu.

Arisaema thunbergii RT Of far south-west. Two feet tall. One leaf of many leaflets. Spathe dark bronze-purple with long tail.

Arisaema tosaense RT Of far south-west. One foot tall. Two leaves of many leaflets. Spathe dark green, white-striped, long-tailed.

Arisaema Many other species, many of very limited range.

Iris japonica Wooded hills of 3 main southern islands. Running colonies of evergreen fans. Sprays of small lilac-blue flowers marked yellow and white.

Lilium (Cardiocrinum) cordatum T Moist woods of central Honshu and south-west. Big heart-shaped ground leaves. 4-foot flowering stems with whorl of leaves near base and heads of greenish-white trumpets marked yellow and purple in the throat. In speckled sunlight.

Lilium japonicum Thickets and wood-openings in hills of central Honshu and south-west. 3 feet high, narrow, stiff leaves. Heads of few horizontal pink funnel-flowers.

Ophiopogon jaburan T West Honshu and south-west. Clumps of evergreen glossy strap-leaves a yard long. Dense 2-foot spikes of small nodding lilac flowers. Deep blue berries.

Ophiopogon planiscapus RT Woods and thickets, Honshu to Kyushu. Similar but much smaller, flowers often white. There is a cultivated variety with black-brown foliage (*Ophiopogon planiscapus nigrescens*).

Reineckia (Sansevieria) carnea Hardy. Lily family. Central Honshu and south-west. Creeping rhizomes. Long, narrow, evergreen leaves. Spikes of many pink trumpets.

Rohdea (Orontium) japonica Hardy. Lily family. Central Honshu and south-west. Thick over-ground rhizomes. Evergreen, narrow leathery leaves in ranks. Short spikes of bowl-shaped little white flowers.

Thalictrum microspermum (Known in cultivation as *Thalictrum kiusianum*.) Six inches or so high, raises loose sprays of little white (or purple in cultivation) flowers filled with stamens over delicate foliage cut into nine leaflets, in April and May. Shikoku and Kyushu only.

Viola japonica (prionantha latifolia) Clumps of smooth toothed leaves, purple flowers in March and April. Common in the lowlands of the south.

Viola violacea Leaves purplish-backed, with white veins on upper surface, deep rosy-purple flowers in April. In drier woods.

Viola maximowicziana (selkirkii major) Its leaves also purple below and white-variegated above, white flowers with purple-veined lips and short spurs in May.

Viola phalacrocarpa (prionantha) Rounded, heart-shaped leaves, small rose-purple violets in April. Wet shady stream-sides under the Alders and Willows in all the main islands.

Viola patrinii (primulifolia) With *Viola phalacrocarpa* in wet places. Small plants, narrow toothed leaves, no runners, white, purple-veined flowers.

Zingiber (Amomum) mioga A wild Ginger of Honshu, Shikoku and Kyushu. Yard-high stems, narrow leaves in 2 ranks, white-hooded, pale yellow-lipped flowers on short spikes.

II. THE TRANSITIONAL EVERGREEN OAK FORESTS OF SOUTHERN JAPAN

Before reaching the limit of their range where the climate becomes too cold, both in the lowlands at the foot of the great mountains of central Honshu, and also at higher elevations in the south, the Evergreen forests begin to change. The Camphors, the heat-loving Conifers, and many others drop out, and the evergreen Oaks form the bulk of the canopy. The first big leaf-losing Oaks appear among them near the limit of their range, and the second storey and bushy underwood contain an ever-growing number of Summer-green trees and bushes, though the majority are still evergreen. The semi-tropical luxuriance diminishes as the humid heat grows less and the winters become cooler. Tree-ferns and many epiphytes disappear, the remaining epiphytes being nearly all Ferns able to stand drier conditions during the winter cold. Tall woody lianes still festoon the trees and bushes, many of which are common to both the Evergreen and Summer-green woods. The tall Bamboos soon disappear, but the small creeping ones remain common.

Standing high above the irregular Oak canopy, and very characteristic, are some huge, warmth-loving Conifers – Silver-Firs, Hemlocks, and the Japanese Cedar (*Cryptomeria*). The Japanese Cedar has been extensively planted, often in pure groves, both in the hills and mountains, and its wild range is difficult to determine.

These Evergreen Oak woods cover all the mountain-sides of the south, except where too wind-swept, or where there is too little soil on steep rock slopes or dry sandy foothills, and they reach to the crests of the lower ridges. In the higher mountains, more and more Summer-green trees appear in the canopy on ascending, until at some 4,000 or 5,000 feet the Evergreen forests merge into the Summer-green ones.

The same changes take place on travelling northward. At the foot of the great ranges and isolated volcanoes of central Honshu, the warm coastal lowlands and peninsulas of the Chubu and Kanto District are (or were, before cultivation removed them), still predominantly under the Evergreen Oaks, but a number of new leaf-losing small trees and shrubs appear among them. Here, however, the Broad-leafed Evergreen and the Pine woods give way to the Summer-green forests as the first cliff-face of the high mountains is reached, where they are not entirely cleared for agriculture. On the Kwanto plains north of Tokyo the last broad-leafed evergreen trees to be found scattered in the Summer-green forests on warm slopes are the Oaks, *Machilus* and *Castanopsis*.

These beautiful woods are more colourful and varied than the Oak–Laurel forests, containing trees, bushes and lianes from both the warm-temperate and cool-temperate zones, both mountain and lowland plants according to height or latitude, with several species restricted to certain mountain ranges. A number of the trees and bushes are rather tender in Britain, but they include,

among other fine plants, some of the main ancestors of the Japanese Flowering Cherries. Several very handsome ground plants of the southern mountain forests are hardy in Britain.

The forests have been much felled and cleared wherever cultivation is possible, and for timber. Apart from cleared land, the mountain forests of the south have many natural sunny openings, torrent-banks, old landslip scars, windy ridges, steep rocky and sterile sandy slopes, where trees cannot grow thickly and the woods are thin. In these places, and on cleared land, crowd many shrubs and low scramblers which cannot tolerate deep shade. Specially characteristic are many species of *Rhododendron*, from which races of the cultivated Japanese hybrids have sprung. Even in the lowlands and foothills are areas with poor, dry sandy soil where the Red Pine is the main tree, and light-loving shrubs and plants are abundant.

In the shadier forests, Ferns remain very numerous on the forest floor, but as the winters grow colder, fewer evergreen ones and more frond-losing ones are found, most widely distributed throughout temperate Japan. The same is true of the flowering plants of the forest floor, and as the seasons become more marked, a quickly developing spring flora of low plants – Anemones and Violets – flower, to be followed by taller leafier ones in summer and autumn, often with inconspicuous blooms, such as Nettles and their relatives. However several beautiful woodland plants, mostly large, come into bloom at this season, especially in sunny glades and among the bush thickets at the forest edge, and do not spread far, or at all, into the Summer-green forests. On the other hand, many plants of the Summer-green forests appear in these woods, especially northward and in the mountains.

Bushes of sunny openings in the hill and lower mountain forests of the south

Where the lower mountain slopes are too steep and rocky, or the hill-sides too sandy or windy, the forest trees cannot form a closed canopy; or there may be natural or man-made clearings and stretches of grassland (the *Haras* or *Genyas*); and in these sunny openings, bushes which need light flourish and often form tangled thickets.

Abundant in all southern Japan are the twiggy and thorny bushes of the Barberry *Berberis thunbergii*, growing as tall as eight feet, and hanging its pale yellow, red-stained flowers singly or in pairs from each cluster of its little round, bristle-toothed leaves. These colour brilliantly in autumn to scarlet and orange, the effect intensified by the bright red berries. A purple-leafed form as well as the type grow well in Britain. Also frequently cultivated in Britain and found wild on sunny lower slopes of the mountains of Honshu and Kyushu, are the low, creeping and thicket-forming shrubs of the Quince *Chaenomeles japonica* (once called *Cydonia maulei*), which glows in spring with

orange-scarlet, stemless blooms along its arched and spreading shoots, developing into large yellow-green, oval and scented fruits.

Several Brambles (*Rubus*), many bushy, others arching or scrambling, are common and form an important part of the thickets. The evergreen, stout and scrambling canes of *Rubus sieboldii*, furnished with rather few and slender prickles and undivided leathery foliage, produces quite large white flowers in small clusters along its stems, followed by red fruits; the slender-branched and slim-prickled *Rubus microphyllus*, with rounded, three-lobed leaves, greyish beneath, and bearing white flowers with purplish-red stalks and sepals, and round red fruit, is a non-climbing deciduous shrub also common on low mountains; as is *Rubus palmatus*, a non-scrambling bush, also leaf-losing, up to eight feet high, with small many-lobed foliage, flattened prickles, and white blossom solitary on short side shoots ripening to yellow juicy fruits.

Other large bushes which are widespread in thin woods and sunny thickets in the foothills of the south are the leaf-losing *Viburnum dilatatum* with downy twigs and hairy leaves, resembling the European Wayfaring Tree (*Viburnum lantana*), which carries a profusion of heads of bright red berries in autumn and is frequently to be found.

There are a number of species of *Rhododendron* in the thin and open woods in the mountains of the south, where the evergreen Oaks or Pines are scattered or absent, often forming part of the shrub thickets which grow up on cleared ground. Apart from a few very common and wide-ranging ones (such as *Rhododendron kaempferi*, which is one of the parents of the Kurume Azaleas raised in Kyushu), most are local and some rare, but several are grown in gardens, either in their wild form or as varieties, and especially as parents of hybrids. Some are shrubs retaining their summer-grown leaves through the winter, but dropping the spring ones, such as the twiggy, brown-bristly bushes of *Rhododendron tosaense*, a yard or two tall and widespread in the south, showing rose-purple blooms in umbels.

Restricted to the low coastal mountains of south-central Honshu are the evergreen bushes, more than a man's height, of *Rhododendron makinoi*, the leaves of which are stiff and narrow, thickly brown-felted on their backs, and which bear trusses of up to six soft pink flowers; and the even taller *Rhododendron komiyamae*, a small tree thirty feet high, which is semi-evergreen, with clusters of a few rose-lilac blossoms at the ends of its shoots.

Many other species of *Rhododendron* grow in thickety places and thin woods in the mountains of south-central Honshu and southward. A few are evergreen or semi-evergreen, such as *Rhododendron keiskei* of rocky, wooded slopes which is only a yard high with rather leathery leaves and um-

bels of a few pale citron-yellow, funnel-shaped flowers; and the low, spreading *Rhododendron macrosepalum* (*linearifolium*), its shaggy narrow leaves crowded at the twig-ends, and with large rosy-lilac funnels with long pointed lobes, which is common in the hills. Most are leaf-losing, some large, such as *Rhododendron sanctum*, up to fifteen feet and all rusty-brown with hair, with umbels of deep rose blooms at the ends of its shoots, or *Rhododendron pentaphyllum nikoense* with fringed leaves and big deep rose flowers, and *Rhododendron lagopus* (*wadanum lagopus*) with solitary and smaller rosy-purple blossoms. Some are much smaller, such as *Rhododendron serpyllifolium*, twiggy little bushes clothed in purplish-brown bristles and bearing solitary funnel-flowers ranging from red to pale pink, or *Rhododendron dilatatum* (*reticulatum*) which can grow to six feet, and produces its purplish blooms in little groups at the twig-tops before its leaves in spring.

Trees of the canopy

Quercus acuta The commonest —

Quercus gilva Densely branched —

Quercus glauca —

Quercus myrsinaefolia (*vibrayeana*) —

—The evergreen Oaks which make up most of the canopy. They do not reach full size in Britain but form glossy-leaved, rounded bushes.

Castanopsis NH —

Machilus NH —

—Common big evergreen trees still present in lower forests and north to Tokyo.

Abies firma Very tall, sturdy, pyramidal Silver Fir —

Cryptomeria japonica Tall, narrowly pyramidal. Clusters of scale-needed shoots —

Tsuga sieboldii Tall graceful Hemlock of the south. Dense tiers of small-needed twigs. A bush in Britain —

—Rising singly high above the canopy.

Pinnus densiflora The Japanese Red Pine. Common in forests on sand hills. Does not ascend high in the mountains.

Quercus acutissima Sturdy. Shining, narrow, bristle-toothed leaves —

Quercus serrata (glandulifera) Slender and rather small. Glossy bright green, bristle-toothed leaves —

Quercus variabilis Like *Quercus acutissima* but leaves dull and hairy beneath. A big tree, thick, corky bark —

—First and commonest Summer-green Oaks of higher levels and north.

Castanea crenata The Japanese Sweet Chestnut also appears early.

Zelkova serrata (keaki or acuminata) Big, Elm-like, many branched. Very local, sometimes in pure stands in lowlands and mountains. Leaves turn brown-red. Flaky grey bark.

Smaller evergreen trees of the second storey

Cephalotaxus harringtoniana (drupacea) The Plum-fruited Yew is still scattered in the mountain forests.

Distylium racemosum RT Still abundant.

Elaeocarpus japonicus NH —

Elaeocarpus sylvestris NH —

—Common. Fringes of white flowers, grey-green, olive-like fruits.

Ilex latifolia Tree-Holly with huge, glossy, non-prickly leaves, red berries close among them.

Ilex pedunculosa Not so big. Non-prickly. Red berries hanging in long-stalked clusters.

Illicium religiosum (*anisatum*) Star Anise. Rather small creamy-yellow Magnolia-flowers, glossy, thick leaves.

Michelia compressa T Still present in the mountain forests.

Prunus spinulosa T —

Prunus zippeliana T —

—Glossy-leaved Bird Cherries scattered singly.

Quercus sessilifolia Low Oak with sparsely-toothed leaves bunched at end of twigs.

Sapindus mukorossi T Scattered. Pinnate leaves, clusters of yellow-green flowers, golden-brown cherry fruits.

Torreya nucifera Big stout Yew-like tree with torn red bark and stiff needles. Bushy in Britain. Scattered singly in mountain woods.

Trochodendron aralioides Stout-branched low tree. *Rhododendron*-like foliage. Upright spikes of vivid green flowers of stamens only.

Smaller Summer-green trees of the second storey

Acer argutum Of south-central Honshu and Shikoku only. Small erect tree, 5-lobed, pale green leaves.

Acer carpinifolium Common in mountain ravines in all Japan. Up to 50 feet. Hornbeam-like leaves, green flowers, curved keys.

Acer capillipes 30 to 35 feet high. Red twigs, red-veined 3-lobed leaves, drooping strings of flowers.—

Acer crataegifolium Slender, erect. Shallow-lobed leaves, yellow flowers in strings. Common in low mountains.—

Acer rufinerve Pale blue-green twigs, red-veined 3-lobed leaves.—

—Small Maples, all snake-barked, appearing in the southern mountain forests. Leaves colour vividly.

Acer palmatum Common in lowlands and mountains in all Japan except Hokkaido. Up to 40 feet. 7-lobed leaves, brilliant in autumn. Purple-red flowers. One of the main parents of the cultivated “Japanese Maples”.

Alnus firma (*yasha*) Of Kyushu only —

Alnus firma hirtella Of Honshu only —

Alnus firma sieboldiana (or *Alnus sieboldiana*) —

—Common on wet mountain streamsides in south-west. Strongly-veined Hornbeam leaves, very small “cones”.

Alnus japonica Tall pyramidal tree. Narrow, dark, shining, pointed leaves, upright catkins. All Japan on wet streamsides.

Carpinus japonica Widespreading, medium-sized tree, scaling furrowed bark, spiky “hops”. All Japan but Hokkaido —

Carpinus tschonoskii (*yedoensis*) Small tree, small leaves, silky “hops” —

—Common Hornbeams of the upper and northern woods.

Cornus controversa Tabular small tree. Flower trusses not showy, black berries. All Japan —

Cornus kousa Small tree. Flowers with showy creamy-white bracts. All Japan but Hokkaido —

—Some of the first trees of Summer-green woods to appear in north and mountains.

Diospyros japonica (*lotus japonica*) Wild Date-Plum. Glossy-leaved small tree. Pale yellow bell-flowers, purple-stained yellow fruits. From Pacific central Honshu southwestward.

Diospyros kaki sylvestris Wild Chinese Persimmon. Large glossy leaves turning yellow and purple. Yellow fruits. South-west.

Idesia polycarpa Hills and mountains of all Japan but Hokkaido. Leaves and branches like a small *Catalpa*. Clusters of dark red, pea-sized fruits.

Lyonia ovalifolia elliptica *Rhodendron* family. Medium-sized tree, red-twigged, spikes of little white pitchers, narrow leaves. Common lower mountains of all Japan but Hokkaido.

Magnolia kobus Hills of all Japan, but scattered. Creamy-white, 5-petalled flowers, small but numerous.

Prunus jamasakura (serrulata) Common in low mountains of all south-west. Rosy-pink trusses of flowers, small dark cherries —

Prunus lannesiana (speciosa) Only central Pacific Honshu on low mountains. Similar, but larger, paler flowers —

—These two Cherries, crossed with other species, are the main parents of the Japanese Flowering Cherries of gardens.

Salix species. Of wet valley streamsides.

Evergreen bushes of the underwood

Cleyera japonica (Eurya ochracea) —

Daphniphyllum macropodum —

Eurya japonica —

Neolitsea sericea (Litsea glauca) —

—Bushes of the Oak–Laurel forests still common in warmer and lower woods.

Camellia japonica —

Fatsia japonica —

Ilex integra —

Viburnum awabuki (odoratissimum) —

—Common in Oak forests near the sea.

Buxus microphylla japonica Mountains from central Honshu south-west. Rare and local. Looser growing than the European Box.

Nandina domestica RT Of mountain ravines from central Pacific Honshu south-west. Bamboo-like growth, 2 or 3 times pinnate leaves, sprays of small white flowers, red berries.

Osmanthus heterophyllus (aquifolius) Very dark, Holly-like leaves, trusses of small white scented trumpets. Common in south-western forests. Purple-black berries.

Rhododendron keiskei Rocky mountain woods from central Honshu south-west. Small, semi-evergreen narrow leaves, many trusses of lemon-yellow funnels.

Rhododendron makinoi Mountains of Pacific central Honshu only. Medium sized bush. Shoots and under-sides of leaves tawny-woolly, soft pink bell-flowers.

Rhododendron metternichii Dense mountain woods of central Honshu and south-west. Similar, broader leaves, rosy bells.

Rhododendron kiusianum

Symplocos lucida Densely branched. Hawthorn-like trusses of white flowers, black berries. The commonest species.

Symplocos Several other similar species, all usually to be found in the south-western forests.

Vaccinium bracteatum Low levels in south-western mountains. Large, thin-leaved bush. Spikes of white urn-flowers, downy red berries.

Bamboos

Arundinaria pumila

Arundinaria pygmaea

Summer-green bushes of the underwood

Clethra barbinervis (*canescens*) Tall bush or small tree, growing up as the woods develop on cleared land. Common in all Japan. Leaves turn red and yellow before falling, long slim chains of scented white stars.

Euonymus alatus Corky-winged twigs, pinkish fruit, orange-red seeds —

Euonymus sieboldianus Large. Pale pink fruit, red seeds —

—Bushes of Summer-green forest in north and mountain Evergreen woods.

Euscaphis japonica (*staphyloides*) Thin woods of central Honshu and south-west. Thick and pithy shoots, glossy pinnate leaves, pyramids of small green flowers, circles of pink pods. Related to Bladder-nuts.

Ligustrum obtusifolium (*ibota obtusifolium*) Leaf-losing Privet of thin hill woods of all Japan. Nodding white plumes, leaves turn rosy-red.

Lindera erythrocarpa red berries —

Lindera obtusiloba Large leaves turning rich yellow. Red berries —

Lindera sericea Black berries —

Lindera umbellata Black berries, leaves turn bright yellow —

—Large aromatic bushes of the Laurel family. Clusters of inconspicuous yellow flowers. Common in central Honshu and south-west.

Mallotus japonicus (Euphorbiaceae) Open woods near the sea.

Meliosma tenuis (Sabiaceae) Large, leaf-losing bush, undivided, dark green, slender-pointed leaves, creamy-white panicles of flowers, waxy-black fruits. Common in forest high in the mountains.

Orixa japonica Rue family. Aromatic, medium-sized. Flowers not showy, leaves turn palest lemon-yellow. Common in hills of all Japan but Hokkaido.

Parabenzoin (Lindera) praecox RT Large erect bush. Small yellow flower clusters before leaves which turn butter-yellow. All Japan but Hokkaido.

Vaccinium smallii glabrum Pine-woods and thickets of Honshu and Shikoku. Small erect bush, small clusters of pinkish-green bells, purple-black berries.

Vaccinium oldhamii Woods and thickets on low mountains in all Japan. 3 to 10 feet high, strings of reddish-buff bells, black berries.

Zanthoxylum ailanthoides T Few-branched small tree. Very big pinnate leaves. Common in mountains of all Japan but Hokkaido —

Zanthoxylum piperitum Medium-sized, ferny-leaved, small reddish fruits. All Japan —

Zanthoxylum planispinum Large. Leaves of few leaflets, small red fruits. Hills of south-west —

Zanthoxylum schinifolium Like *Zanthoxylum piperitum*, fern-like foliage. Hills of all Japan but Hokkaido —

—Thorny leaf-losing shrubs with pinnate leaves. Flower clusters not showy. Also in Summer-green forests. Rue family.

Bushes of wood-edges and open sunny places

Many of these are pioneer shrubs of cleared forest land in all warmer lowlands, hills, and lower mountain slopes throughout temperate Japan, both in the Evergreen and Summer-green zones.

Callicarpa japonica Common pioneer shrub of all temperate Japan. Erect. Trusses of small pink flowers, lilac-purple berries. Leaves turn plum-purple.

Camellia sasanqua RT Thickets in mountains of Kyushu only. Evergreen leathery leaves, rather small usually white flowers. Up to 20 feet high.

Chaenomeles japonica (Cydonia maulei) Dwarf Japanese Quince. Low, spiny, spreading, leaf-losing shrub of low mountains in Honshu and Kyushu. Scarlet flowers, big yellow-green fruits.

Indigofera decora Slender shrub, 1 to 1½ feet, pinnate leaves, axillary dense spikes of flowers with white standards crimson at base and pink wings. River banks and rocky places, Honshu, Kyushu, rather common; C. China.

Lycium chinense Long-arching, spiny, leaf-losing shrub, narrow-oval leaves, pale purple to white funnel-shaped flowers veined darker, in small axillary clusters, red fruits. Thickets and river-banks in lowlands, 3 southern islands, common; Korea, Manchuria, China, Ryukyus, Taiwan.

Pieris (Andromeda) japonica Sunny hill thickets of 3 southern islands. Medium-sized shrub. Glossy, evergreen leaves, drooping strings of waxy white pitchers.

Rhododendron indicum (Not the *Rhododendron indicum* of gardens which is the Chinese *Rhododendron simsii*.) Rocky ravine-sides of central Honshu and south-west. Semi-evergreen small bush, narrow small leaves, single or paired scarlet-red funnels. (The evergreen "Indian Azaleas" of gardens are hybrids of *Rhododendron indicum*, *Rhododendron kaempferi* and *Rhododendron simsii*.)

Rhododendron kaempferi Sunny thickets in hills and mountains of all Japan and very common. Medium-sized, semi-evergreen. Small clusters of flowers from fawn to salmon or rosy-scarlet. (One of the parents of the "Kurume Azaleas" with *Rhododendron kiusianum* of high Kyushu mountains, and other species.)

Rhododendron macrosepalum (linearifolium) Common in sunny thickets of Pacific central Honshu and Shikoku. Small spreading shrub, densely hairy leaves, lilac or purple-pink scented funnels.

Rhododendron mucronulatum Of the extreme west. Slender, leaf-losing bush. Bright rose-purple funnels.

Rhododendron reticulatum pentandrum (dilatatum) Mountains of Pacific central Honshu and south-west. Big bush, broad leaves turning plum-purple. Purple solitary or paired funnels before the leaves.

Rhododendron ripense Only the south-west. Yard-high, brown-hairy, semi-evergreen shrub. Rose-purple funnels in small clusters. A white sport of this is *Rhododendron mucronatum* of gardens.

Rhododendron serpyllifolium Mountains of central Honshu and south-west. Small, dense, leaf-losing. Very small leaves, solitary or paired rose-pink funnels.

Rhododendron weyrichii Pacific south-west. Large. Loses its broad-clustered leaves. Wide, brick-red, purple-spotted funnels before the leaves.

Rhododendron many other species, often local.

Rubus corchorifolius Suckering, leaf-losing Bramble up to 8 feet. Leaves undivided (except on young shoots), small clusters of white flowers, edible red fruits. Of Pacific central Honshu and Kyushu only.

Rubus illecebrosus "Strawberry-Raspberry". Small subshrub, creeping. Pinnate leaves on foot-high stems, clusters of white flowers, large edible red fruits. Thickets in central Honshu and south-west.

Rubus microphyllus Common on low mountains of 3 southern islands. Suckering, mounded, small Bramble with 3-lobed leaves.

Rubus palmatus Leaf-losing, 20-foot long prickly stems, Maple-like leaves, solitary white flowers, yellow fruits. Hills of Pacific central Honshu and south-west.

Rubus parvifolius Low, slender, leaf-losing shrub. 3 or 5 leaflets. Clusters of small rose flowers, red edible fruits. Very common in lowlands and hills of all Japan.

Rubus many other species.

Symplocos chinensis pilosa (crataegoides) Bright blue berries. Common on hills and mountains of all Japan. In Britain needs hot summer to set well —

Symplocos coreana Blue-black berries. Central Honshu and south-west —

Symplocos paniculata Black berries. Central Honshu and south-west —

—Leaf-losing large bushes. Trusses of Hawthorn-like flowers. Common on cleared land as forest trees re-colonize.

Viburnum dilatatum Downy-leaved. Much like European "Wayfaring-Tree" —

Viburnum erosum Common in central Honshu and south-west —

Viburnum sieboldii Large. Glossy-leaved. All Japan but Hokkaido —

—Bushes of sunny hill thickets. No large sterile florets. Big clusters of bright red fruits.

Viburnum plicatum Plates of flowers all on upper side of horizontal branches, with ring of white sterile florets. Garden form with ball of sterile florets only known as *Viburnum tomentosum plicatum*. Mountain thickets of central Honshu and south-west; variety *Viburnum plicatum glabrum* centre and north of Japan Sea side of Honshu.

—They all need a hot summer in Britain to set good crops of fruit.

Sun-loving Ferns

In the warm rainy climate of the south, certain Ferns grow in the comparatively dry and sunny thickets which cannot tolerate deep shade.

Dicranopteris (Gleichenia) linearis NH Forms wide mounds a yard high by repeated forking of hard, evergreen, simply pinnate divisions. Dry thin woods and thickets from central Honshu south-west.

Gleichenia japonica (glauca) NH Similar, but divisions once more cut. Thin woods of same districts. Common.

Lygodium japonicum NH Climbing by twining its central frond axis, to 10 feet. Forms tangles of evergreen secondary divisions, cut and recut like complete fronds. Common in thickets in lowlands and low mountains of central Honshu and south-west.

Scramblers in the thickets

Clematis japonica Slender climber. Leaves of 3 leaflets, clusters of a few nodding, small, brown-purple bells. Mountains of Honshu and Kyushu.

Clematis patens Slender climber to 12 feet. Leaves of 3 to 5 leaflets, big, solitary, wide-open, white to violet-blue flowers. A parent of the large-flowered garden hybrid. Not Hokkaido.

Cynanchum species Climbing herbs of *Asclepias* family. Not showy.

Rosa luciae Semi-evergreen rambler. Glossy leaflets, trusses of small white scented flowers, small dark red hips. Resembles *Rosa wichuriana*. Hills of Pacific central Honshu.

Smilax sieboldii Semi-evergreen, prickly tendril-climber related to *Asparagus*. Glossy leaves, blue-black berries. Not Hokkaido.

Vitis flexuosa Slender Vine. Small, shining, broad-heart-shaped leaves, small blue-black grapes. Hills and mountains (not Hokkaido).

Ground plants of the southern mountain forests

On climbing the mountains of the south, the canopy of the forests becomes even more irregular on the rocky slopes with their steep valley-sides, rushing torrents, and rounded shoulders, and the ground layer of plants on the forest floor is also more varied. Where the bushes of the underwood grow in dense thickets, there is little below them but dead leaves and moss, and a few scrambling plants such as *Rubia* and its relatives the Bedstraws (*Galium*). Where the big old trees cast their shade and there are few bushes, groups and carpets of small woodland plants, many of them creeping in the humus-rich soil between the boulders and rock outcrops, crowd each other; while, edging the damp openings by streams in the valley bottoms, colonies of taller plants, especially Ferns, Polygonums, Nettles and their allies, and late-flowering Composites grow up.

Though some of the woodland plants are curiously restricted in their range, many can be found both in the Evergreen Oak mountain forests of the south and in the Summer-green ones higher up, as well as those of low hills in the warmer parts of the north, even as far as Hokkaido. The protection of the trees and bushes produces a moist, still, and comparatively equable climate below them, both in the mountains and in the lowlands, and their decaying leaves provide a humus-rich soil. This is almost always acid, as so much of Japan is of granite or ancient hard gneiss, both of which break down in the rainy climate to yield a base rich in quartz sand, most of the other mineral constituents being washed away. However the warm climate aids decay of the fallen leaves, and peat accumulations are formed only on the colder heights of the mountains and in the far north. The volcanic ashes and lavas are also leached thoroughly by the year-round rains and yield similar forest soils.

Growing in damp ravines of the mountain woods of Honshu, Shikoku and Kyushu, but not extending to Hokkaido, and flowering in April and May, the plants of *Meehania* (*Dracocephalum*) *urticifolia* raise their nearly foot-high flower-stalks from their mats of heart-shaped, coarsely-toothed and

hairy leaves, and spread by stolons. The lipped blooms are in one-sided spikes, a half inch long, and blue-purple.

The half-open white blooms of the Helleborine Orchid *Cephalanthera falcata* appear in April, May and June singly among leaf-like bracts at the top of their two-foot, leafy stems, forming a short spike. The sepals and petals are nearly alike, and the small lip bends back only at the tip, and has three lobes. The broad lance-shaped leaves grow from the stem without stalks. It is common in thickets and open woods on the foothills and lower mountain slopes all over the south; where also, though in the forests rather higher in the mountains, the colonies of arching stems, one or two feet tall, of *Croomia heterosepala* shoot up early in the season from creeping rhizomes. They dangle their small greenish-yellow flowers in little groups from among their stalked, oval, ribbed leaves, which are collected near the tops of the stems. The flowers are of six widespreading segments, one being much longer than the others.

A small Umbellifer showing its white plates in May and June is *Pternopetalum tanakae* which forms patches of finely cut foliage from rhizomes which creep in the dark humus in damp hollows and valleys in the mountain forests. Blooming along the streamsides with it, but only in central Honshu, the stout upright stems, to eighteen inches tall, of the Bugle *Ajuga incisa* bear leafy spikes of large, dark purple-blue trumpets, rising from clumps of its deeply cut and toothed foliage, while *Ajuga japonica*, with less cut leaves and paler purple flowers, though more widespread in damp places in the woods, is rare.

In damp sandy soil, often in the needle-litter of the Conifers, the small evergreen creeping mats of *Coptis quinquefolia*, its leaves divided like those of a *Potentilla* into five toothed leaflets, and from which in April and May, single, white, cup-shaped blooms are sent up, grows in the mountain woods of west-central Honshu and Shikoku, with a variety in Kyushu. Ranging further north, over most of Japan, in similar situations, the round, deep green leaves with paler nerves, and also evergreen, of *Pyrola japonica* (*Asarifolia japonica*) also form mats spread by runners, which send up loose spires of waxy white cups in the same season. Spreading colonies of the Bladder-Fern *Cystopteris japonica* grow in the mountain woods of Honshu, Shikoku and Kyushu. Their deciduous fronds appear in groups or quite far apart from creeping rhizomes, and are carried on slender, glossy stems a foot or more tall. The blades are divided three times, are pointed, and sometimes nearly two feet long and of almost equal breadth. Also common are the much-divided fronds of *Onychium japonicum*. The handsome broad foliage, still retaining a tinge of bronze, of *Dryopteris erythrosora*, and those of *Dryopteris varia* and *Dryopteris polylepis* are everywhere, with a number of species of *Athyrium*.

Common in the woods of the hills in the south is the wide-running Bamboo *Arundinaria pygmaea*, its canes rising singly from its creeping rhizomes to a height of a yard or two, with up to three branches from each node. It has abruptly pointed, rather narrow, lance-shaped leaves; while those of *Arundinaria pumila*, forming its colonies in the same woods, are narrower still, and its equally slim, dull purple culms, some four feet high, carry fewer branches.

The lianes

Many of the lianes of the Oak–laurel forest continue into those of the Evergreen Oaks, only the more tender evergreen ones dropping out. They are joined, as the winters become cooler, by many which are common over most of Japan, both in Evergreen and Summer-green woods.

The ground plants

The Ferns

Several of the big evergreen ferns disappear, but most are common to Evergreen and Summer-green woods of all temperate Japan, especially the many that die down in winter. Some evergreen ferns are more abundant, however, in the mountain forests of the warmer half of Japan.

Adiantum monochlamys (*venustum monochlamys*) Evergreen Maidenhair Fern. 9-inch wiry stems, foot-long blades cut into many separate delicate divisions. Common in most of Honshu and south-west. Loses many fronds in winter in Britain.

Athyrium species Many not hardy.

Blechnum amabile Foot-long, simply pinnate fronds ending in tail. Fertile ones separate. Creeping. Hills of all Japan (not Hokkaido).

Dryopteris species (including *Dryopteris erythrosora*).

Polystichum species Usually with firm, dark, awn-tipped fronds.

Woodwardia orientalis NH Oval, twice-divided, drooping, yard-long evergreen fronds on tall stems. Central Honshu (further north on Pacific side) and south-west. Its variety *Woodwardia orientalis formosana* of south-west only, has 6-foot fronds.

Woodwardia japonica

Plants flowering in spring

Anemone keiskeana Colonies of 3-lobed foliage, flowers of many narrow lilac rays, collared. South-west only.

Anemone nikoensis Like European Wood Anemone, but leaves more cut. Not in Hokkaido.

Arisaema monophyllum 2½ feet, single parasol leaf, light green spathe with purple band inside, long-pointed. Local in central Honshu, often in Summer-green woods also.

Arisaema species Many very local ones, not in cultivation it seems.

Asarum caulescens One-year leaves, dull bell-shaped flowers.

Asarum other species Similar, and not grown in gardens in Britain.

Epimedium diphyllum Evergreen leathery leaves of separate leaflets. Sprays of small white nodding flowers. Of Shikoku and Kyushu only. One of the parents of the garden hybrid called *Epimedium x youngianum*.

Epimedium setosum Leaf-losing. Smaller white flowers. Rare. South-west Honshu only.

Viola bissettii Large pale purple flowers before thick leaves. Central Honshu and south-west.

Viola keiskei Clumps of long leaves, white flowers, lip striped purple. Common in mountains of 3 southern islands.

Viola makinoi Clumps of heart-shaped leaves, rosy-purple flowers. Mountains of 3 southern islands.

Viola rossii Creeping. Rosy-lilac flowers before long leaves. Mountains of 3 southern islands.

Viola shikokiana Creeping mats of heart-shaped leaves, white flowers, lip purple-striped. Pacific central Honshu and south-west.

Viola violacea Narrow leaves, long-spurred deep rose-purple flowers. Central Honshu and south-west.

Viola All these Violets have no main stem, and most grow in the Summer-green woods also. Apparently not in cultivation.

Plants flowering around midsummer

Ancistrocarya japonica Borage family. Loose sprays of small, erect, blue-purple flowers on 2½ foot stems with leaves near middle. Endemic to central Honshu and south-west.

Asperula trifida Like European Sweet Woodruffe but small.

Ellisiophyllum (Ourisia) pinnatum Delicate running clumps of pinnately cut leaves, small solitary white flowers. Local.

Hosta species of the south-west Most of the many species of *Hosta* are wild in Japan, often in limited districts, especially the warm, wet Pacific side of the south-west. Few of these are grown in occidental gardens, but the Japanese have long cultivated some of them, and a number of these cultivars have been introduced and given scientific names, though the wild parentage is not known. Most clones of gardens of the west are probably derived from northern Japanese species, but some with small narrow leaves may have part parentage in southern species, such as *Hosta lancifolia*, *Hosta tardiflora*, *Hosta undulata*, *Hosta ventricosa* and others. The Kinki district of south-central Honshu, and especially the wet and warm mountains of its Kii Peninsula, the highest peaks of which are over 5,500 feet, and the neighbouring island of Shikoku, also mountainous, with peaks up to 6,400 feet, are the home of many species of *Hosta*, and where, perhaps, new ones are developing, as with *Arisaema* and *Asarum*.

Hosta capitata (coerulea) Broad dull leaves, 2-foot stems with dense, purple heads. Shikoku only.

Hosta caput-avis Thick, broad leaves, arching stems with white to dull purple flowers. Among rocks in mountain ravines of Shikoku and nearby Pacific Honshu.

Hosta gracillima Tiny, shining, narrow leaves only 1 to 2½ inches long. Loose, one-sided heads of lilac on stems of 8 to 10 inches. Shikoku only.

Hosta longissima (japonica or lancifolia) Dull narrow leaves, few small rosy-purple flowers on 1½ foot stems. South-west Honshu.

Hosta longissima brevipes Of wet places. More flowers.

Hosta pachyscapa Dark, shining, large, broad leaves, stems up to a yard tall, pale purple flowers. South Pacific Honshu.

Hosta rhodeifolia Cultivated in Japan. Yellowish leaves.

Hosta rhodeifolia viridis Wild in Kii Peninsula of Honshu. Narrow leaves, nearly yard-high stems, nodding, large pale purple flowers.

Hosta tardiviva Large plant. Dull oval leaves, 1½ foot stems with one-sided heads of pale purple. Shikoku and nearby Honshu.

Hosta tokudana Cultivated in Japan. Wild in small area of south-west Honshu on Japan Sea side. Large, round, blue-green leaves, 1½ to 2-foot stems, dense white to lilac heads.

Hosta several other species.

Polygala reinii A woody, running Milkwort, common in south-central Honshu only. Tight heads of yellow flowers.

Pseudopyxis depressa Small creeping plant of Bedstraw family. Endemic to central Honshu and south-west. A few lilac trumpets with flaring mouths topping each 4-inch stem.

Pseudopyxis heterophylla Larger, flowers white. Also endemic.

Tanakea radicans Evergreen, bristly, fleshy rosettes with runners. 6-inch stems of *Spiraea*-like white fluffy flowers. Of shady, damp rock-pockets in central Honshu and south-west but rare.

Plants flowering in late summer and autumn

By late summer, in July, August and September, the forests have lost their freshness, and are hot and humid. The foliage of the canopy and underwood, both evergreen and leaf-losing, is dense and dark green, and in the damp shade below, larger and coarser plants are full grown, and take over the forest floor. The Ferns remain rich green and luxuriant, and the running colonies of low Bamboos show new leaves on their young canes.

Boehmeria species Large hairy-leaved herbs or sprawling sub-shrubs —

Elatostema species, *Pilea* species Large, juicy, non-stinging. Of wet places —

Laportea species, *Urtica* species Stinging plants of damp places —

—Large and very common members of the Nettle family.

Achyranthes (Iresine) japonica Large plant related to *Amaranthus*. Long terminal greenish-white spikes. All Japan but Hokkaido, also in Summer-green woods.

Ardisia japonica T Creeping woody stock, whorls of deep green, shining leaves on foot-high stems, round heads of white flowers, red berries. Common in all Japan but Hokkaido, also in Summer-green woods.

Ardisia crispa NH Much taller, flowers red-purple and spotted, red berries. Of south-west only.

Ardisia other species

Boenninghausenia (Ruta) japonica The White Rue. 2½ feet tall, long stalked, much cut, juicy grey foliage, large sprays of white stars. Common in mountain woods of central Honshu and south-west.

Cardiandra alternifolia T Semi-woody, to 2½ feet. Topped by trusses of lilac-white fertile flowers with few white sterile ones fading rose —

Deinantha bifida 2-foot stems with crinkly, glossy leaves, clusters of white fertile and sterile flowers —

—Both related to *Hydrangea*. Mountains of central Honshu and south-west.

Iris rossii In woods to 3,000 feet. South-west Honshu. Long narrow leaves greyish beneath, stems 2 to 6 inches, solitary large blue-purple fruits.

Kirengeshoma palmata Yard-high, glossy dark stems, big palmately-lobed leaves, open sprays of waxen yellow bells. Of Shikoku and Kyushu, but rare.

Lychnis miqueliana 2-foot, swollen-jointed stems, few, large, vermillion, round-petalled flowers. Mountain woods of central Honshu and south-west. Often on damp brooksides.

Lychnis kiusiana Lighter red, fringed flowers. West Honshu and Kyushu but rare.

Phytolacca japonica Large yard-high plant. Juicy stems, spikes of fluffy pink flowers, black berries. Central Honshu and south-west.

Sambucus chinensis A creeping Elder with stout annual stems to 5 feet. Flat white heads, red berries. Thickets and woods in hills of all Japan but Hokkaido.

Strobilanthes (Ruellia) oligantha 2-foot clumps, dense spikes of curved, tubular pale purple flowers. Mountain woods of south-west.

Thalictrum acteaeifolium 1- or 2-foot high Meadow Rue. Much cut foliage, flattened heads of fluffy white flowers. Hills and mountains of central Honshu and south-west.

Tricyrtis flava Hairy 1½-foot stems, densely leafed. Leaves spotted, flowers erect, yellow, spotted purple inside. Mountains of Pacific south-west.

Tricyrtis nana 6-inch stems, few flowers, erect, yellow spotted brown. Mountains of Pacific south-west.

Tricyrtis macrantha 2-foot stems, shining spotted leaves, nodding, yellow, brown-spotted flowers. Shikoku only, and rare.

Tricyrtis macranthopsis Similar but a little larger. Kii Peninsula of Honshu only, and rare.

Tricyrtis A few other very local species of Toad-Lily, mostly yellow.

From the mats of deep green, strap-shaped leaves, more than a foot long, of *Liriope spicata*, spreading by stolons, the naked flowering stems, scarcely longer than the leaves, arise in July to September, and bear rather narrow and loose spikes of many little lilac, bead-like blooms; while those of the related and similar *Ophiopogon ohwii*, which are white and on very short stems, are half hidden in their dense clumps of nearly upright, scurfy foliage. Coming into bloom at the same season, in the same foothill woods of all the islands except Hokkaido, is the handsome *Lycoris sanguinea*, a member of the Amaryllis family. Its soft green leaves, also strap-shaped, appear through the leafmould after the flowers are over in autumn and have died down when the eighteen-inch, slender flowering stems shoot up. They carry umbels of up to seven, erect, trumpet-shaped, dull orange-red blooms with greenish tubes and pale yellow anthers, while those of the

similar *Lycoris squamigera*, growing in the same wooded hills, are larger, pale rosy purple and fragrant, on longer and stouter stems. The Orchid *Calanthe reflexa* accompanies them, flowering in August. Its foot-high stems bear loose, open spires of many small pale mauve blooms with darker lips. The lips are three-lobed, wavy-edged and pointed, while the wings are turned back. The three to five narrow, pointed leaves are a foot long and pleated.

Also abundant in the woods and thickets of the hills and plains throughout Japan are the tall, roughly hairy and slowly spreading clumps of *Polygonum (Tovara) filiforme*, up to five feet high, and bearing large pointed leaves and loose spikes of little rosy-pink or occasionally white blossom. The beautiful Lily *Lilium speciosum (lancifolium)*, which, however grows only in glades in the mountain woods of Shikoku and Kyushu, is rare even there. Its stems are up to four feet tall, its leaves are rather broad and glossy, and its nodding turkscap blooms are white to carmine-pink, freely spotted inside with deep crimson. Even less common is *Lychnis sieboldii (Lychnis coronata sieboldii)*, confined to a district (Shinano) in central Honshu and to Kyushu, where it produces its deep red flowers, each petal with two lobes. *Lychnis sieboldii* has crossed with *Lychnis fulgens*, also of central Honshu, to produce the hybrid *Lychnis x haageana*, a foot or so tall with bright red flowers, and often cultivated in gardens.

The transition to Summer-green forest

Climbing higher in the mountains, more and more leaf-losing trees and shrubs in the underwood as well as in the high canopy, which ascend into the Summer-green forests above and far to the north, begin to change the character of the woods from Evergreen to Summer-green. Scattered singly here and there are the fiercely spined trees of the Japanese Locust *Gleditschia (Gleditsia) japonica*, usually low, but sometimes quite tall, reaching 60 or 70 feet, with their almost fern-like pinnate foliage, dense spikes of yellowish-white pea-flowers, and curved pods. The stout-twigged, spreading low trees of the Sumach *Rhus trichocarpa* are frequent in the underwood below the Evergreen Oaks. They produce downy, yellow-brown pyramids of many very small flowers and pendulous yellowish berries, but their long pinnate leaves turn to flaming scarlet in the autumn. Very handsome Dogwoods first appear also in the Evergreen mountain forests and are common in the higher parts and northward. *Cornus controversa* spreads its boughs in flat tiers at the end of each year's upward growth, forming a handsome tabular small tree, though its plates of little flowers and black berries are not showy. *Cornus brachypoda* is similar. On the other hand, the four large, creamy-white petal-like bracts surrounding the tiny balls of bloom on the big bushes of *Cornus kousa*, standing up erect along the slender branches, are very beautiful. The fruits are red, and grouped together tightly, looking like Strawberries.

High up in the Evergreen mountain forests Hornbeams (*Carpinus*) begin to appear, and soon become abundant as underwood. They are all rather small and bushy trees; *Carpinus japonica*, scaly-barked and having handsome corrugated leaves and Hop-like seed-clusters; *Carpinus cordata* with larger foliage; *Carpinus tschonoskii* (*yedoensis*), in spite of its old name found only in Honshu and Shikoku; and *Carpinus laxiflora*, both the latter with smooth trunks.

LOWLAND AND HILL SUCCESSION GRASSLANDS AND OPEN GROUND

Japan, like Britain, has a grassland flora growing on open hill and mountain sides, and in the lowlands, in spite of lying almost entirely in a climate favourable to forest. Except for that on marshy river flood plains, most of the grassland is probably a succession stage back to forest, following its destruction by fire, typhoon, or man. At present in the lowlands of temperate Japan, gently ascending wooded hillocks intermix with lush green meadows and stretches of cultivation. In contrast, the lower mountain slopes are often covered by a rolling, uniform, tall-grass sea (Japanese *Hara* or *Genya*), dotted with many flowers in early summer, and which in some places extends to considerable altitudes, forming a girdle between the forests in the mountains. These steppe-like grasslands are typical of sterile sandy soils on the lower slopes and at the foot of volcanoes, and those derived from young granites and sandstone. Even in the lowlands they are an early succession stage after forest clearance in the warmer parts of Japan.

These grasslands are composed of tall Reed-like grasses (*Miscanthus imperata*, *Themeda*, mixed, or one or another dominant), which form more than a third of the ground cover, growing with low shrubs, herbs, and Bracken. The grasses form thick root-mats which prevent a continuous turf from forming, but form clumps and colonies standing apart from each other, and do not retain so much moisture, in spite of the heavy rainfall, as do the lower meadows and pastures. They always include many sun-loving shrubs which can compete with the grasses, and which cannot grow in the shade of forests, such as Brambles (*Rubus*), Rhododendrons, the Butterfly Plants (*Lespedeza*), *Smilax china* and others. Herbs with larger or more delicate leaves shelter among the tall grasses.

The steppe-like grasslands are thought to be perpetuated by fire which often sweeps them when they are dry in autumn (October to December) and the forest frequently survives in the deep erosion gullies which cross them, where there is shelter from typhoons, and more moisture. If not destroyed, the next stage in succession back to forest is the appearance of such bushes as *Mallotus*, *Clethra*, *Callicarpa*, Summer-green species of *Symplocos*, followed by leaf-losing Oaks, especially the fire-resistant Daimyo Oak (*Quercus dentata*), or in the hills and lowlands, the Red Pine (*Pinus*

densiflora). Between the grasslands and the forests on the mountains in mid-Japan, beautiful Summer-green shrubs often form flowery bush-woods in places too dry and exposed for high forest to flourish, perhaps also a succession stage in some cases. Grasslands are replaced on the sterile sands of the upper slopes of isolated volcanoes in the south by bushland, mainly of Rhododendrons.

The lowland and hill meadows are probably mostly also on old forest land of finer textured soils, and would revert to woods if left. Some may be a transition to wet water-meadows where the water-table is too high for forests to flourish, or are subject to flooding.

Many European grasses and other plants have become naturalized in the meadows.

A number of plants growing in the drier parts of the mountain meadows and grassy slopes at low altitudes find shelter among the tall grasses and shrubs, especially in more level places, where better soil can collect, though the heavy rainfall enables a number of them to grow even on poor sandy soil.

There are also numerous annuals and biennials, especially in the lowlands and hills.

Succession to forest on the hills and low mountains of temperate Japan

The tall stems of *Miscanthus (Eulalia) sinensis*, standing five or six feet high, are abundant and characteristic everywhere. They bear narrow leaves arching out from their whole height to form fountain-like clumps, topped by fingered purplish flower spikes. As well as the typical form, varieties with leaves striped or with cross bars of yellow (*Miscanthus sinensis zebrinus*), or with very narrow foliage (*Miscanthus sinensis gracillimus*) are cultivated and valuable for their graceful growth. A relative *Miscanthus floridulus* is only found from central Honshu southward, where it is common, as is another stout tufted grass *Themeda japonica*, a yard high with spiky heads, which extends to the north of Honshu. Abundant, especially in sandy soil all over temperate Japan, is the running grass *Imperata cylindrica*, which, in its varieties, is very widespread in warm and tropical lands. It grows three feet tall with silvery-white spikes of flowers in May and June.

Other tall grasses common on the sunny hills and in the developing bush thickets in all the islands are the yard-high clumps of *Eccoilopus (Andropogon) cotulifer* with loose sprays of drooping spikes; *Arundinella hirta* of the same height and bearing purplish plumes in late summer; and the handsome two-foot tussocks of *Pennisetum alopecuroides*, sending up thick, softly bristly, purple-tinged flower spikes in the form of pokers. Below these tussocks in open places spread lower grasses; the dense running mats of stiff, narrow leaves, only a few inches high, of *Zoysia japonica*,

much used for lawns in hot climates; the very widespread Crested Hair-grass *Koeleria cristata* (*gracilis*); and several others.

Also very characteristic and common as pioneers are species of *Lespedeza* of the Pea family. Shooting up annually from a base which becomes woody, to a height of nearly two yards, *Lespedeza bicolor* sends out in late summer spikes of rather small rosy-purple flowers from the axils of its trifoliate leaves. It persists as underwood with the thickets of shrubs that grow up as the grass-land reverts to thin woods of Oak or Pine, but dies out if the forest becomes dense. The smaller *Lespedeza cyrtobotrya*, absent from Hokkaido, of similar growth but with crowded, umbel-like heads of rosy-purple, *Lespedeza thunbergii* (*sieboldii*), also not found in Hokkaido, its flower-spikes of the same colour but collected into big clusters near the top of five-foot stems, and *Lespedeza cuneata* (*sericea*), stiff and slender-shooted, very leafy and producing short dense clusters of white, purple-marked blossom, are all semi-woody plants dying back in winter and useful in the garden for late-summer flowering.

Another common early colonist of open slopes, sprawling among the grass tussocks and later scrambling over the young growing bushes, is *Smilax china* forming networks of prickly stems which bear glossy oval leaves with a pair of tendrils on their stalks. It is related to *Asparagus*, and its little yellow-green flowers set abundant red berries. *Smilax sieboldii* is a similar climber with black berries, but it is not such a typical pioneer.

Seedlings of shrubs soon appear in open places to compete with the grasses as they grow up. Typical early woody colonists are several species of Brambles (*Rubus*). Some of them grow into large bushes, others arch or scramble and form dense thickets. Abundant everywhere is the Japanese Wineberry *Rubus phoenicolasius*, sending up arching canes densely covered with short red bristles and a few thorns, and opening clusters of white blossoms from long-pointed sepals also clothed in red bristles, and which sets red conical fruits; the stiffly erect, man-high bushes of *Rubus crataegifolius* of the mountains, with few and small prickles and very large, three-lobed leaves like those of a Maple, showing trusses of rather large white flowers and red fruit; the arching, ten-foot velvety canes of *Rubus mesogaeus* carrying clusters of small rosy-pink blossoms followed by round black fruits; and the much lower shrubs of *Rubus parvifolius* which form tangles of slender branches clothed with dark green, white-backed foliage and which bear bright rose-pink flowers and red berries. All these lose their leaves in winter. Common in the lowlands and foothills, but not ascending far up the mountains or extending into Hokkaido, are the little shrubs of *Rubus hirsutus* with densely downy leaves, few and slender prickles, and usually solitary white flowers setting red fruits; and the larger but slender branched *Rubus microphyllus*, also non-scrambling and leaf-losing, and bearing white blossoms with purple-red stalks and calyces, followed by round red fruits.

With the Brambles a number of species of *Rhododendron* soon seed themselves into open places, especially when rocky, and are characteristic pioneers. Most common and widespread on sunny slopes in both hills and mountains are the big bushes, up to ten feet high, of *Rhododendron kaempferi*, which retains many of its young leaves throughout the winter, and shows bell-shaped blooms ranging through shades of rose-scarlet to rose-purple. It is one of the parents of many evergreen garden hybrids, including the Kurume Azaleas. In the mountain thickets of Honshu and southwards it is joined by *Rhododendron semibarbatum*, also making large bushes, but with white flowers flushed pink, and leaves which all fall in autumn after changing colour to orange and crimson; the beautiful *Rhododendron quinquefolium* carrying its deciduous leaves, which colour vividly in the autumn also, in whorls at the end of its shoots, and small clusters of hanging saucer-shaped blooms which are white with green spots; and *Rhododendron nudipes* with rose-purple solitary or paired flowers on its big bushes. Other species of *Rhododendron* of open woodland are also to be found as pioneers.

Other bushes of open woodland which commonly grow up among the Rhododendrons and Brambles as pioneers forming the thickets which shelter and precede the new young trees are the leaf-losing *Symplocos chinensis pilosa (crataegoides)* with its Hawthorn-like flowers and brilliant sky-blue berries; *Callicarpa japonica* with its bead-like rosy-purple ones, *Mallotus japonicus* (in the lowlands only, and not reaching Hokkaido); and *Clethra barbinervis*. Saplings of the Japanese Red Pine *Pinus densiflora* are generally the first trees to shoot up above the thickets and form light woods.

The grasses

Many European grasses are naturalized in the meadows.

Agropyrum tsukushiense Clump-forming, 1½ to 3 feet, narrow spikes. Grassy and open waste places, lowlands, all Japan, very common; Korea, Manchuria, China, Ryukyus.

Arthraxon hispidus Creeping leafy stems, 8 to 20 inches, fan-shaped heads of pale green to purple spikes. Lowlands and hills, all Japan, very common; E. and tropical Asia.

Arundinella hirta Creeping, stout, hairy, 1 to 3 feet, rather dense panicles of dull purplish or bluish spikelets. Lowlands and mountains, all Japan, very common; open woods and sunny slopes.

Bothriochloa parviflora 1½ to 3 feet, sprays of slender spikes of few red-brown spikelets. Open places and thickets, lowlands, C. and W. Honshu, Shikoku, Kyushu; Manchuria, Korea, China, India, Malaysia, Australia.

Bromus yezoensis 2½ to over 3 feet, nodding sprays of large spikelets. Grassy places in lowlands, Hokkaido; S. Kuriles, S. Sakhalin.

Cymbopogon tortilis Clumps, 2 to 3 feet, narrow interrupted heads of pale green to dull purple spikes. Open places in hills, 3 southern islands; Manchuria, China, Taiwan, Philippines, Indochina.

Eccoilopus cotulifer 2½ to 3½ feet, fingered white-downy long-stalked spikes in nodding heads. Grassy places and thickets in hills, all Japan, common; Korea, China, Taiwan, India.

Eriochloa villosa 1½ to 3 feet, 1-sided white-downy spikes in pyramids. Grassy places, 3 southern islands, rather common in lowlands.

Festuca ovina coreana Tufted, narrow leaves, 8 to 16 inches. Hills and low mountains of 3 southern islands, common; Korea.

Imperata cylindrica Creeping, 1 to 2½ feet, narrow dense heads of silver-white short spikes. Open ground in lowlands, often a pioneer, all Japan, very common; widespread in warm temperate regions.

Kengia (Cleistogenes) hackelii 1½ to 3 feet, narrow spires of grey-green spikelets marked purple, often not out of sheath. 3 southern islands; Korea, China, Ussuri, Mongolia.

Koeleria cristata Lowlands and mountains of all Japan, rather common. Temperate N. Hemisphere.

Miscanthus sinensis 3 to 6 feet, leaves arching from Reed-like stems, sprays of downy white to purple spikes. Slopes in lowlands and mountains of all Japan, common, one of the main pioneers. S. Kuriles, Korea, China, Taiwan, Ryukyus.

Miscanthus floridulus Evergreen, 1 to 2½ yards, blue-green arching stem leaves, pyramids of downy white spikes. Lowlands, C. and W. Honshu, Shikoku, Kyushu; Taiwan, Pacific islands.

Pennisetum alopecuroides (japonicum) 1 to 2½ feet, single cylindrical, thick bristly purplish spikes. Grassy places and open ground, lowlands, S.W. Hokkaido, Honshu, Shikoku, Kyushu, very common; Korea, China, Taiwan, Philippines.

Poa sphondylodes Clump-forming, blue-green, 1 to 2 feet, narrow panicles. Sandy, sunny places, all Japan, very common; E. Siberia, Korea, China, Taiwan.

Sorghum nitidum Clump-forming, 1½ to over 3 feet, tall narrow heads of brown-hairy spikes. Open ground and thickets, lowlands, S.W. Honshu, Shikoku, Kyushu; S. Korea, China, Malaysia.

Themeda japonica (triandra japonica) Clump-forming, with stem leaves, 2½ to 3 feet, short spikes of large, hairy and awned, rusty-brown spikelets. Lowland and low mountains, 3 southern islands, common and often a pioneer; Manchuria, Korea, China, India.

Trisetum bifidum 1½ to 2½ feet, soft, nodding yellow-brown shiny panicles. Hills and lowlands, W. Hokkaido, Honshu, Shikoku, Kyushu, very common; Korea, China, Taiwan.

Zoysia japonica Wide-creeping, 4 to 8 inches, short narrow to awl-shaped leaves, narrow heads of shiny spikelets. Sunny slopes in hills and mountains, all Japan, common, often used for lawns; Korea, China.

Perennial species of *Paspalum*, *Sporobolus*, *Panicum*, *Eulalia*, *Cynodon dactylon*, and others, with many annual or biennial grasses.

Plants of the lowland and hill meadows and grasslands

Pteridium aquilinum

Plants flowering in spring and early summer

Mid-March to mid-June

Ajuga shikotanensis With stolons, 4 to 10 inches, rosette-forming, spikes of whorled, small pale purple flowers. Sunny hills, Honshu, rather rare; related to *Ajuga genevensis*.

Ajuga nipponensis Greyish downy, 4 to 10 inches, terminal spikes of pale blue whorls between small bracts. Low mountains, Honshu, Shikoku.

Ajuga other species

Aletris spicata 1 to 1½ feet, narrow leaves, many-flowered spikes of erect, small, narrow, white to reddish bells. Hills and low mountains, C. and W. Honshu, Shikoku, Kyushu; Taiwan.

Allium grayi 1½ to 2 feet, 3-angled leaves, heads of pale pink flowers with many bulbils. Lowland meadows to foothills, all Japan; China.

Arabis (Turritis) glabra "Tower Mustard". Dandelion basal leaves, clasping spear-leaves on stem, 1 to 2½ feet, heads of small white flowers. Sunny places, lowlands to foothills, all Japan; temperate N. Hemisphere.

Asparagus schoberioides 1½ to 3 feet, many branches, bundles of sickle-shaped shiny cladodes, small greenish-yellow axillary bells, red fruits. All Japan; Sakhalin, Dauria, Ussuri, Manchuria, Korea, China.

Astilbe simplicifolia 4 to 12 inches, lobed leaves, loose plumes of small white flowers. Pacific C. Honshu, endemic to the Fuji volcanic region, rare.

Astilbe thunbergii 1½ to 2½ feet, leaves cut into 3s, slender white plumes. Sunny grassy places, 3 southern islands, common.

Bletilla striata (Orchidaceae) 1 to 2 feet, narrow-oval leaves, spires of rosy-purple large flowers. Grassy foothill slopes, C. and W. Honshu, Shikoku, Kyushu, rare; China.

Campanula punctata 1½ to 2½ feet, hairy heart-shaped leaves, rose-purple, nodding, dark-spotted bells. Grassy slopes in lowlands to low mountains, all Japan, common; N. China.

Cymbidium goeringeri (virescens) (Orchidaceae) Clumps of evergreen narrow leaves, 4 to 10 inch stems, solitary greenish flowers with white lip spotted red-purple. Grassy places in foothills, 3 southern islands; China.

Erigeron thunbergii 4 to 14 inches, clumps of spatula-shaped leaves, solitary large blue-purple daisies. Grassy slopes in lowlands and mountains, N. and C. Honshu.

Fritillaria amabilis 6 to 8 inches, 2 mid-stem leaves, whorl of narrow ones at top, unchequered yellowish narrow bell. W. Honshu, Shikoku, Kyushu, rare.

Fritillaria japonica 6 to 8 inches, similar, broader bells pale yellow chequered dark purple inside. C. Honshu, Shikoku, rare.

Gagea japonica Resembles *Gagea lutea*, smaller. Lowland river meadows, Honshu, Hokkaido, rare.

Gentiana thunbergii Biennial, 2 to 6 inches, blue trumpets. Sunny places in lowlands and mountains, 3 southern islands, rather common.

Gentiana squarrosa Similar, smaller. (Annual.)

Gnaphalium affine Biennial. White-woolly, leafy, 6–16 inch stems, woolly spatula-shaped leaves, dense heads of small pale yellow button-flowers. Open ground in lowlands. All Japan, common.

Gnaphalium other species.

Hypoxis aurea Linear leaves 4 to 10 inches, stem 1½ to 4 inches, 1 or 2 small yellow flowers, hairy outside. Sunny slopes and thickets in foothills, C. and S.W. Honshu, Shikoku, Kyushu, rather rare; China, India, Malaysia.

Ixeris dentata Slender 8–20 inch stems, narrow leaves, few-rayed, cup-shaped yellow (or white in a variety) daisies. Sunny places in lowlands and low mountain slopes. All Japan.

Ixeris japonica (debilis) Creeping leafy stems 4–12 inches long, large yellow daisies. Open ground in lowlands. All Japan, common.

Ixeris stolonifera Prostrate stems, rounded leaves, few large yellow daisies. Open ground in lowlands and mountains. All Japan, common.

Lithospermum (Buglossoides) zollingeri Running, growth like *Lithospermum purpureocaeruleum*, 9 inches, 1-sided heads of light-blue stars. Sunny grassy slopes. All Japan; Korea, China, Taiwan.

Lotus corniculatus japonicus Open ground and waste places, all Japan, common, the type in Eurasia.

Luzula capitata Related to *Luzula campestris*. Clumps of linear leaves, 4 to 12 inches, dense heads of small green to red-brown flowers. Lowlands and mountains, rather common, all Japan; Kamchatka, E. Siberia, Sakhalin, Korea, China.

Luzula plumosa macrocarpa Often with stolons, linear leaves, loose open heads of small green, part red-brown flowers. Hills and mountains, all Japan, rather common; Amur, Korea, China.

Luzula other species.

Lysimachia japonica Sprawling and creeping leafy stems, oval, pellucid-dotted leaves, axillary, solitary, small yellow flowers. Thickets and open ground in lowlands and mountains, all Japan, common; China, Taiwan, Malaysia.

Picris hieracioides Biennial. 12 to 32 inches tall, rough stems and lance-shaped leaves, many heads of Dandelion-flowers. Grassy places in lowlands and mountains. All Japan, common.

Polygala japonica (sibirica) Mat-forming, 4 to 12 inches, loose spikes of purple flowers. Grassy slopes in lowlands and hills, all Japan, very common; Korea, Manchuria, China, Taiwan.

Potentilla kleiniana Close to *Potentilla reptans*. 8 to 16 inches, 5-foliolate leaves, sprays of small yellow flowers. 3 southern islands, rather common; Korea, China, India, Malaysia.

Potentilla chinensis 1 to 2 feet, stems leafy, doubly pinnate leaves, white-woolly beneath, sprays of many flowers. Sandy sunny places especially along lowland rivers, 3 southern islands; Amur, Manchuria, Korea, China, Taiwan.

Potentilla other species.

Pulsatilla cernua 4 to 16 inches, silky cut leaves and ruff, nodding narrow bells, silky outside, dark red-brown to red-purple inside. Grassy slopes in foothills, 3 southern islands, rather common; Korea, China.

Ranunculus japonicus Close to *Ranunculus acris*. Grassy places in lowlands and mountains, S.W. Hokkaido, 3 southern islands, common; Korea, China, Taiwan, Ryukyus.

Rumex species Docks.

Scutellaria indica Creeping, 8 to 16 inches, heart-shaped leaves, whorls of pale purple, long-tubed trumpets. Sunny hills, 3 southern islands, common; Korea, China, Taiwan, Indochina.

Scutellaria indica parvifolia (indica japonica) Sprawling, shorter. C. and W. Honshu, Shikoku, Kyushu.

Scutellaria other species

Sedum japonicum Basal mats of cylindrical leaves, flower stems 4 to 6 inches, branched, small yellow-white stars. Rocks in thin woods and sunny slopes in foothills, 3 southern islands, common.

Sedum lineare Straggling, narrow lance-shaped leaves in whorls of 3, loose umbels of yellow stars. 3 southern islands.

Sedum other species.

Senecio integrifolius Resembles *Senecio campestris*. Rosettes of cobwebby oblong leaves, few narrow stem leaves, heads of large yellow daisies, 8 inches to 2 feet. Sunny slopes in hills and low mountains, 3 southern islands, common; Korea, Manchuria, China, Taiwan.

Smilax china Creeping woody base, 1½ to 6 feet, much branched, sprawling, prickly, shiny oval leaves with tendrils on stalk, axillary umbels of yellow-green small flowers, red fruits. Hills and mountains, all Japan, common, often a pioneer; Korea, China.

Spiranthes sinensis (Orchidaceae) Slender, 4 to 16 inches, dense spikes of small, half-closed, pale rose flowers with white lip. Grassy places in lowlands and hills, all Japan, very common; Siberia, Sakhalin, Kuriles, Manchuria, Korea, China, Taiwan, India, Malaysia, Australia.

Taraxacum japonicum Resembles "Dandelion". 8 inches, pinnately cut leaves, single large yellow suns. C. and W. Honshu, Shikoku, Kyushu.

Taraxacum other similar local species.

Taraxacum albidum Similar growth, flowers white. C. and W. Honshu, Shikoku, Kyushu.

Thesium chinense (Santalaceae) 4 to 10 inches, erect, linear leaves, small green flowers. Lowland and mountain meadows, 3 southern islands, common; Korea, China.

Triosteum sinuatum (Caprifoliaceae) Herbaceous, hairy, 2 to 2½ feet, perfoliate oval leaves, 1 or 2 axillary tubular bells, yellow-green striped purple-brown inside. C. Honshu; China to Amur.

Umbellifers (*Heracleum*, *Torilis*, *Centella*, *Hydrocotyle*, and others)

Vicia cracca "Tufted Vetch". 2½ to 5 feet, pinnate leaves with tendrils, dense spikes of blue-purple flowers. Grassy places and thickets, all Japan, common on hills; temperate regions.

Vicia (Orobus) unijuga 2 to 3 feet, no tendrils, short spikes of blue-purple flowers. Grassy places and thickets, lowlands and low mountains, all Japan, very common; E. Siberia, China, Korea, Sakhalin.

Vicia other species.

Viola mandshurica (patrinii) Stemless, 2 to 8 inches, deep purple flowers. Grassy and open places, lowlands and hills, all Japan, very common; S. Kuriles, Korea, Manchuria, China, Taiwan.

Viola yedoensis (philippica) Stemless, 3 to 6 inches, purple flowers with slender spur. Grassy and open places, lowlands, 3 southern islands; Korea, Manchuria, China.

Viola phalacrocarpa (prionantha) Stemless, 2 to 4 inches, deep rose-purple flowers with slender spur. Lowlands, all Japan; Manchuria, Korea, China.

Viola other species.

Wahlenbergia marginata (Campanulaceae) Slender, branching, 8 to 16 inches, spatula-shaped leaves, small open blue funnels. Grassy sunny places in lowlands and low mountains, S. W. Honshu, Shikoku, Kyushu; Korea, China, Taiwan, Ryukyus.

Plants flowering in high summer

Late June, July, August. The season of heat and monsoon rain. Many of the scramblers on bushes, always present in the grasslands, flower now.

Agrimonia pilosa 1 to 2½ feet, thin spikes of small yellow flowers. Meadows and open ground, lowlands and hills, all Japan, rather common; Korea, China, Siberia, E. Europe.

Aristolochia debilis Scrambling, slender, 1 to 3 feet, creeping, heart-shaped leaves, single, yellow-green, tubular trumpets in axils opening obliquely, brown-purple inside. Thickets and meadows in lowlands, C. and W. Honshu, Shikoku, Kyushu; China.

Calystegia japonica Related to *Calystegia sepium*. Twining, arrow-shaped leaves, large rose flowers. Sunny grassy slopes and thickets in lowlands, all Japan; Korea, China.

Calystegia other species, including *Calystegia sepium* "Great Bindweed".

Chrysanthemum (Tanacetum) vulgare "Tansy". 2 to 2½ feet, flat heads of rayless yellow flowers. Hokkaido; Korea, Manchuria, E. Siberia, Sakhalin, type Eurasia.

Cirsium species.

Cynanchum (Vincetoxicum) paniculatum Erect, 1½ to 3 feet, narrow leaves, on stems, sprays of small yellow-brown stars. Grassy slopes in hills and mountains, all Japan, rather common; Dauria, Korea, Manchuria, China.

Cynanchum ascyrifolium Erect, 1 to 2 feet, oval leaves, sprays of small white stars. C. and W. Honshu, Shikoku; Korea, Manchuria.

Cynanchum sublanceolatum Scrambling, slender, narrow oval leaves, umbels of small dark purple stars. Thickets in hills and low mountains, C. Honshu.

Cynanchum other species (Asclepiadaceae).

Dioscorea tokoro Twining, arrow-shaped leaves, erect long axillary spikes of small yellow-green flowers. Thickets in lowlands to foothills, all Japan, common.

Dioscorea batatas (Dioscoreaceae) "Chinese Yam". 6 to 10 feet, twining, glossy heart-shaped leaves, axillary spikes of small white flowers. Yard-long tubers. All Japan; Korea, China, Taiwan.

Dioscorea other species.

Euphorbia pekinensis Erect branching clumps, 8 inches to 2½ feet, yellow-green heads, glands dark purple-brown. Grassy places in lowlands and mountains, 3 southern islands, common; Korea, China, Manchuria.

Geranium sibiricum Sprawling, 1 to 2½ feet, small pale rose to white flowers. Grassy places in lowlands, Hokkaido, N. Honshu; Korea, China, Siberia, Sakhalin, Kuriles.

Geranium thunbergii (*nepalense thunbergii*) Sprawling, 1 to 2½ feet, large pale rose to rose-purple flowers. Grassy places in lowlands, all Japan; Korea, China, Taiwan, Ruykyus, Kuriles.

Geranium wilfordii Sprawling, 1½ to 2½ feet, pale rose flowers veined deeper. Lowlands and hills, all Japan; Korea, Amur, Manchuria, China.

Geum aleppicum 2 to 3¼ feet, pinnate leaves, sprays of rather small yellow flowers. Thickets and grassy places in lowlands and low mountains, Hokkaido, Honshu, common; E. Europe, Turkey, Siberia, China, Korea, N. America.

Hemerocallis longituba (*fulva longituba*) 20 to 24 inches, forked heads of big orange-yellow to orange-red funnels, smooth grassy leaves. 3 southern islands, rather common.

Hemerocallis fulva kwanso Double orange-red flowers. Hills and low mountains, all Japan, common, type from Europe to Siberia.

Hypericum erectum 8 inches to 2 feet, black-dotted oval leaves on stems, rather small yellow flowers in sprays. Grassy places and thin woods, all Japan, very common in hills and mountains (*Hypericum elatum*).

Kalimeris (*Boltonia* or *Aster*) *incisa* Creeping, 3 to 4½ feet, shiny lance-shaped stem leaves, sprays of white to lilac-pink daisies. Meadows and open ground, S.W. Honshu, Shikoku, Kyushu; Siberia, Manchuria, Korea, N. China. (July–October)

Leonourus macranthus (Labiatae) 1½ to 3 feet, oval toothed leaves, interrupted whorls of large pink flowers. Grassy places and thickets, hills and mountains, all Japan; Korea, Manchuria, China.

Lilium callosum (*tenuifolium stenophyllum*) 1 to 3¼ feet, narrow stem leaves, few orange-red to yellowish turkscaps. 3 southern islands; Amur, Manchuria, Korea, China, Taiwan.

Lysimachia clethroides 1½ to 3¼ feet, creeping, narrow-oval greyish leaves on stems, dense spikes of white small flowers. Sunny hills and low mountains, all Japan, very common; Manchuria, Korea, China, Indochina.

Lysimachia barystachys 2¼ to 3¼ feet, many stem leaves, long, 1-sided, dense spikes of white flowers. Sunny hills and low mountains. C. and W. Honshu, common; Korea, N. China, Manchuria.

Macleaya (Bocconia) cordata 3½ to 6½ feet, grey-white pinnately lobed leaves, big plumes of small white flowers. Open meadows and waste ground, lowlands and foothills, 3 southern islands, common; China, Taiwan.

Pinellia tripartita (Araceae) 3-lobed basal leaves, 2½ to 4 inches in spathe of 8 to 20 inch stems, pale green outside, purple within, with long-tailed spadix. S.W. Honshu, Shikoku, Kyushu.

Pinellia ternata Similar, trifoliolate leaves, with bulbils, spathe all green. Open ground, all Japan, rather common; Korea, China.

Platycodon grandiflorum 1½ to 3 feet, leafy stems, heads of broad blue bells, balloon-shaped in bud. Grassy slopes in hills and mountains, all Japan; Korea, N. China, Manchuria, Ussuri (Aug–Sep).

Prunella vulgaris lilacina and varieties With stolons, 8 to 12 inches, hairy, dense spikes of tall blue-purple hooded flowers. Sunny places in lowlands and mountains, all Japan, common; Korea, Kuriles, cool E. Asia, Aleutians. Grades into European varieties.

Rhynchosia volubilis (Leguminosae) Twining, yellow-green hairy trifoliolate leaves, axillary spikes of yellow flowers. Thickets in hills and lowlands, C. and W. Honshu, Shikoku, Kyushu; Korea, China, Taiwan, Philippines.

Sophora flavescens (Leguminosae) Herbaceous, 2½ to 4½ feet, pinnate leaves of many leaflets, terminal spikes of green-yellow to purplish flowers. Grassy and open places in lowlands, 3 southern islands, common; Siberia, China, Korea.

Tylophora nikoensis (Asclepiadaceae) Scrambling, narrow-oval leaves, branched sprays of small dark purple stars. Thickets in lowland and mountains, 3 southern islands.

Plants flowering in late summer and autumn

Mid-September to late November

Achyranthes fauriei (Amaranthaceae) 1½ to 3 feet, branched, oval leaves, long spikes of small green-white flowers. Thickets and open ground, lowlands to hills, 3 southern islands, common; China (*Iresine*).

Adenophora triphylla japonica 1½ to 3¼ feet, whorled stem leaves, sprays of many small blue bells. Grassy places in lowlands and mountains, all Japan, common.

Artemisia japonica Herbaceous, 1½ to 3 feet, silky pinnately lobed leaves, heads of many small, round, shiny, yellow-green buttons. Sunny hills to low mountains, 3 southern islands, common; Manchuria, China, Korea, Taiwan, Philippines.

Artemisia feddei (lavandulaefolia) Creeping, with stolons, 3 to 3¼ feet, pinnately cut cobwebby leaves, many small button-flowers. Grassy places, 3 southern islands; Korea, Manchuria, China, Taiwan.

Artemisia gilvescens (vulgaris gilvescens) Related to “Mugwort”. With stolons, 1 foot, pinnately cut leaves densely woolly beneath, white-spotted above, narrow heads of tubular flowers. S. W. Honshu, Shikoku.

Artemisia princeps (vulgaris maximowiczii) Creeping, with stolons, 2 to 4 feet, pinnately cut leaves, green above, white-felted below, large sprays. Thickets and open ground, lowlands to low mountain, 3 southern islands, very common; Korea, Bonins.

Aster fastigiatus (micranthus) 1 to 3 feet, narrow leaves, many white flowers in dense sprays. Open ground especially along rivers, lowlands, 3 southern islands; Dahuria, Manchuria, Korea, China (*Aster Hauptii*).

Aster glehnii Creeping, slender, narrow downy leaves, sprays of white to purplish flowers with small centres. Grassy places in Hokkaido, grass and woods in mountains, Honshu (a variety).

Belmacanda chinensis (Iridaceae) Flattened Iris-like leaves, leafy stems, 1½ to 2 feet, branched heads of orange-red, darker-spotted, star-shaped flowers. W. Honshu, Shikoku, Kyushu; China, N. India.

Bupleurum falcatum 1½ to 2¼ feet, lance-shaped smooth leaves, heads of green-bracted yellowish umbels. Grassy slopes in hills. 3 southern islands, common; Siberia, Korea, Manchuria, China, Mongolia, Caucasus, Europe.

Chrysanthemum makinoi With stolons, woody base, 1½ to 2½ feet, 3-lobed leaves woolly beneath, solitary or few large white flowers, pink on back. Hills and low mountains, Honshu, Shikoku, common.

Chrysanthemum indicum Creeping and with stolons, 2 to 3 feet, pinnately cut leaves, loose sprays of inch-wide yellow daisies with short rays. S.W. Honshu, Shikoku, Kyushu. A parent of autumn-flowering garden Chrysanthemums.

Chrysanthemum other species

Cirsium japonicum Stems 18 inches to 3 feet or more, oblong, pinnately lobed leaves with short spines, quite large, erect, rose-lilac thistle-heads on long stems. Lowlands and low mountain slopes, Honshu, Shikoku, Kyushu, very common.

Cirsium dipsacolepis 18 inches to 3 feet, large, lance-shaped, shallowly pinnately cut leaves, few large, rose-lilac thistle-heads. Lowlands of Honshu, Shikoku, Kyushu.

Cirsium nipponicum 3 to 6 feet tall, with several varieties from seashore to high mountains. Long, thick, pinnately cut, spiny leaves, large clusters of many, nodding, small, rosy-lilac thistle-flowers. All Japan in its varieties.

Cirsium pendulum Biennial. 3 to 6 feet tall, long, narrow, pinnately cut leaves, tower-like leafy clusters of many, nodding, small rose-lilac thistle-flowers on long upright stalks. Grassy places in lowlands. North Honshu, Hokkaido.

Cirsium tanakae 18 inches to 3 feet high, narrow, cobwebby, deeply pinnately cut leaves, erect, rose, thistle-heads in pairs on long stalks. Grassy places in north and central Honshu, a variety in mountains.

Desmodium heterocarpon (Leguminosae) Sprawling subshrub, pinnate leaves, spikes of small red-purple flowers. Grassy slopes and open ground, lowlands C. and W. Honshu, Shikoku, Kyushu, locally common; China to India, Taiwan, Malaysia.

Dianthus superbis longicalycinus 1 to 2 feet, branched, narrow greyish-green leaves, heads of large, pale rose, deeply fringed flowers. Meadow lowlands and mountains, 3 southern islands; Korea, China, Taiwan. (July to October)

Echinops setifer 3 feet, pinnately cut, spine-edged leaves, white-woolly beneath, balls of blue flowers. Low mountains, S.C. Honshu, Shikoku, Kyushu; Korea.

Eupatorium fortunei 3 to 4½ feet, opposite, 3-cleft leaves, dense flattish heads of small white flowers. Grassy slopes and riverbeds, C. and W. Honshu, Shikoku, Kyushu; Korea, China.

Habenaria flagellifera (Orchidaceae) 8 to 20 inches, leafy lower stems, spikes of spurred red-green flowers. Grassy places in lowlands, C. and W. Honshu, Shikoku, Kyushu.

Heteropappus hispidus 1 to 3 feet high, *Aster*-like plant with narrow leaves on roughly hairy stems, branching heads of pale lilac daisies. Lowlands of Honshu, Shikoku, Kyushu.

Indigofera pseudotinctoria Subshrub, slender, twiggy, pinnate leaves, dense spikes of small pale pink to white flowers. Grassy slopes and river banks, C. and W. Honshu, Shikoku, Kyushu, very common; C. China.

Leibnitzia anandria (Compositae) Pinnately cut leaves, heads of white daisies with red-purple backs on 4 to 8 inch stems in spring, rayless ones in autumn on 2 feet stems. Grassy hills and low mountains, all Japan; Sakhalin, Siberia, Manchuria, China, Taiwan.

Lespedeza cyrtobotrya (Leguminosae) Herb with woody base, 2¼ to 3½ feet, trifoliate leaves, short axillary spikes of rose-purple flowers. Meadows and grassy places in hills and low mountains, 3 southern islands, common; Korea, China.

Lespedeza bicolor Rather sprawling herb with woody base, trifoliate leaves, 2 to 5½ feet, spikes of rose-purple flowers. Grassy places and thickets, lowlands and mountains, all Japan, common; Korea, Ussuri, Manchuria, N. China.

Lespedeza cuneata Stiff, erect herb, twiggy, densely leafy, 2 to 3 feet, axillary clusters of white flowers blotched purple. Open ground and grassy places, lowlands, all Japan, common; Korea, Manchuria, China, Taiwan, India, Australia.

Lespedeza pilosa Trailing, 2 to 3 feet, trifoliate leaves, short spikes of small yellowish to white flowers. Thickets and grassy places, lowlands and hills, 3 southern islands, rather common; Korea, China.

Lespedeza other species

Lycoris radiata (Amaryllidaceae) 1 to 1½ feet, narrow strap-shaped leaves appearing in autumn, umbels of bright red to pink funnels. Around meadows and open ground, lowlands and hills, 3 southern islands; China.

Lycoris aurea 1 to 2 feet, shining, strap-shaped, bluish-green leaves, heads of few large yellow funnels. Open ground, warmer parts of Shikoku, Kyushu; Ryukyus, Taiwan, China.

Nothoscordum (Allium) inutile Flower stems before linear leaves in autumn, 8 to 12 inches, umbels of small white bell-shaped flowers. Lowland meadows, Honshu, rare.

Osbeckia chinensis (Melastomaceae) 1 to 1½ feet, slender, lance-shaped leaves, terminal heads of few, large, open, rose-purple flowers. Grassy places, lowlands, E.C. Honshu, Shikoku, Kyushu; China, Taiwan, Ryukyus, Malaysia.

Oxalis corniculata Creeping stems, trifoliate leaves, heads of yellow flowers. Open ground in lowlands and hills, all Japan, very common. Cosmopolitan in warm and temperate regions.

Oxalis fontana Similar, 8 to 16 inch stems from creeping rhizomes. Hokkaido, C. N. Honshu; Temperate Asia, N. America.

Patrinia villosa (Valerianaceae) With stolons, 1½ to 3 feet, oval or pinnately cut, white-downy leaves, heads of many small white flowers. Sunny hills and foothills, all Japan, common; Korea, Manchuria, China, Ryukyus.

Plectranthus inflexus (Labiatae) 1½ to 2½ feet, toothed oval leaves, long spikes of whorled blue-purple flowers. Thickets and thin woods, hills and low mountains, all Japan, common.

Polygonum cuspidatum (*Polygonum sieboldii* of gardens 6 to 9 feet) 1½ to 4½ feet when wild, branched arching leafy stems, oval leaves, sprays of cream-white small flowers, wide-creeping. Sunny places in hills and high mountains, all Japan, very common; Korea, China, Taiwan. The high mountain form is *Polygonum cuspidatum compactum* (*Polygonum reynoutria*).

Rubia akane Creeping, long branching stems, oval to heart-shaped leaves whorled in 4s, sprays of pale yellow stars, black fruits. Thickets in lowlands and low mountains, 3 southern islands, rather common; Korea, China, Taiwan.

Scilla scilloides 2 linear leaves 8 to 16 inches, dense spikes of rose-purple half-closed flowers. Hills and lowlands, all Japan; Korea, Manchuria, China, Ussuri, Taiwan.

Sedum telephium purpureum 1 to 1½ feet, fleshy, flat, greyish stem leaves, large dense flattish heads of deep rose-purple stars. Rocky slopes and thickets, Hokkaido, Honshu, Kyushu; Siberia, Europe.

Sedum verticillatum 1 to 2 feet, greyish whorled flat leaves often dark brown spotted, dense heads of yellow-green flowers with dark anthers. All Japan; Kamchatka, Siberia, Europe.

Sedum aizoon Erect stems, 8 to 20 inches, narrow flat toothed leaves, heads of many yellow stars. Hokkaido, Honshu; Siberia.

Sonchus brachyotis 1–3 feet tall leafy stems, creeping rootstocks, oblong leaves, many yellow Dandelion heads. All Japan; Kuriles, Sakhalin, Korea, China, Siberia, Altai.

Veronicastrum sibiricum (related to *Veronicastrum virginicum*) Leaves in whorls on stems 2½ to 5 feet, long dense terminal spikes of small blue-purple flowers. Grassy places in lowlands and mountains, all Japan; Sakhalin, Siberia, Manchuria, Korea, N. China.

THE SUMMER-GREEN FORESTS OF JAPAN

The magnificent Summer-green forests of Japan are seldom dominated by one species of tree as in Europe, but of several species growing together. The high canopy is irregular therefore, and allows enough sunlight through for a very rich underwood of many lesser trees and shrubs to flourish. Large lianes, mostly leaf-losing, climb the trees and loop and twine over the bushes in tangles and festoons. Many of the trees, bushes and lianes turn to blazing reds and yellows before the leaves fall, giving a splendid display of fiery colour in autumn, enhanced by the dark Cypresses and other Conifers which grow intermixed in the mountains. These forests share a large number of fine trees, lianes and shrubs cultivated in occidental gardens with those of southern Korea and the

mountains of central China, though some are peculiar to Japan. Epiphytes are not nearly so common as in the Evergreen forests, and are mostly Ferns which can stand some dry periods.

Cooler winters with increasing snow and frost, and sunlit springs when the trees and bushes are leafless, cause the plants of the forest floor to take on more marked seasonal aspects than in the Evergreen forests. There are fewer evergreen ones, even among the Ferns. First a carpet of low plants shoots up quickly and often flowers before their foliage is fully developed, followed by taller ones a little later before the canopy is dense. In high summer in the shade, only a few plants flower among the many Ferns – Enchanters Nightshades, Sanicles and other Umbellifers, and of course Labiates. Along brooks colonies of members of the Nettle family produce inconspicuous flowers, with other large plants, but in gaps and thin woods several more decorative plants bloom. In late summer and autumn the woods are taken over by Composites, mostly large and coarse – woodland Thistles, Asters and their relatives, with Cimicifugas and Monkshoods.

The warm-climate (Oak–Chestnut–Magnolia) and cool-climate (Beech–Oak) Summer-green forests

The Summer-green forests are not uniform over the whole of their range, though the different types merge into each other and there is no sharp distinction between them. In the warm lowlands and foothills of the Summer-green zone, especially on the Pacific side, the predominant trees which take the place of the Evergreen Oaks and Laurels are several leaf-losing Oaks, Sweet Chestnuts and Magnolias, accompanied by more scattered individuals of a number of other trees. These forests reach higher in the mountains of the south-west, where several trees and bushes (and lower plants) grow which are not found elsewhere. Near the upper range of these forests in the mountains, several stately Conifers become conspicuous in the woods – Cypressess, Thujas, and locally the Umbrella Pine, sometimes in pure groves, as they are much planted. Alders and Willows line the streams, and the Red Pine is still the main tree, sometimes almost alone, or with the leaf-losing Daimyo Oak, on dry, sandy hills.

At greater elevations in the mountains, as the winters become longer and cooler, the forests gradually change, and the Beeches, which have been scattered even in the lower forests, become predominant, but still intermixed with many other trees. Some of the more tender trees and shrubs disappear, their places taken by hardier ones, but the character of the forest is not greatly altered. Still further up the mountains they merge into high-mountain Conifer forests with the appearance of Silver-Firs, Spruces and Hemlocks among the Beeches in cold gullies.

Similar changes occur on travelling northward as the winter snow-cover increases. The Oak–Chestnut–Magnolia forests continue on warm hillsides even into south Hokkaido, but many south-

ern species drop out, especially in the northern island, as the strait between Honshu and Hokkaido seems to be a very old and important divide. The Alders and Willows along the river alluviums are joined by tall Poplars and Ashes, while on the hills and mountain-sides northern Birches, big members of the *Aralia* family, and others appear. The forests are not so varied, the underwood is not so interwoven by climbers, and tall Bamboos are absent though low creeping ones still occupy large areas of the forest floor. The beautiful Cypressess do not reach the far north of Honshu. The north-easternmost Summer-green forests, in Hokkaido, are river-valley woods of Ashes, *Acanthopanax* and a number of others common in northern forests, which are mixed with Spruces and Silver-Firs on the mountain-sides. Higher up the leaf-losing trees become smaller and fewer, only as an understorey among the Conifers until they die out entirely. Many open slopes in these woods are overgrown by low, running Bamboo brakes. On sandy hills nearer the coast the Mongolian Oak is common, with beds of Bracken below.

The finest Summer-green forests are those on the mid-slopes of the great mountains of central Honshu, with their bouldery torrents and waterfalls in cool ravines, and their flower bush thickets. Here the complete transition occurs, from Evergreen woods, through Oak–Chestnut–Magnolia up to about 3,250 feet where the Beeches become predominant, to high-mountain Silver-Fir–Spruce–Hemlock forest at around 5,000 feet, ending in Subalpine scrub and Elfinwood. A number of trees, bushes and lower plants grow nowhere else in all Japan but in these mountain forests.

On the Japan Sea side of central and north Honshu, under its very deep and prolonged snow-cover, the forests are modified also. A number of evergreen bushes are found beyond their eastern range, protected by the snow, several more are prostrate, and in the ravines the copious melt-water causes giant herbs to flourish which do not grow elsewhere, or, if they do, only in forms of much smaller growth.

I. THE WARM-CLIMATE OAK–CHESTNUT–MAGNOLIA FORESTS

Note: “All Japan” means all Summer-green zone; “South-west” means the Kinki and Chugoku Districts of Honshu with Shikoku and Kyushu.

Trees of the canopy

Aesculus turbinata Sometimes a big tree resembling the European Horse Chestnut but with much larger leaves. Common singly in mountain ravines of all Japan.

Castanea crenata Like European Sweet Chestnut but a smaller tree. Round-toothed leaves. Common from south-west Hokkaido southward, but not high in the mountains.

Cercidiphyllum japonicum Tall, slender-branched, often with several trunks. Small leaves turn pink and yellow. All Japan.

Fagus crenata (sieboldii) Very like European Beech. Scattered; more common in cooler forests, but not far into Hokkaido.

Magnolia obovata (hypoleuca) Wide-spreading tree up to 80 feet. Huge white cups, big leaves falling in autumn. Slow to flower in Britain. Singly in mountains of all Japan, best in north.

Pinus densiflora The Red Pine of dry sandy foothills, northward to south Hokkaido.

Pterocarya rhoifolia Japanese Wingnut. Can reach 100 feet, usually much lower. Big pinnate leaves, thick twigs, long dangling catkins. Common in mountain stream valleys of all Japan.

Quercus variabilis Medium-sized tree with corky bark. Leaves with awn-tipped teeth, yellow-grey felted beneath. C. Honshu westward, Shikoku, Kyushu. Sometimes to 80 feet.

Quercus mongolica grosseserrata (crispula) Up to 100 feet. Glossy, deeply toothed leaves, Very common in mountains of all Japan.

Quercus acutissima (serrata of Blume) Slender branches, small shiny bristly leaves. 40 to 50 feet. Not Hokkaido.

Quercus serrata (of Thunberg) (glandulifera) Slender tree, glossy silver-backed leaves. 40 to 50 feet. Very common everywhere.

Quercus dentata Daimyo Oak. 60 feet tall, gaunt tree, round-lobed leaves a foot long. Open, dry sandy woods everywhere, especially near the coast.

—All these Oaks are leaf-losing and are important in the canopy.

Ulmus laciniata (montana laciniata) Widespreading, related to Wych Elm. Scattered singly in woods over all Japan.

Ulmus davidiana japonica (propinqua) Drooping branches. Scattered over all Japan but rare. Neither Elm very large.

Trees of more restricted range

Chamaecyparis obtusa 100 feet, conical. Red-brown bark, flattened dark green fronds, slow-growing. Mountains of central Honshu and south-west.

Chamaecyparis pisifera Similar, not so good in Britain. Mountains of central Honshu and Kyushu only.

The Japanese Cypresses often grow in pure groves and are much planted. They are not so quick-growing, and do not grow so tall in Britain as those from north-west America, but are handsome trees. Several dwarf forms of both, many with juvenile foliage and once called *Retinospora*, are valuable in gardens.

Pseudotsuga japonica Up to 100 feet. Red-brown bark, widesweeping branches, flat ranks of needles. Singly in mountains of Shikoku and nearby Pacific Honshu, but rare. Poor in Britain.

Sciadopitys verticillata Umbrella Pine. Up to 100 feet. Scale-leaves, needle-like modified shoots like umbrella spokes in tiers. Local in mountains from north-central Honshu south-west, endemic, sometimes in groves. Good in Britain.

Thuja standishii (japonica) Smaller than Cypresses, open-branched, drooping fronds. Singly in mountains of Honshu and Shikoku, sometimes in pure groves.

Zelkova serrata (keaki or acuminata) Very local in hills and mountains of 3 southern islands. Much planted.

Abies firma —

Cryptomeria japonica —

Torreya nucifera —

Tsuga sieboldii —

—Singly in lower parts of south-western forests only. Large plantations of *Cryptomeria* in mountains of most of the 3 southern islands.

Trees and bushes of wet streamsides

Acer ginnala 20 feet, sometimes shrubby. Evenly ranked, spear-shaped, 3-lobed leaves turning red, sprays of yellow-white flowers. Wet streamsides, all Japan; Korea, Manchuria, E. Siberia.

Alnus firma hirtella Small tree or bush to 10 feet, long-pointed leaves, erect "cones". Common in Honshu.

Alnus firma yasha Similar but downy. Common in mountains of Kyushu.

Alnus hirsuta (incana hirsuta) To 65 feet. Dull, lobed, doubly-toothed leaves, rusty below. Mountains and hills, all Japan; Kamchatka, Sakhalin, E. Siberia, Korea.

Alnus hirsuta sibirica (incana glauca) Similar, less downy. Similar range.

Alnus japonica 60 to 80 feet. Pyramidal. Narrow, glossy, dark green leaves. Common wet lowlands of all Japan.

Alnus serrulatoides (glutinosa or maritima japonica) Small tree. Dark, smooth bark, leaves broader at tip with fine teeth. Along rivers, C. to W. Honshu, Shikoku.

Often beneath the Alders are the very dense, stiff and neat shrubs of the little evergreen Holly *Ilex crenata*, showing black berries among its small, crowded, narrow and glossy leaves.

Pterocarya rhoifolia Japanese Wingnut. To 100 feet. Long pinnate leaves, catkins to 1 foot, 2-winged nuts. Rather common in mountain valleys of all Japan.

Salix eriocarpa Tree. Narrow lance-leaves, slim catkins with leaves. Wet lowlands of Honshu, Shikoku, Kyushu.

Salix subfragilis (amygdalina or triandra nipponica) Tree to 30 feet, or bushy. Narrow lance-leaves, catkins slim. Wet lowlands of all Japan; Sakhalin, Manchuria, Ussuri, Korea, N. China.

Salix gracistyla Bush to 6 feet. Grey-green, rather narrow leaves silky below. Catkins woolly, before leaves, orange or scarlet stamens. All Japan; Korea, Manchuria, China.

Salix gracistyla melanostachya Catkins dark brown, stamens scarlet. Not known wild.

Salix Many other species, both trees and bushes.

Smaller trees of the second storey and gaps in the canopy

Acanthopanax sciadophylloides Thick pithy branches, big palmate leaves, ivy-like heads of greenish-yellow, no prickles. Leaf-losing. Common in hills of all Japan.

Acer carpinifolium Hornbeam-leaves turning yellow and brown. Common in mountain ravines of all Japan.

Acer cissifolium 3-foliolate bronzy leaves turning red and yellow. 20 to 30 feet. Mountains of all Japan.

Acer crataegifolium 20 to 30 feet. Snake-barked, small shallowly lobed leaves, yellow flowers. Common in gaps, plains to mountains of 3 southern islands.

Acer diabolicum Big 5-lobed leaves, hanging yellow flowers, bristly keys. Mountains of 3 southern islands.

Acer distylum Lime-like leaves turning rich yellow. Mountains of Pacific Honshu and Kyushu.

Acer micranthum Small 5-lobed leaves turning red. Mountains of 3 southern islands.

Acer mono (pictum) 5- or 7-lobed leaves turning yellow. Up to 60 feet tall. Rather common in mountains of all Japan.

Acer nikoense 3-foliolate leaves, grey beneath, turning orange and vermilion. Mountains of 3 southern islands.

Acer palmatum 5- or 7-lobed leaves turning red and orange, dangling dark red flowers. Parent of many garden varieties. Very common in gaps in woods of 3 southern islands.

Acer rufinerve Snake-barked. Blue-green twigs, 3-lobed leaves turning red and yellow. Common in openings in 3 southern islands.

Acer sieboldianum Like *Acer japonicum*, but yellow flowers.

The Maples are mostly small trees, sometimes bushy, usually scattered in gaps in the forests or at their edges. *Acer palmatum* and *Acer japonicum* are the parents of the beautifully cut-leaved “Japanese Maples” of gardens.

Amelanchier asiatica Chinese Service-berry. Slender tree, leaves turn bright red, trusses of white flowers, purple-black berries. Common in hills and mountains of 3 southern islands.

Aphananthe aspera Still scattered in warm lowlands and hills of 3 southern islands.

Carpinus cordata Scaly, furrowed bark, rather broad heart-shaped leaves. All Japan—

Carpinus japonica Narrow leaves, wide-spreading tree. 3 southern islands—

Carpinus laxiflora Larger tree, drooping branches, slender-pointed leaves. All Japan—

—The Hornbeams are widespread small trees with conspicuous Hop-like seed clusters.

Celtis jessoensis A Nettle-tree with Elm-like leaves and juicy black berries. All Japan.

Cephalotaxus harringtoniana (*drupacea*) The Plum-fruited Yew is still scattered in the lower forests of the south-west.

Cladastris platycarpa Up to 60 feet. Foot-long pinnate leaves, pyramids of white, yellow-marked pea-flowers. Mountains of central and west Honshu and Shikoku.

Cornus controversa Tiers of horizontal branches, flat cream heads of small, bractless flowers, black berries. Handsome Dogwood common in mountains of all Japan.

Cornus kousa Rows of flower-heads with large white bracts, strawberry fruits, leaves turn bronzy-red. Common in mountains of 3 southern islands.

Euptelia polyandra Wych-hazel family. Slender tree. Long-pointed leaves turn red and yellow, flowers of red stamens only. Quite common in mountains of 3 southern islands.

Evodiopanax (*Acanthopanax*) *innovans* Stout branches, thin palmate leaves of 3 leaflets, Ivy-like flower-heads, no prickles. Leaf-losing. Common in hills of all Japan.

Fraxinus apertisquamifera (sambucina) Small slender Flowering Ash. Thin pinnate leaves, dense flower-sprays, very narrow white petals. Mountains of Honshu only.

Fraxinus sieboldiana (longicuspis sieboldiana) Slender, fluffy-white flowering Ash. Leaves turn purple. Common in hills and mountains of 3 southern islands.

Fraxinus spaethiana Taller, stout tree. Large leaves with dark brown inflated bases. Mountains of central Honshu and south-west.

Gleditschia japonica Up to 60 feet. Long branched spines on trunk and branches, leaves 1- or 2-times pinnate, white pea-flowers. Singly in woods of central Honshu and south-west.

Hovenia dulcis Buckthorn family. Raisin-tree. 30 feet. Glossy, heart-shaped, pointed leaves, forked yellow flower clusters. Flower-stems redden, swell and are edible. All Japan except mainland Hokkaido. Scattered, not common.

Maackia (Cladastris) amurensis var. pubescens 40 feet. Peeling bark, pinnate leaves, spikes of white pea-flowers, blue-tinged. Common (in its varieties) in all Japan.

Magnolia kobus 30 feet. Slow to produce its many white flowers. Pink fruits. Quite common on hills of all Japan.

Magnolia salicifolia Slender tree, narrow leaves, narrow-petalled flowers before leaves. Mostly on snowy mountains of Japan Sea side of Honshu, also Kyushu.

Malus sieboldii (toringo) 10 feet, drooping branches, some leaves lobed, pink buds, white flowers, small reddish-yellow fruits. Common in mountains of all Japan. The parent, crossed probably with *Malus baccata mandschurica*, of *Malus floribunda*.

Malus tschonoskii Conical tree up to 40 feet. Leaves grey-woolly when young, turning scarlet and orange. White flowers and yellowish apples not showy. Honshu only, and rare.

Morus bombycis (japonica) Small tree, large oval leaves, sometimes lobed, purple-black fruits. A Mulberry used for silk worms. Mountains of all Japan.

Ostrya japonica Hop-Hornbeam. Medium-sized, scaly-barked tree. Velvet-backed leaves, many hanging clusters of Hop-like nutlets. All Japan, as underwood.

Picrasma quassioides Small tree, pinnate leaves turning orange-scarlet, small green flowers, red pea-fruits. Common in lowlands and hills of all Japan.

Platycarya strobilacea Walnut family. Small tree, pinnate leaves, male catkins, female in erect cones. Mountains of 3 southern islands. Scattered.

Prunus buergeriana Spikes of small white flowers, shiny leaves. Hills and mountains of 3 southern islands. Not common.

Prunus jamasakura (*serrulata* or *pseudocerasa*) Only in the lower forests of the south-west.

Prunus pendula ascendens The wild form of the Rosebud Cherry. 50 feet high, fissured bark, slim twigs, small pale pink flowers. Mountains of 3 southern islands. Probably one of the parents of *Prunus subhirtella*.

Pterostyrax (Halesiai) corymbosa Small tree, oval leaves, sprays of white, stamen-filled flowers, winged fruits. Mountains of south-west only. Perhaps not very hardy.

Pterostyrax hispida Up to 40 feet. Drooping 9-inch sprays of similar white flowers, ribbed fruits. Mountains of 3 southern islands.

Rhus javanica (*chinensis* or *semi-alata osbeckii*) 20 feet high, broad-headed tree. Pinnate leaves turning red, large yellowish pyramids of flowers, fruits orange-red. Lowlands and mountains, common in all Japan. Rather frost-tender in spring.

Rhus trichocarpa Stout Sumach up to 25 feet. Pinnate leaves turn brilliant orange-vermillion, drooping clusters of yellow fruits. Common in hills and mountains of all Japan.

Sorbus gracilis Bushy Mountain-Ash. Dull green, white-backed pinnate leaves, orange-red fruits. Mountains of south-west only.

Sorbus japonica A Whitebeam 40 to 60 feet tall. Not very common. Lobed leaves white-felted below, as are heads of white flowers, scarlet fruits. Hills and mountains of 3 southern islands.

Stewartia monadelpha RT Tea family. Up to 80 feet, oval leaves turning red and yellow, white camellia-flowers, violet anthers. Mountains of Pacific central Honshu and south-west.

Stewartia pseudocamellia 50 feet, flaking bark, cupped white flowers, yellow anthers, oval leaves turn deep red and yellow. Mountains of all 3 southern islands. Common as underwood.

Stewartia serrata 30 feet high, toothed oval leaves turning red, creamy-white cups, red-stained outside yellow anthers. Pacific central Honshu and south-west.

Styrax japonica A *Storax* tree up to 25 feet. Widespreading branches, oval leaves, rows of white, open bells dangling singly. Very common in wood-openings in hills and mountains of all Japan.

Styrax obassia Up to 30 feet. larger, broader leaves, long strings of white flowers. Quite common in all Japan.

Taxus cuspidata Japanese Yew. Medium-sized tree, thick trunk, upstanding dark needles, red "fruits". Singly in woods of all Japan except western Honshu.

Thujaopsis dolabrata Conical tree, broad flat branches. Allied to *Thuja*. Mountains of central Honshu northward, also Shikoku and Kyushu. More common in the cooler Beech zone.

Ulmus parvifolia (*chinensis* or *sieboldii*) Chinese Elm. To 40 feet. Slender trunks and branches, small, leathery, glossy leaves. Central Honshu and south-west.

Bushes of the underwood

There are few evergreens (noted below), all the rest are leaf-losing.

Acanthopanax spinosus (*pentaphyllum*) *Aralia* family. 10 feet, slender, arching, branches with few prickles. Thin palmate leaves, round greenish Ivy-heads, black berries. Common in Honshu.

Acanthopanax other similar species.

Alangium (*Marlea*) *platanifolium trilobum* RT Large, pithy. Rounded, lobed leaves. Tubular, small, lily-like, white flowers erect on long-stalked sprays. Quite common in all Japan.

Aucuba japonica Glossy evergreen leaves, small brown flowers, large red berries on females. Fairly common in Evergreen, but specially so in Summer-green woods of central Honshu and south-west. Usually grown in variegated varieties, specially the "Spotted Laurel".

Berberis sieboldii Yard-high, suckering, spiny. Leaves like small Common Barberry, colouring brightly, strings of pale yellow flowers, glossy red berries. Pacific central Honshu.

Berberis thunbergii 4 to 8 feet, compactly, spiny. Small, spatula-leaves turning scarlet and orange, 1 or 2 pale flowers in axils, red berries. Common in central Honshu and south-west.

Clerodendron trichotomum 10 to 20 feet, pithy. Large spear-leaves, clusters of white trumpets, bright blue fruits set in crimson calyx-stars. Common in all Japan.

Deutzia crenata (scabra) Strong erect-growing to 10 feet. Peeling bark, sprays of white starry flowers. Common in all Japan.

Deutzia gracilis RT 4 feet. Sprays of white flowers held upright. Frost-tender in spring. Mountains of Pacific central Honshu and south-west.

Deutzia maximowicziana 6 feet. Like *Deutzia crenata* but leaves white-downy beneath. Central Honshu westward, and Shikoku.

Enkianthus campanulatus Erect to 10 feet. Clustered leaves turning orange, red and yellow, trusses of pale fawn bells with red tips, or in its southern varieties pink or dark red. Mountains of north Japan, varieties in south-west.

Enkianthus cernuus 5 to 8 feet. Fringed, bell-shaped, white flowers, deep red in variety *Enkianthus cernuus rubens*. Leaves turn red and orange. Mountains of south-west.

Enkianthus perulatus (japonicus) White, nearly round flowers, leaves turn vivid scarlet. 6 feet. Pacific central Honshu and south-west.

Euonymus alatus Up to 9 feet. Winged twigs, leaves turn rosy-red, purplish-pink, lobed fruits, orange-red seeds. Common in thickets and woods of all Japan.

Euonymus fortunei radicans Evergreen, creeping, sometimes climbing by aerial roots. Flowering only on adult shoots, fruit pink, orange seeds. Common in lower mountains of all Japan. Variegated varieties usually grown in gardens.

Euonymus oxyphyllus Slow-growing up to 25 feet. Leaves turn purple-red, red fruits, scarlet seeds. Common on lower mountains of all Japan.

Euonymus sieboldianus (yedoensis) 10 feet. Large pale green leaves turning red, pale pink fruit, orange seeds. Common on hills and mountains of all Japan.

Euonymus other species.

Hamamelis japonica 8 feet, spreading. Hazel-like leaves, spidery yellow flowers before leaves. All Japan.

Helwingia (Osyris) japonica Dogwood family. 4 feet. Flower and leaf-stems fused, so small green flowers and black berries appear in middle of smooth oval leaves. Common on hills and lower mountains of all Japan (not far into Hokkaido).

Hydrangea involucrata RT 6 feet. Pale blue fertile flowers, white ray florets. Open woods and sunny rocky slopes of central and north Honshu and 2 southern islands.

Hydrangea macrophylla acuminata (serrata acuminata) 5 feet, slender. Fertile florets blue, ray florets pale blue. Common in open mountain woods of 3 southern islands.

Hydrangea thunbergii 2 feet. Purplish-blue (or pink on calcareous soil). Cultivar "Rosalba" (*Hydrangea japonica*) deep rosy-pink.

These mountain woodland "Lacecap" Hydrangeas have been much hybridized by the Japanese, and the resulting cultivars are most usually grown in gardens, often under the name *Hydrangea serrata*.

Ilex geniculata 8 feet. Leaf-losing, slender Holly. Sharp-toothed small leaves turn yellow, vermilion berries on long stalks. Mountains of 3 southern islands.

Ilex macropoda Leaf-losing small tree. Clustered spiny leaves, clusters of red berries. Common in the mountains of all Japan.

Ilex micrococca Up to 50 feet. Smooth slightly toothed leaves, many stalked clusters of small, dark red berries. Mountains of south-central Honshu and south-west.

Ilex latifolia —

Ilex pedunculosa —

—Evergreen tree-hollies still to be found in lower Summer-green forests of the south-west.

Kerria japonica Up to 6 feet, suckering, twiggy, green-stemmed. Deep yellow Buttercup-flowers. Common in the mountains of all Japan.

Ligustrum obtusifolium (*ibota obtusifolium*) 10 feet. Leaf-losing Privet. Common in thin hill woods of all Japan.

Ligustrum tschonoskii (*acuminatum*) Twiggy, leaf-losing. Large pointed leaves, slender white plumes, glossy black berries. Common in thin woods in mountains of all Japan.

Lindera species Several of these leaf-losing members of the Laurel family are still common in the lower Summer-green forests, *Lindera umbellata membranacea* reaching Hokkaido. This has short umbels of yellow flowers, black berries, leaves turn yellow.

Lonicera species

Menziesia ciliicalyx 2½ feet, Heath family. Bristly oval leaves, nodding clusters of urn-shaped waxy, creamy white flowers. Rather common from central Honshu south-west.

Menziesia ciliicalyx multiflora Larger, purple-stained flowers. Common in the north to Hokkaido.

Menziesia ciliicalyx purpurea Rose-purple flowers. Of the north to Hokkaido.

Philadelphus satsumi (*acuminata*) 6 to 8 feet, slender, upright. Sprays of rather small, slightly scented, white flowers. All Japan but Hokkaido.

Pourthiaea (*Photinia*) *villosa* 16 feet. Sharp-pointed toothed leaves turning scarlet and orange, sprays of white flowers, Haw-like bright red fruits. Very common on hills of all Japan.

Rhamnus japonica Spiny Buckthorn up to 9 feet. Glossy leaves, many round clusters of small brownish flowers, black fruit. Common in all Japan.

Rhamnus other species.

Rhododendron japonicum (*Azalia mollis*) Up to 8 feet. Leaves turn vividly, trusses of orange-yellow, salmon to vermilion flowers. The parent of many garden hybrid *Azaleas*. Common locally in colonies on stony slopes in mountains of all Japan.

Rhododendron other species.

Rosa multiflora (*polyantha*) A big bush-Rose with scrambling shoots to 20 feet. Large cones of small white flowers, small, round red hips. Ancestor of Hybrid Polyantha Roses of gardens. Common in Hokkaido, Honshu and Shikoku.

Skimmia japonica (Rutaceae) Evergreen domed shrub. Leathery leaves. Females with clumps of red berries, males with [[ILLEGIBLE]] and small white flowers. In mountain woods, Honshu, Shikoku, Kyushu. Rather common.

Staphylea bumalda 3 to 6 feet, spreading. Trifoliate leaves sometimes turning red, clusters of small dull white flowers, inflated fruits. Common in hill woods of all Japan.

Syringa reticulata (*japonica*) Japanese Lilac (*Ligustrina*). Up to 35 feet, stout-growing. Paired, dense spikes of creamy-white flowers. Fairly common in mountain woods of all Japan.

Trochodendron aralioides Big, glossy evergreen with spires of bright green, stamens-only flowers. Still fairly common in Summer-green zone of 3 southern islands.

Viburnum plicatum (*tomentosum*) To 10 feet. Flat tiers of branches, with flat, white "lacecap" clusters on upper side in rows, red fruits. Open sunny places in mountains of central Honshu and south-west.

Zanthoxylum ailanthoides —

Zanthoxylum piperitum —

Zanthoxylum schinifolium —

—The Yellowwoods remain fairly common singly in the hill and mountain Summer-green woods of the 3 southern islands, *Zanthoxylum piperitum* reaching Hokkaido.

Rare and local bushes

Several other bushes are only scattered here and there locally, mostly in sunny open woods or thickets in the mountains.

Buddleia japonica To 6 feet. Narrow, woolly, pale lilac spikes. Rather rare in sunny mountain thickets of W. Honshu and Shikoku. Not good for gardens.

Corylopsis pauciflora Widespreading and twiggy, short, dangling strings of pale yellow bells before leaves. Mountain woods in south-central Honshu, but rare.

Corylopsis spicata Hazel-like growth, longer tassels of smaller flowers. Rare in mountain woods of Shikoku.

Forsythia japonica Clear yellow flowers before white-hairy leaves. Rather rare in mountain thickets of S.W. Honshu.

Rhodotypos scandens (kerrioides) To 6 feet, upright growth, papery Rose-like flowers (white) singly on spurs, glossy big black fruits. Rare in mountain thickets of S.W. Honshu.

Stephanandra tanakae Arching wands, Maple-like leaves turning orange; slim spikes of small white flowers. Mountains of central Honshu.

Weigela (Diervilla) florida (Weigela rosea or Weigela amabilis) Arching growth, trusses of funnel-flowers deep rose on outside, nearly white within. Mountains of Kyushu only, but also Korea and China. The most popular species in western gardens. There is a purple-leaved form in cultivation.

Weigela (Diervilla) praecox Rosy-pink flowers with yellow throat. Mountains of Kyushu.

Bushes of grassy openings, rocky slopes, and thin woods

Abelia spathulata RT 3 to 4 feet. Paired creamy-white trumpets with yellow throat. Sunny thickets of 3 southern islands, in mountains.

Abelia other species Mostly southern.

Aralia elata Suckering clumps up to 45 feet tall. Thick prickly stems topped by huge doubly pinnate leaves and foam-like heads. Black berries. Common in thin woods and colonizing grassy slopes on hills of all Japan.

Callicarpa japonica Common pioneer in evergreen and Summer-green zones.

Clethra barbinervis Also pioneer in both zones.

Eleagnus multiflora 6 to 10 feet. Leaves silver- and brown-scaled beneath, small yellow bells, dark red, oblong, hanging, edible fruits. Common in thin open woods of all Japan.

Eleagnus umbellata 12 to 18 feet. Narrower leaves, silvery beneath, small silver-yellow funnels, short-stalked, round, orange fruits. Common in thin open woods of lowlands and hills of all Japan (not far into Hokkaido).

Rhododendron kaempferi Very common on sunny slopes in hills and mountains of all Japan, in Evergreen and Summer-green zones.

Rhododendron other species.

Rubus phoenicolasius 8 to 10 feet. Stems covered with red bristles. Leaves 3-foliolate, white-felted beneath, flowers pink, fruit conical, red. Clearings in lowlands and mountains of all Japan.

Rubus mesogaeus 10 feet. Arching velvety canes, rosy-white flowers, black-purple fruits. All Japan.

Rubus crataegifolius A bush 6 to 8 feet. Big Maple-like leaves turning red and yellow, flattened prickles. Flowers white, fruits round, red. Clearings in mountains of all Japan.

Rubus parvifolius Common in lowlands and hills of all Japan, Evergreen and Summer-green zones.

Sambucus sieboldii 18 feet. Japanese Elder. Pinnate leaves, rounded heads of creamy-white flowers, scarlet fruits. Very common in thin hill woods of 3 southern islands.

Stachyurus praecox Up to 10 feet. Stiffly hanging strings of pale yellow bells before big oval leaves, yellow-green fruits. Common in thin mountain woods of all Japan (not far into Hokkaido).

Stephanandra incisa 4 to 8 feet. Zigzag wiry stems, lobed, toothed leaves. Crowded sprays of green-white small flowers. Thickets in hills of south Hokkaido and 3 southern islands.

Symplocos chinensis pilosa Common as pioneer in hills and mountains of all Japan both Evergreen and Summer-green zones.

Evergreen bushes of the snowy west side of Hokkaido and northern Honshu

Aucuba japonica borealis Smaller than type. Hokkaido, Honshu.

Camellia rusticana Snow Camellia. Smaller, flatter red flowers. Honshu, hills.

Cephalotaxus harringtoniana nana Prostrate main branches. Mountains of Hokkaido and Honshu.

Daphniphyllum humile Shrubby. Woods of Hokkaido and Honshu.

Ilex crenata paludosa Creeping branches. Wet places of Hokkaido, Honshu.

Ilex leuococlada (integra leuococlada) Creeping main branches. Hokkaido, Honshu.

Skimmia japonica intermedia repens Creeping main branches. Hokkaido, Honshu.

These prostrate or low evergreens reach much further north, under the winter protection of deep snow, than their close relatives do on the eastern (Pacific) side of Japan.

The lianes and climbers

The woods and thickets are festooned by many magnificent lianes and climbers. Some make thick woody ropes which sling themselves from tree to tree, or climb up the trunks by means of aerial roots, forming tangles in the canopy, others have more slender stems, some dying back in the winter and only reaching the tops of the bushes.

The woody lianes and climbers

All leaf-losing, except those noted.

Actinidia arguta Tall twiner, red-velvet covered young shoots, big glossy leaves, small green-white flowers, oblong green-yellow edible fruits. All Japan.

Actinidia polygama More slender and lower. Fruits beaked, translucent yellow. All Japan.

Akebia quinata Tall twiner; usually 5-lobed leaves, hanging clusters of red-purple star-flowers, dark purple oblong fruits. 3 southern islands.

Akebia trifoliata 3-lobed leaves, flowers dark brown-purple, sausage-shaped fruits to 5 inches long, pale violet. Hill and mountain woods in all Japan.

Ampelopsis brevipedunculata (*Vitis heterophylla*) Tall tendril climber; 3- to 5-lobed leaves, small flowers, abundant bright blue berry-like grapes. Lower woods in all Japan. Needs a hot summer to set good crops in Britain.

Berchemia racemosa (Rhamnaceae) Deep green leaves with marked veins, turning yellow, sprays of small green-yellow flowers, small oblong fruits turning from green to red to black. Over bushes in lower mountains of all Japan.

Celastrus orbiculatus (*articulatus*) Long woody twiner; often in open glades and forming nets over thickets. Small flowers, fruits opening to show scarlet seeds in yellow, petal-like outer part. Common in all Japan.

Celastrus flagellaris Similar but smaller. S.W. Honshu, Kyushu, rather rare.

Clematis patens Slender wiry climber to 12 feet forming tangles over bushes. Leaves of 3 to 5 leaflets; big, single white to pale purplish-blue flowers, feathered seeds. Honshu, Shikoku, Kyushu. A parent of many large-flowered garden hybrids.

Clematis japonica Low subshrubby climber over mountain thickets. Trifoliate leaves; purplish or brownish-red bell shaped flowers.

Clematis maximowicziana (*paniculata*) To 30 feet. Forming tangles of dark green, 3- to 5-lobed leaves, sprays of small white flowers, short-feathered seeds. All Japan.

Euonymus fortunei radicans (*Euonymus radicans*) Evergreen aerial-rooted climber to 20 feet or more. Small green flowers on bushy shoots at top. Pinkish fruit, orange seed. Lower mountain woods of all Japan. Popular in Britain in coloured leaf forms as ground cover.

Hydrangea petiolaris (*scandens*) Tall aerial-rooted climber. Broad leaves, upward-facing plates of small greenish fertile flowers ringed by a few big white sterile ones. All Japan, common.

Lonicera japonica Tall nearly evergreen twiner. Some young shoot leaves lobed. Tubular, scented, tongued flowers in pairs in leaf axils, white fading to buff-yellow. All Japan. Variegated form also cultivated.

Lonicera affinis Similar, larger white-downy leaves. S.W. Honshu, Shikoku and Kyushu.

Lonicera hypoglauca Similar. S.W. Honshu, Shikoku and Kyushu.

Parthenocissus tricuspidata (*Vitis inconstans* or *Ampelopsis veitchii*) Tall suckered-tendrill climber. 3-lobed long stalked leaves turning bright red, small purple-black grapes. All Japan. Popular for walls in Britain.

Rhus ambigua Aerial root climber, tall. Trifoliolate leaves, narrow clusters of small yellow flowers, pale yellow berries. Poisonous (related to American "Poison Oak"). All Japan, common.

Schisandra (*Schizandra*) *repanda* (Magnoliaceae) Tall twiner. Broad oval leaves, small, round, hanging white flowers, each setting a string of bloomy black fruits. All Japan.

Schizophragma hydrangeoides Tall aerial root climber. Coarsely toothed leaves, plates of flowers like *Hydrangea*, but sterile ones of only one big creamy-white petal. Common in all Japan.

Tripterygium regelii (Celastraceae) Tall twiner. Long, pointed oval leaves, small yellow star-flowers, winged Elm-like fruits. W. Honshu and Kii Peninsula, Shikoku, Kyushu.

Vitis coignetiae Huge tendril climber. Big embossed-leather, heart-shaped leaves, rusty below and turning rich red, small purple-black grapes. Common in all Japan.

Vitis thunbergii Slender, rather low-growing in mountain thickets. Grape-vine leaves, rusty-felted beneath and turning red, bloomy black grapes. Lower mountains of all Japan.

Wisteria floribunda (*multijuga*) Tall twiner. Long silky pinnate leaves, hanging trusses (to 2 feet long) of violet-blue pea-flowers. All Japan except Hokkaido.

Summer climbers

As well as the woody-stemmed climbers and lianes in the high bushes and in the trees, other rampant twiners and scramblers send up their fast-growing trailing shoots every spring into the shrubs of the thickets, especially in open places, and die down to their perennial rootstocks in winter.

Apios fortuneii A Ground Nut. Twiner in thickets and forest edges of all Japan. Leaves of 3 leaflets, some of which again trifoliate; pale greenish yellow pea-flowers in short spikes.

Calystegia sepium japonica (or *Calystegia japonica*) A rose-coloured form of the Great Bindweed. All Japan in damp places in the lowlands.

Gynostemma pentaphyllum (Cucurbitaceae) Slender creeping tendril climber. Palmate leaves, small greenish-yellow flowers, small green-black fruits. Lowlands of all Japan.

Humulus japonicus Annual. No swollen "hops" as used in brewing.

Paederia scandens (Rubiaceae) Twiner over bushes to 20 feet from woody rootstock. Slender-pointed thin leaves, slim spires of small white tubular flowers with spreading lobes and red-purple throat, orange-yellow small fruit. Common on low mountains of all Japan.

Pueraria lobata Kudzu Vine. Quick-growing to 20 feet or more, often over rocks in open places as well as bushes. Trifoliate leaves, downy below, long spikes of scented red-purple pea-flowers. Common in all Japan.

Trichosanthes kirilowii japonica (*Trichosanthes japonica*) (Cucurbitaceae) NH Tendril climber over bushes. Leaves with 3 to 5 triangular lobes; big white deeply fringed flowers, oval yellow fruits. Open woods of all Japan.

The Bamboos

Mostly running, rather low species forming wide-spreading thickets a yard or two tall. The canes have few branches and comparatively broad leaves.

Sasa nipponica Slender, few-branched canes, 1 to 3 feet with swollen nodes. The leaves often have white margins in winter. Honshu, Shikoku, Kyushu.

Sasa palmata More branched bright green canes 3 to 6 feet, broad leaves with edges often withering white in winter. All Japan.

Sasa senanensis 6 feet or more. Mountains of Hokkaido, Honshu, Shikoku.

Sasa other similar species.

Plants of the forest floor

The general forest floor conditions of shelter from wind, rather acid, leaf-mouldy soil, and moist atmosphere, enable a number of plants to grow not only in the warm-climate but also in the cool-climate Summer-green forests, as well as the cooler Evergreen-Oak forests of the mountains of the south-west. But the increasing cold to the north and higher in the mountains causes some plants to drop out, especially evergreen ones, and the seasons of growth to become more marked.

The hills and mountains, with their shady slopes where trees and bushes grow thickly, sunny or sun-speckled openings and glades, rocky ravines, and damp brook banks, cause many variations in these conditions, and though some plants are widespread all over temperate Japan, others are confined to limited districts, perhaps in some cases also due to volcanic action leading to geographic isolation, the nature of the underlying rock, or other reasons.

The spring

Plants of the forest floor begin to shoot as early as February, and in March and April several are in bloom. The few evergreen ones are still conspicuous at first in the leaf-litter and moss under the bare boughs of the trees, especially the ferns, but soon become lost among the quickly sprouting foliage of the Summer-green plants. These are mostly low colonies of Anemones, Violets, Wood Sorrels and Epimediums, with some taller plants shooting up rapidly, Orchids, Arisaemas, Disporums, Paeonies and some Umbellifers, several of which flower before their foliage is fully developed. The brakes of Bamboos still carry their rather tattered leaves.

Spring-flowering plants

All are dormant in winter except the evergreens noted.

Anemone flaccida Carpets of thick dark, pale-splashed leaves like a Buttercup. Large creamy-white flowers. Common along brooks in foothills of all Japan.

Anemone raddeana Mats of palmately divided leaves. White flowers purple-stained on back, singly above a frill of 3 leaves. Damp mountain forests, all Japan except Kyushu.

Arisaema japonicum and varieties 12 to 20 inches. 2 leaves of 3 to 5 leaflets, dark purple or green spathe striped white. Honshu, Shikoku, Kyushu.

Arisaema limbatum 8 to 24 inches tall. Leaves of 7 to 11 leaflets, dark purple spathe striped white. S.C. to N. Honshu.

Arisaema monophyllum Reaches N. Honshu.

Arisaema peninsulae (*angustatum peninsulae*) 2 leaves of 5 to 14 leaflets, spathe green, white striped. Hokkaido, Honshu.

Arisaema robustum (*amurense*) 8 to 14 inches, one leaf palmately divided into 5 leaflets, spathe green or dark purple, striped white. Woods, Hokkaido, Honshu, Kyushu.

Arisaema other species.

Asarum caulescens Summer-green, heart-shaped leaves. Woods in mountains, all Japan except Hokkaido.

Asarum fauriei Leaves overwintering, glossy kidney-shaped. C. and N. Honshu. Variety *serpens*, variegated greyish-leaved garden form in Japan.

Asarum nipponicum Leaves overwintering, longer than broad. C. Honshu.

Asarum other species.

Calanthe discolor (Orchidaceae) Pleated evergreen leaves, 18 inch spikes of small red-brown flowers with white or rose lips. Common, Kyushu to S. W. Hokkaido.

Chamaele decumbens An Umbellifer. Leaves like Wild Chervil, white flowers on bare stems less than 1 foot tall. All Japan.

Chelidonium (*Stylophorum* or *Hylomecon*) *japonicum* Broad pinnate leaves, 12 to 16 inch stems with 1 or a few quite large yellow Poppy-flowers. Woods in lowlands and hills, Honshu.

There is also a small and lower mat-forming plant, also with pinnate leaves, and bigger flowers borne singly, usually known in Britain as *Hylomecon japonicum*, which may be a form, or a distinct species.

Chloranthus japonicus (Chloranthaceae) Creeping colonies of swollen-jointed 18 inch stems, whorls of 4 leaves near top, spikes of small white flowers with white stamens. Woods in hills, all Japan.

Chloranthus serratus Similar but larger, same range.

Corydalis lineariloba Much divided leaves, spikes of blue-purple flowers. Common in woods and open grassy glades of hills and mountains of Honshu and Kyushu.

Corydalis ambigua Similar. N. Honshu, Hokkaido.

Corydalis other species, most biennial and yellow-flowered.

Cremastra variabilis (Orchidaceae) Creeping colonies of pseudobulbs, each with 1 pleated leaf often spotted cream, 18 inch spikes of hanging, tubular, dull brownish-rose flowers. Common in hill woods of all Japan.

Cremastra unguiculata Smaller, rare in foothill woods of Hokkaido, Honshu, Shikoku. Leaves purple-spotted and backed, yellow-brown white lipped flowers.

Cypripedium japonicum 12 to 18 inch stems with 2 opposite big fan-leaves, flowers with standard and lower sepals greenish and red spotted, wings and pouch yellow-white tinged crimson. Common lowland woods of all Japan.

Cypripedium debile 8 inch stems with 2 rounded leaves, small drooping pale yellow-green flowers with white, purple-veined pouch. Mountain forests of Honshu, Shikoku.

Disporum (Uvularia) sessile 12 to 24 inch leafy stems, few hanging, tubular, white flowers with green tips. Common in hill woods of all Japan.

Disporum (Uvularia) smilacina 6 to 16 inch stems, hanging cup-shaped white flowers. Hill woods of all Japan.

Duchesnea (Fragaria) indica Strawberry-like growth, yellow flowers, tasteless red "strawberries". Woods, grassy slopes along streams in ravines in hills. Common in all Japan.

Epimedium grandiflorum (macranthum) Compound thin leaves, purplish when young, each leaflet on wiry stalk, long-spurred lavender to white flowers. Woods of Honshu, Shikoku, Kyushu.

Epimedium x youngianum is a hybrid of garden origin between *Epimedium grandiflorum* and *Epimedium diphyllum* of Shikoku and Kyushu (white flowered).

Epimedium x versicolor sulphureum is a hybrid of garden origin between *Epimedium grandiflorum* and *Epimedium pinnatum colchicum* from the Caucasus.

Eranthis pinnatifida Like Winter Aconite. Parasol-leaves, white, yellow-centred flowers above a ruff. Mountain woods of C. and S.W. Honshu, rather rare.

Hepatica triloba japonica Leaves 3-lobed, sometimes variegated, flowers white or tinged pink. Honshu.

Iris japonica Evergreen. Still present in lower Summer-green woods of all Japan except Hokkaido.

Isopyrum trachyspermum Mats of leaves like Wood Anemone (related), small yellow-green flowers. All Japan.

Isopyrum stoloniferum Creamy-yellow flowers. Honshu.

Lamium album barbatum Japanese form of White Deadnettle. White to pinkish flowers. Thickets and thin woods along streams in lowlands and mountains, common in all Japan.

Mercurialis leiocarpa Like Dogs Mercury. Lower mountain woods of all Japan except Hokkaido.

Omphalodes (Cynoglossum) japonica Blue star-flowers in spikes on 8 inch stems. Mountain woods of N.C. Honshu, to Shikoku, Kyushu.

Osmorrhiza aristata White-hairy Umbellifer. 2 foot stems, white flowers. Common in woods of all Japan.

Oxalis griffithii Like common Woodsorrel but larger leaves and flowers. Mountain woods of all Japan except Hokkaido.

Oxalis obtriangulata Larger still, angled leaves. All Japan except Hokkaido.

Pachysandra terminalis Evergreen. Creeping carpets of glossy leaves in whorls on 8 to 12 inch stems, tufts of fringe-like white flowers. Lowland and hill woods of all Japan.

Paeonia japonica Grey-backed leaves, white half-open cups, yellow stamens. Edges of thickets and open woods in mountains of Honshu, Shikoku, Kyushu.

Paeonia obovata Close to *Paeonia japonica*. Pale rose flowers (white form cultivated in Britain). Woods and thickets in mountains of Hokkaido, Honshu, Shikoku, commoner in north.

Polygonatum odoratum varieties Angled leafy stems, 1 to 3 feet high, 1, 2 or more dangling white green-tipped tubular flowers in axils. Thin woods and meadows, lowlands and foothills of all Japan. Common.

Scopolia japonica (Solanaceae) Stout, fleshy plant to 2 feet, solitary, hanging, pale yellow bells stained purple. Mountains of Honshu, Shikoku, Kyushu.

Trillium smallii Collar of 3 leaves on 12 to 18 inch stems, flowers of 3 small purple-brown or green sepals, petals usually absent. Foothill woods of all Japan.

Trillium tschonoskii Whorl of 3 big round leaves near top of stem, rather small white flowers. Mountain woods of Honshu, Shikoku.

Viola dissecta sieboldiana (*pinnata sieboldiana*) Palmately cut leaves, flowers white veined purple. Rather common in mountains of Honshu, Shikoku, Kyushu.

Viola dissecta chaerophylloides Leaves cut like a bird's foot, flowers rosy-lilac. Same range.

Viola hondoensis (*hirta nipponica*) Hairy heart-shaped leaves spreading by stolons, pale lilac or white flowers, purple-veined. Moist woods of all Japan.

Viola keiskei White, purple-veined flowers. Rather common in mountains of Honshu, Shikoku, Kyushu.

Viola makinoi (*violacea makinoi*) Smooth narrow leaves, rose-purple flowers. Mountains of Honshu, Shikoku, Kyushu.

Viola patrinii White, purple-veined flowers. On wet shady stream sides in lowlands of all Japan.

Viola takedana Thick broad leaves, often white-veined, rose-purple flowers. Mountain woods of Honshu.

Viola other species.

High summer

By May the trees of the high canopy and the underwood bushes are in full leaf, and the mountain slopes and hillsides below them are deeply shady where the forests are thick.

There are very few showy flowers opening in the heat of high summer in the shade, but in damp silty places along stream banks and on slopes wet with seeping water, large coarse plants, many of them members of the Nettle family (Urticaceae) produce their inconspicuous flowers.

The fronds of the many and varied Ferns are fully uncurled, some as big fountains of rich green, or dark and leathery shuttlecocks, others in wide colonies of delicate lacy fans, and stiffer and firmer but gracefully arching shields.

The Ferns

Most are dormant in winter, except those noted as evergreen.

Adiantum monochlamys (*venustum monochlamys*) Still present in mountain woods except the far north of Honshu and Hokkaido. Evergreen.

Asplenium incisum (*elegantulum*) Evergreen. Small narrow bipinnate fronds. Common in lowland and hill woods of all Japan.

Asplenium varians Evergreen. Similar. Honshu, Shikoku, Kyushu.

Athyrium grammitoides Simply pinnate, 18 inches. Common in hills of all Japan.

Athyrium multifidum Close to *Athyrium filix femina*. 30 inches, 3 x pinnate. Hokkaido, Honshu, Shikoku.

Athyrium niponicum Bipinnate, 18 to 30 inches. Common in lowlands of S.W. Hokkaido, Honshu, Shikoku, Kyushu.

Athyrium yokoscense Bipinnate, 2 feet. Common in lowlands and mountains of all Japan.

Blechnum niponicum Evergreen. 1 foot, simply pinnate, dark green fronds, sterile and fertile about equal. Mountain woods of all Japan.

Botrychium virginianum Single triangular 3 x pinnate sterile fronds, tall branched fertile fronds, 12 to 24 inches. Woods of all Japan, rather rare.

Coniogramme fraxinea NH Simply pinnate tailed fronds to 4 feet. Evergreen. Common in hill woods of all Japan (*Gymnogramme javanica*).

Cyrtomium fortunei (*falcatum fortunei*) NH or T Holly Fern. Evergreen. Simply pinnate, hard glossy fronds to 2 feet. Thickets in hills of S.W. Hokkaido, Honshu, Shikoku, Kyushu, common.

Dennstaedtia hirsuta Running colonies of downy, bipinnate, dark green fronds to 1 foot. Common in all Japan.

Dennstaedtia wilfordii Similar but smooth. All Japan.

Dryopteris (*Lastrea*) *japonica* Creeping, thin bipinnate fronds, long-stalked to 3 feet. Common in all Japan.

Dryopteris (*Lastrea*) *quelpartensis* Like *Dryopteris oreopteris*. Fronds to 3 feet, nearly bipinnate. Mountains in all Japan.

Dryopteris (*Arachnoides*) *standishii* Dense clumps of 4 x pinnate broad-based fronds to 3 feet. Common in mountain woods of all Japan.

Dryopteris chinensis Bipinnate fronds, 5-angled to 30 inches. All Japan.

Dryopteris crassirhizoma Like *Dryopteris filix mas*. Hokkaido, Honshu, Shikoku.

Dryopteris polylepis Also like *Dryopteris filix mas*. Mountain woods of Honshu, Shikoku, Kyushu.

Dryopteris sabae Simply pinnate fronds with few pinnae, to 2 feet. All Japan.

Dryopteris tokyoensis Simply pinnate, crowded fronds with many-lobed pinnae, 34 to 48 inches. All Japan.

Dryopteris other species.

Matteuccia orientalis Fronds smaller on longer stems than Ostrich Fern, simply pinnate. All Japan.

Matteuccia struthiopteris Ostrich Fern. Larger, more divided fronds with many more pinnae. Both with dark brown fertile fronds on taller stems than sterile. Mountains of all Japan.

Onoclea sensibilis interrupta Sensitive Fern. Running colonies of simply pinnate fronds. Wet places in woods or open, all Japan.

Osmunda cinnamomea asiatica Cinnamon Fern. Wet woods of all Japan, locally common. Up to 2 feet, simply pinnate with cut pinnae, central, narrow, fertile red-brown fronds.

Osmunda claytoniana Similar, but fertile pinnae in middle of sterile fronds. Wet woods of central Honshu, locally common.

Osmunda regalis japonica Royal Fern. Common in wet woods and stream sides of all Japan.

Phyllitis (Asplenium) scolopendrium Harts Tongue Fern. Evergreen. Shady slopes and rocks in mountains. All Japan.

Polystichum polyblepharum Like *Polystichum aculeatum*. Bipinnate, prickly, rather narrow stiff fronds. Evergreen. Woods of Honshu, Shikoku, Kyushu, common. Up to 3 feet.

Polystichum retrorsopalaeceum and varieties Allied to above but larger. Woods in mountains of all Japan.

Polystichum tripterum Fronds simply pinnate above, bipinnate at base, softly spiny, to 3 feet. Common in mountain woods of all Japan.

Polystichum other species.

Epiphytic Ferns

Davallia mariesii Creeping rhizomes, 4 or 5 x pinnately cut, 9 to 12 inch fronds, dying in winter. Rocks and tree trunks, S.W. Hokkaido, Honshu, Shikoku, Kyushu.

Pleiopeltis thunbergiana (*Polypodium lineare*) Creeping, narrow, undivided, leathery fronds, 8 to 12 inches. Tree trunks and rocks in all Japan.

Pleiopeltis onoei Similar but much smaller. Tree trunks and mossy rocks of all Japan.

Pyrrosia linearifolia Creeping, undivided, narrow fronds, 1¼ to 3 inches long. Rocks and tree trunks of all Japan.

Plants flowering in high summer

Aconitum loczyanum White, narrow-hooded flowers stained purple, 2 feet. Wet shady places and along mountain streams, Honshu, Shikoku, Kyushu.

Aralia cordata (*Dimorphanthus edulis*) Stout; creeping rhizomes; big, thin much divided leaves; spires of small green flowers; to 5 feet. Along streams in woods of all Japan. Dies down in winter.

Aralia glabra To 3 feet, purple-tinged, similar leaves to above, purplish-green flowers. C. Honshu only, in deep shade, rather rare.

Aster (*Gymnaster*) *savatieri* Smooth ground leaves, 18-inch sprays of large white or purple-stained daisies. Mountain woods of Honshu, Shikoku, Kyushu.

Boehmeria species Large, straggling, non-stinging members of the Nettle family. Common everywhere.

Circaea erubescens Spreading colonies of 1 foot smooth red stems and leaf-stalks. Sprays of tiny reddish flowers. Moist woods, all Japan.

Circaea cordata Close to the Enchanters Nightshade (*Circaea lutetiana*). All green, downy. 16 to 24 inches. Moist woods, Hokkaido, Honshu, Shikoku.

Circaea other species.

Cryptotaenia japonica (*Umbelliferae*) Trifoliate leaves, white flowers, 12 to 24 inches. Common in mountain and hill woods of all Japan.

Elatostema species Thick-stemmed, soft or fleshy, non-stinging members of the Nettle family.

Houttuynia cordata Spreading colonies of dark bluish-green, heart-shaped leaves, 18-inch stems with single flower of 4 white bracts and white central cone. Damp lowland woods of all Japan.

Laportea species Stinging members of the Nettle family.

Nepeta subsessilis and varieties 20- to 32-inch spikes of quite large purple flowers. Wet shady mountain slopes, Hokkaido, Honshu, Shikoku.

Ostericum sieboldii (Umbelliferae) Stout stems to 20 or 32 inches, much divided leaves, white flowers. Common in mountain woods of Honshu, Shikoku, Kyushu.

Petasites japonicus Running colonies along forest brooks of huge, rounded leaves on long stalks. Flowers (thick spikes of white tufts) before leaves. Hill and mountain forests of Honshu, Shikoku, Kyushu.

Pilea species Soft, juicy, non-stinging members of the Nettle family.

Polygonatum macranthum (giganteum) Stout stems to 3 or 4 feet, flowers pale green, 3 to 4 in each axil. Mountain woods of all Japan.

Sanicula chinensis Glossy, lobed leaves, tiny greenish flowers in branching clusters. Common hill woods of all Japan.

Sanicula rubriflora Small deep purple flowers. C. Honshu only, rare.

Sanicula other rare species.

Scutellaria pekinensis var. *ussuriensis* and var. *transitra* Slender and smooth. Spikes of pale purple upright trumpets. Mountain woods of all Japan.

Smilacina japonica Creeping, 12 to 28 inches, leafy stems topped by whitish plumes. Mountain woods and thickets of all Japan.

Smilacina robusta 3 to 5 feet, stout, densely hairy white plumes. C. Honshu only, rather rare.

Urtica species Stinging Nettles.

Plants of grassy glades, bushy openings and thin woods

Where the forests open into grassy glades, edged and invaded by re-colonizing thickets of bushes and sapling trees, often after clearing by man, or landslips, typhoons and other natural causes, a number of plants grow which cannot flourish in full shade, many of which flower in high summer. Some also grow in open thin woods in the hills, often on rather dry and sandy soil.

Adenophora remotiflora Loose sprays of large pale blue bells, 16 to 32 inches. Mountain woods of Honshu, Shikoku, Kyushu.

Cephalanthera erecta (Orchidaceae) 8 to 16 inches, half-open, erect, white flowers among upper leaves. Common in thickets, thin woods, and grassy slopes in hills of all Japan.

Cephalanthera longibracteata Similar, rather more leafy, 12 to 20 inches. Thickets and grassy slopes in hills. Rather common in all Japan.

Cirsium effusum 3 foot leafy stems, long, doubly pinnately cut, spiny leaves, loose clusters of small, nodding, pale rosy-lilac thistle-heads. Woods in mountains, East central Honshu (Sagami, Suruga, Kai, Musashi).

Cirsium spicatum 4½ to 6 feet tall, stout, very leafy stems, long, deeply pinnately cut, spiny leaves, dense column of rose-lilac thistle-flowers among leaves. Mountain woods, Shikoku, Kyushu.

Cirsium suzukaense 3 to 4½ feet high, cobwebby stems, narrow, deeply pinnately cut, spiny leaves, open clusters of many erect or drooping, rosy-lilac thistle-heads. Central Honshu (Kinki, Tokaido).

Cirsium yezoense 3 to 6 feet or more, cobwebby, leafy stems, large, deeply pinnately cut and toothed leaves with short spines, solitary, nodding, rose thistle-heads. In woods, north Honshu, south Hokkaido.

Clinopodium (Satureia) chinense (Labiatae) White-hairy plant to 16 inches. Whorls of rose-purple or white flowers among leaves. Common in hill thickets and woods, all Japan.

Clinopodium micranthum (*Calamintha robusta*) 6 to 20 inches, spikes of white or pink flowers. Rather common in hill woods of all Japan.

Codonopsis (*Campanomoea lanceolata*) Scrambling scale-leaved stems, leafy branches, solitary pale green big bells purple-spotted within. Woods in hills of all Japan.

Codonopsis (*Campanomoea ussuriensis*) Similar, smaller and more downy, bells purple inside at top, spotted below. Woods in lowlands and mountains of all Japan.

Desmodium oxyphyllum (Leguminosae) Woody-based, 24 to 48 inches, rather sparse trifoliate leaves, spikes of red-purple small flowers. Common in lowland woods and thickets of all Japan.

Desmodium other similar species.

Euphorbia sieboldiana Creeping, 8 to 16 inches, soft leaves, open sprays of yellow-green and brown-purple flowers. Thickets and grassy slopes, lowlands and mountains, all Japan, rather common.

Geum japonicum 2 feet, velvety-downy leaves, loose sprays of large yellow flowers. Common in woods and thickets of all Japan.

Geum aleppicum Larger, coarsely hairy, smaller yellow flowers. Thickets and grassy slopes in lowlands and hills of Hokkaido, Honshu. Common.

Glechoma (*Nepeta hederacea grandis*) Japanese Ground Ivy. Running mats of rounded lobed leaves, whorls of mauve trumpets in axils. Common in thickets of lowlands and hills, all Japan.

Hosta albomarginata (*lancifolia*) Stems to 18 inches, grey-green pointed leaves, many pale purple flowers. Honshu, Shikoku, Kyushu.

Hosta clavata Stems 16 to 18 inches, stalked, narrow, dull leaves, horizontal white or pale purple flowers. Mountains of E.C. Honshu.

Hosta decorata normalis Stems 20 inches, stalked, blunt, dull leaves, nodding pale purple flowers. C. Honshu.

Hosta longipes Stem 12 inches, oval, dull leaves, pale purple flowers. Honshu, Kyushu.

Hosta venusta Stem 8 inches, very small leaves, narrow spikes of pale purple flowers. C. Honshu.

There is still confusion in naming the wild *Hosta* species. The smaller leaved ones are mostly on wet shady cliffs and rocks.

Hypericum erectum Sprays of rather small yellow, stamen-filled flowers, leaves black-speckled. Grassy slopes and thin woods in hills and mountains. Common in all Japan.

Kalimeris pinnatifida Creeping, 16 to 60 inches high, oval, pinnately cut toothed leaves, loose clusters of pale lilac daisies. Hills and lower mountain slopes, Honshu.

Lactuca sororia 28 to 48 inches tall, pinnate leaves, large sprays of very small lilac daisies. Honshu, Shikoku, Kyushu.

Liriope minor (*graminifolia*, or *Ophiopogon spicatus*) Clumps of dark, narrow leaves, purple flower-stems to 6 inches, spikes of small pale purple rounded flowers. Rather common in thickets in lowlands and foothills, all Japan.

Lycoris sanguinea (Amaryllidaceae) Strap-leaves in spring. Umbels of funnel-shaped orange-red flowers on 12 to 20 inch stems. Common in hill woods of Honshu, Shikoku, Kyushu.

Ophiopogon japonicus Clumps of narrow blunt leaves, spikes of white or pale lilac nodding bells on 1 foot stems. Open lowland and foothill woods, all Japan. Used for lawns in dry, hot climates.

Phryma leptostachya asiatica (Phrymaceae) Thin, toothed oval leaves, long spikes of small, tubular, lipped, pale rose or white flowers. Hill woods and thickets, all Japan, the type in N.E. America.

Physalis alkekengi franchetii Creeping, 16 to 32 inches, broad oval leaves, solitary cream flowers in axils, inflated coral-red calyx. Rather dry thickets and wood edges, all Japan.

Polygonatum falcatum 20 to 32 inches, leaves often white-banded down centre, 3 to 5 green-white flowers in axils. Hills of 3 southern islands and perhaps Hokkaido.

Polygonatum lasianthum 12 to 24 inches, leaves whitish below, long horizontal flower-stalks, white flowers tipped green. Thin hill woods of all Japan.

Polygonatum humile Meadows and thin woods in lowlands and hills, Hokkaido, C and N Honshu. Creeping colonies, 6-12in, yellowish green flowers.

Polygonum (Tovara) filiforme Stout, leafy stems, 16 to 32 inches, foot-long narrow spikes of rose (rarely white) flowers. Common in woods and thickets in lowlands and hills, all Japan.

Salvia japonica Long spikes of small pale purple flowers on stems 8 to 32 inches. Woods and thickets, hills and mountains, Honshu, Shikoku, Kyushu.

Salvia nipponica 8 to 16 inches. Spikes of pale yellow flowers. Rather common in mountain woods and thickets, Honshu, Shikoku, Kyushu.

Viola grypceras Close to *Viola sylvestris*. Sprawling stems with heart-shaped smooth leaves, deep lilac flowers. Thin woods, lowlands and mountains, common in all Japan.

Plants flowering in late summer and autumn

Most of the plants flowering in late summer and autumn in the lightest parts of the forests are large, coarse members of the Composite family. Some continue into early winter.

Aconitum japonicum To 3 feet, stems arching at top. 3 to 5 cleft leaves, clusters of few bluish-purple flowers. Hills and mountains, S.W. Hokkaido, Honshu, Shikoku.

Ainsliaea species (Compositae) Small and graceful plants. Light sprays of flowers consisting of long tubular calyces from which the few ray florets spread, rose-mauve or purple in colour and nodding.

Ainsliaea apiculata Creeping mats of kidney-shaped, lobed leaves, stems 3 to 12 inches. Mountains and hill woods of S.W. Hokkaido, Honshu, Shikoku, Kyushu.

Ainsliaea dissecta Carpets of palmately lobed leaves, 4 to 12 inches. Mountain woods of E.C. Honshu only.

Ainsliaea other species in the south-west.

Aster ageratoides (trinervius) A very variable species, found mostly in C. Honshu and south-westward. Its varieties range from a foot to a yard tall, spreading by rhizomes or clump-forming, smooth or downy, stout or more slender. The flowers are medium-sized and in sprays, more than 3 to each branch. (Close to *Aster amellus*.)

Aster ageratoides harae and its forms 2 to 3 feet, narrow, often glossy leaves, sprays of rather small white flowers. All Honshu, Shikoku, Kyushu.

Aster ageratoides ovatus Creeping, stout leafy branching stems to 3 feet, sprays of 1 inch wide blue-purple flowers. Mountains and hills. Common, form in all Japan.

Aster ageratoides viscidulus Clumps of downy stems 1 to 2 feet tall, blue-purple flowers. Mountain forests of E.C. Honshu only.

Aster ageratoides other varieties

Aster glehnii hondoensis Downy, densely leafy stems to 4 feet, dense heads of small white flowers. Grassy slopes and woods in mountains. Honshu.

Aster scaber Stout stems to 4 feet, heart-shaped leaves, loose sprays of white flowers with yellow centres. Rather common in hill woods and thickets of Hokkaido, Honshu, Kyushu.

Cacalia species (Compositae) Large leafy plants, some with nodding, white or purplish trusses of rayless flowers rather like *Eupatorium*, others with pale yellow button-heads like Tansy. In woods and ravines of all Japan.

Carpesium species (Compositae) Large stout and leafy plants. Nodding heads of round yellowish flowers without ray florets. In woods of all Japan.

Cimicifuga acerina (japonica acerina) Slim pure white fluffy spikes on leafless stems to 4 feet, leaves divided into groups of 3 pointed leaflets. Woods of Honshu, Shikoku, Kyushu.

Cimicifuga japonica 2½ feet, blunter leaflets. C. and W. Honshu.

Cirsium species Many woodland Thistles, all Japan. Some spiny, some unarmed; often cobwebby, with lilac or lavender-purple flowers, nodding or upright.

Pertya species (Compositae) Large plants, sometimes scrambling and woody, others with creeping rhizomes; leaves of different size and shape on new and old shoots; clusters of rayless flowers. Most in the 3 southern islands.

Saussurea nipponica and varieties Yard-high Thistle-like plant, slender and mealy-downy, sprays of purple rayless flowers. All Japan in mountain woods.

Saussurea Several other species.

Plants characteristic of north-east Honshu

Along the west coast of central and north Honshu, facing the Sea of Japan and on the hills and mountains behind, where the snow lies very deeply in the winter but the summers are warm, a number of plants are found on the floor of the forests which grow nowhere else in Japan, intermingled with the common woodland species of wider range.

In the shady ravines in the mountains and in wooded valleys in the hills, colonies of gigantic herbs are characteristic. Most of them also occupy similar situations in Hokkaido, and in Sakhalin, Kamchatka, and the wetter parts of eastern Siberia, but are not found elsewhere in Japan.

Asarum megacalyx Arrow-shaped, glossy biennial leaves, large flowers in spring. N.W. Honshu.

Corydalis capillipes Ground-leaves soon dying, rather small lilac flowers in spikes. Mountain woods and meadows, N.W. Honshu.

Epimedium koreanum Leaf-losing, creamy-yellow flowers. S.W. Hokkaido, N.W. Honshu.

Epimedium sempervirens Evergreen. 16 to 24 inches, spiny-edged leaves, quite large white flowers. N.W. Honshu.

Hosta sieboldiana Broad blue-green leaves, rather dense spikes of lilac-white trumpets. 2 feet. W.C. Honshu (Hokuriku and N. Kinki).

Hosta sieboldiana fortunei (*Hosta fortunei*) Smaller, greener. Same range.

Lilium rubellum (*japonicum rubellum*) 2½ feet, rather few funnel-shaped, unmarked, pale rose flowers. Thickets in hills up to alpine thickets, N.W. Honshu.

Polygonum sachalinense Colonies of 6 to 8 feet arching, stout stems with broad leaves, rather small spikes of creamy-white flowers in axils. Rather common along mountain streamsides. Hokkaido, N.W. Honshu, Sakhalin, S. Kuriles.

Ranzania (Podophyllum) japonica (Berberidaceae) Creeping. 18 inch stems with 2 leaves of 3 rounded leaflets again 3-lobed, near top; sprays of lavender, nodding flowers 1 inch wide at top. Rare, in mountain woods of N.W. Honshu.

Viola faurieana Smooth heart-shaped leaves, short-stalked lilac flowers. Woods of N.W. Honshu.

Viola rostrata japonica Thick leaves, pale violet, long-spurred flowers on very short stems. Woods, N.W. Honshu, the type in N. America.

II. THE COOL-CLIMATE BEECH–OAK FORESTS

Trees of the canopy

Abies homolepis (brachyphylla) Nikko Fir. 100 to 130 feet. Crowded, white-lined short needles, purple young cones. Upper Beech–Oak forests of C. Honshu, Shikoku, Kyushu.

Aesculus turbinata Mountain ravines north to Hokkaido.

Betula davurica 60 feet. Grey-brown shaggy bark peeling to papery curls, C. and N. Honshu, Hokkaido; Korea, Manchuria, Amur.

Betula grossa (ulmifolia) 50 to 80 feet. Dark grey, smooth, non-peeling bark. Mountains of Honshu, Shikoku, Kyushu.

Betula maximowicziana To 90 feet. Largest leaves of any Birch (6 inches long), orange-grey bark peeling into papery shreds. C. and N. Honshu, Hokkaido.

Betula platyphylla japonica 60 to 80 feet. White bark, resembles *Betula pendula*. Often in colonies in upper Beech–Oak forest and above. C. and N. Honshu, Hokkaido.

Betula schmidtii 60 to 100 feet. Black-grey bark peeling in small thick plates, small leaves. C. and N. Honshu; Korea, Manchuria, Ussuri.

Betula other local species.

Cercidiphyllum japonicum All the Summer-green forests north into Hokkaido; China.

Cercidiphyllum magnificum Similar, larger, rounder leaves, unfissured bark. Higher in mountains of C. and N. Honshu.

Fagus crenata (sieboldii) To 100 feet. The main Beech of the high canopy in all islands of Japan, not far into Hokkaido.

Fagus japonica Smaller, to 70 or 80 feet. Often with several trunks. Mountains of Honshu, Shikoku, Kyushu.

Juglans ailanthifolia (sieboldiana) 50 to 65 feet. Big pinnate leaves to yard long, male catkins to 1 foot, clusters of hard-shelled nuts. All Japan, specially common in Hokkaido.

Kalopanax septemlobus (Acanthopanax ricinifolius) (Araliaceae) 80 to 100 feet. Trunk and branches with stout thorns, big, dark, glossy, palmately lobed leaves, round clusters of white flowers in flattened heads. Common in mountains of all Japan; Korea, Sakhalin, Manchuria, Ussuri, China.

Larix leptolepis 60 to 100 feet. Reddish bark, needles more blue-green than European Larch. C. Honshu and isolated mountains in the north. Often in colonies on lower crests and cleared slopes. Forms timber-line on Fuji. Elsewhere scattered singly.

Pinus koraiensis Up to 150 feet. Thick trunk, open-branched conical head, grey-green stiff needles. Mountains of C. Honshu, Shikoku, rather local; Korea, Manchuria, Ussuri.

Pinus parviflora Japanese White Pine. 20 to 50 feet. Flattened head, short curved blue-green needles, bark of thin flakes. Usually scattered in woods, occasionally forming small stands. Mountains of Honshu, Shikoku, Kyushu.

Pinus parviflora laevis Bark not flaky. C. and N. Honshu, Hokkaido.

Pinus parviflora pentaphylla Longer, looser needles. C. and N. Honshu, Hokkaido.

Populus sieboldii (tremula villosa) Japanese Aspen. To 60 feet. Purplish-grey branches, white-downy twigs. Mountains of all Japan, often a pioneer.

Quercus mongolica Medium-sized, stout irregular branches, large lobed leaves clustered at end of twigs. C. and N. Honshu, Hokkaido; Sakhalin, Korea, E. Siberia to E. Mongolia. Often in rather open woods on dry warm slopes in the north of its range.

Quercus mongolica grosseserrata (crispula) Common in high canopy with Beech in mountains of all Japan. Also Sakhalin.

Quercus dentata Daimyo Oak. Sunny open woods and thickets, mainly in lowlands of north, mountains in south. All Japanese islands, S. Kuriles.

Quercus serrata (glandulifera) North to Hokkaido and S. Kuriles.

Sciadopitys verticillata Umbrella Pine. Up to 70 to 120 feet. Pyramidal growth of whorled branches, dark green false needles in inverted umbrellas. Scattered in Summer-green woods, locally in pure stands. Mountains of N. C. Honshu westward, Shikoku, Kyushu.

Thujopsis dolobrata Dense, broad-conical, 40 to 50 feet, large horizontal fans of dark green, glossy twigs and leaves. Scattered in mountain Summer-green woods of C. and N. Honshu, Shikoku, Kyushu.

Thujopsis dolobrata hondae Larger up to 100 feet, and denser. N. Honshu, Hokkaido, often in pure stands.

Ulmus davidiana japonica (propinqua) All Japanese Summer-green woods, but rare. The type in Sakhalin, Korea, E. Siberia, N. China.

Ulmus laciniata (montana laciniata) Temperate forests of Hokkaido, Honshu, Kyushu; Korea, N. China, E. Siberia, Kamchatka.

Picea bicolor —

Picea polita (also in Shikoku, Kyushu) —

Picea jezoensis hondoensis —

Tsuga diversifolia (also in Shikoku, Kyushu) —

—Trees of the upper conifer forests which appear in the higher parts of the Beech–Oak woods on cold slopes.

Smaller trees of the second storey

Acer mono (pictum) To 60 feet. 5- or 7-lobed leaves turning yellow. Rather common in mountains of all Japan.

Acer japonicum Often shrubby. Many-lobed leaves turning red and yellow, drooping clusters of purple-red flowers. Mountains of Honshu, Hokkaido. One parent of “Japanese Maples” of gardens.

Acer ukurunduense Small tree. 5-lobed leaves colouring vividly, yellowish upright flower clusters. Hokkaido, C. and N. Honshu, Shikoku; E. Siberia, Sakhalin, Korea, Manchuria.

Fraxinus lanuginosa 20 to 30 feet. Slender growth, small pinnate leaves turning purple, small sprays of white fluffy flowers. Mountains of all Japan (close to *Fraxinus sieboldiana*).

Maackia (Cladastria) amurensis The type is common in Hokkaido, Honshu; Korea, Manchuria, Ussuri, Amur, China.

Malus baccata mandschurica (Malus mandschurica) 40 to 50 feet. Round headed, white flowers, bright red and yellow small apples. C. and N. Honshu, Hokkaido; Sakhalin, Korea, Ussuri, Manchuria, N. China.

Phellodendron amurense Amur Cork Tree. 40 feet. Stiff growth, corky bark, long pinnate leaves turning yellow, upright clusters of tiny yellow-green flowers, small black fruits. Mountain woods of all Japan; Korea, Amur, Manchuria, N. China.

Prunus incisa Fuji Cherry. Shrubby, clusters of small white flowers, small, sharp-toothed leaves colouring vividly. Mountains of C. and N. Honshu, varieties in south and west. *Prunus subhirtella* is probably a hybrid of *Prunus incisa* and *Prunus pendula ascendens* (Rosebud Cherry).

Prunus maximowiczii To 25 feet. Slim trunk, dense head. Upright spires of cream-white flowers, leaves turn scarlet. Mountains of Hokkaido, Honshu, Kyushu; Sakhalin, Korea, Manchuria.

Prunus sargentii (*serrulata sachalinensis*) 50 feet. Red-brown banded bark, clusters of rose-pink flowers, leaves bronze in spring, turning orange and red, small red to black cherries. Mountains of C. and N. Honshu, Hokkaido; Sakhalin, Korea. One parent of the "Japanese Flowering Cherries".

Prunus verecunda Similar, white flowers. Mountain woods of all Japan; Korea.

Pyrus ussuriensis Snow Pear. To 40 feet. Bristle-toothed leaves turning red-brown, dense rounded heads of white flowers, round yellow-green pears. Varieties in C. and N. Honshu. Type in Manchuria, Korea, Ussuri.

Sorbus (*Micromeles*) *alnifolia* 40 to 60 feet. Dense, erect. Double-toothed leaves turning scarlet and orange, flat heads of white flowers, bright-red berries. Common in mountain woods of all Japan.

Sorbus commixta (*aucuparia japonica*) 30 feet, columnar. Finely pinnate, glossy leaves colouring brightly, sticky buds, flat trusses of white flowers, red berries. Mountains of all Japan.

Taxus cuspidata Scattered in all Summer-green forests on mountains of Hokkaido, C. and N. Honshu, Shikoku, Kyushu.

Tilia japonica Up to 60 or 70 feet. Smooth, heart-shaped rather small leaves, hanging greenish-yellow flower clusters. Mountains of all Japan—

Tilia maximowicziana Up to 70 or 100 feet. Larger down-backed leaves, twigs, and flower clusters. Hokkaido, C. and N. Honshu—

—Both Limes generally do not grow so tall, and are second storey trees.

Bushes common in the north or on high mountains of the south

Berberis amurensis japonica Resembles *Berberis vulgaris* but leaves larger. Oblong red berries in strings. Woods of Hokkaido to central Honshu.

Corylus sieboldiana Beaked Hazel. All Japan.

Corylus sieboldiana mandschurica 15 feet. Rounded leaves, beaked husks. Hokkaido to central Honshu; Amur, Manchuria.

Corylus heterophylla Central Honshu; Amur, Manchuria.

Corylus heterophylla thunbergii Larger bush, variously shaped leaves, deeply toothed husks. Hokkaido, Honshu, Shikoku.

Crataegus maximowiczii Spiny shrub, glossy red-brown twigs, 3-lobed leaves, dense heads of white flowers, yellowish-red haws. Hokkaido (rare); E. Siberia, Sakhalin, Manchuria.

Crataegus chlorosarca Small spiny tree, shallowly-lobed, toothed leaves, more open flower-heads, black haws. Hokkaido, Shinano in Honshu; Sakhalin.

Enkianthus campanulatus Tiered clusters of red-tipped, pale brown bells, autumn leaves soft orange to rich pink. Mountains of Hokkaido to central Honshu.

Euonymus macropterus (ussuriensis) 10 feet. Pink fruits, deep red seeds. Woods and thickets of Hokkaido to central Honshu; Amur, Manchuria.

Euonymus planipes (sachalinensis) (latifolia planipes) 20 feet. Rose to scarlet fruits. Damp hollows in woods of Hokkaido to central Honshu; Amur, Manchuria.

Lonicera morrowii Twiggy bush. White funnels fading yellow, red berries. Hokkaido, Honshu, Shikoku.

Lonicera maackii Big spreading bush, 10 to 15 feet. Many pure white flowers in pairs, fading yellow, dark red to black berries. Mountains of central Honshu, rare; Amur, Manchuria, N. China.

Lonicera gracilipes glandulosa Slender shrub, solitary narrow pink funnels, fruit red. Mountains of S. Hokkaido and the 3 southern islands.

Lonicera other species.

Menziesia pentandra Deciduous, umbels of small yellow-white flowers. Mountains of all Japan; Sakhalin.

Menziesia ciliicalyx Varieties.

Rhamnus davurica nipponica Related to *Rhamnus cathartica*. Central and north Honshu.

Rhododendron metternichii pentamerum 6 feet, evergreen. Leaves rusty beneath, clusters of many rose flowers. Woods in high mountains of central and north Honshu.

Rhododendron other species.

Ribes japonicum Strings of black berries. Mountain woods of Hokkaido, Honshu, Shikoku.

Ribes maximowiczianum (*Ribes maximowiczii*) Slender, short strings of oval red berries. Central Honshu; Manchuria.

Ribes sachalinense Procumbent, strings of oval, hairy dark red berries. Hokkaido, central Honshu, Shikoku.

Sorbaria sorbifolia 3 to 6 feet, suckering. Pinnate leaves, big upright plumes of small white flowers. Hokkaido to central Honshu, rare.

Spiraea japonica 3 to 5 feet. Flat-topped trusses of many small rose-pink flowers. Mountains of all Japan, common.

Spiraea salicifolia 3 to 6 feet, suckering. Upright pyramids of pink flowers. Wet boggy places in mountains of Hokkaido to central Honshu.

Spiraea other species.

Syringa reticulata Fairly common in mountain woods of all Japan.

Tripetaleia paniculata (Ericaceae) Deciduous, 2 to 6 feet. Erect sprays of many flowers of 3 recurved white to rosy petals. Mountain woods of all Japan, endemic, also in the conifer forests above.

Tripetaleia bracteata 3 to 6 feet. Spires of few reflexed, 3-petalled, rosy-white flowers. High mountains of Hokkaido to central Honshu, common northward.

Viburnum opulus canescens (*sargentii*) Lobed leaves, rings of sterile white flowers, red berries. Mountains of all Japan.

Viburnum furcatum 12 feet. Rings of sterile white flowers, leaves toothed, not lobed, berries turning black, crimson autumn colour. Mountains of all Japan.

Viburnum wrightii 6 to 10 feet. No sterile flowers, berries red. Mountains of all Japan. Brilliant autumn colour.

Weigela (Diervilla) hortensis 6 feet. Leaves grey-downy beneath, pale to carmine funnels. Hokkaido, Honshu.

Weigela (Diervilla) sanguinea Deep red funnels. Mountains of central Honshu.

Weigela (Diervilla) maximowiczii Pale yellow trumpets. Mountains of central and north Honshu.

Bushes of openings

Coriaria japonica Arching branches, ranked leaves, red fruits of swollen petals. Thickets in hills and mountains of Hokkaido to central Honshu.

Hydrangea paniculata 12 to 30 feet. Pyramids of mixed sterile and fertile white to cream florets. Sunny slopes and open woods of all Japan; Sakhalin.

Leucothoe grayana Leaf-losing, 1 to 3 feet deciduous, upright one-sided spikes sunny mountain slopes, Hokkaido, C and N Honshu.

Rhododendron nipponicum 3 to 6 feet, deciduous. Red-brown, shining, peeling bark, umbels of white bells. Mountains of north Honshu and west central Honshu.

Rhododendron tschonoskii Deciduous, dense growing, small, short white funnels. Rocky places in mountains of all Japan.

Rhododendron wadanum 6 to 12 feet, deciduous. Slender, brown-hairy, rose-purple flowers usually before leaves. Mountains of central and north Honshu.

The lianes and climbers

The cool-climate forests become less intertwined by lianes and climbers towards the north and high in the mountains.

Actinidia arguta All Japan; Sakhalin, Manchuria.

Actinidia polygama Mountain thickets and woods of all Japan.

Actinidia kolomikta 10 to 20 feet, slender. Heart-shaped leaves, often half white or pink near inflorescence. White flowers, yellowish fruit. Mountain woods of central Honshu to Hokkaido; Amur, Sakhalin, Manchuria.

Celastrus orbiculatus Thickets and grassy slopes in lowlands and mountains of all Japan; Korea, Sakhalin, Manchuria, China.

Humulus lupulus cordifolius Resembles the type. Thickets in mountains of central Honshu to Hokkaido; China.

Hydrangea petiolaris Mountain woods of all Japan; Sakhalin, south Korea.

Lonicera japonica Thickets in hills and mountains of all Japan; Korea, Manchuria, China.

Parthenocissus cuspidata (*Ampelopsis veitchii*) Thickets and woods of all Japan; Korea, China.

Rhus ambigua Poisonous. Mountain woods of all Japan; Sakhalin, China, Taiwan.

Schisandra repanda Mountains of all Japan; south Korea.

Schisandra chinensis Small climbing shrub. Hanging creamy-white flowers, round red fruits. Mountains of central Honshu to Hokkaido.

Schizophragma hydrangeoides Mountain woods and thickets of all Japan; Sakhalin, south Korea.

Vitis coignetiae Thickets in mountains of all Japan; Sakhalin, Korea.

Aconitum volubile

Plants of the forest floor

Many of the more common plants and ferns of the warm-climate Summer-green forests are also abundant in the cool-climate woods, but a number of those of the south and west drop out, and towards the north the flora becomes poorer. However, there are several which are only found in the cooler woods of the high mountains and the north.

Plants flowering from spring to midsummer

Among the widespread Anemones, Violets and others are some confined to, or more common in the north or the higher mountain woods.

Adonis amurensis 4 to 12 inches. Pinnately much cut leaves, large yellow cups. Mountain woods, sometimes with *Anemone pseudaltaica*. Hokkaido, Honshu, Kyushu; to E. Siberia, Manchuria, Korea.

Adoxa moschatellina Damp woods in hills and mountains of central Honshu to Hokkaido.

Anemone pseudaltaica (altaica) Growth like *Anemone nemorosa*, but more divided leaves, solitary, white or lilac, narrow-rayed cups. Mountain woods of central Honshu to Hokkaido.

Anemone stolonifera 2 or 3 white cups to a stem, less cut leaves. Mountain woods of central Honshu to Hokkaido.

Anthriscus sylvestris Common in mountains of all Japan.

Arisaema proliferum 1 to 2 feet, 2 pinnate leaves of many leaflets, spathe dark green with white stripes. Central Honshu to Hokkaido.

Arisaema takedae To 30 inches, 2 leaves of many leaflets on 2 spiral stems, spathe dark purple. Central Honshu to Hokkaido.

Arisaema other species.

Glaucidium palmatum 18 inches, big Maple-like leaves, 1 or 2 big, satiny, pale purple-blue flowers. High mountain woods of central Honshu to Hokkaido, endemic.

Helionopsis (Scilla) orientalis Rosettes of narrow evergreen leaves, nodding, rose-purple stars on stems up to 2 feet. Mountain thickets to alpine meadows of all Japan.

Omphalodes krameri Narrow, white-hairy leaves, rich blue open flowers in forked spires. Mountain woods of Honshu and Hokkaido.

Paeonia obovata Mountain woods and thickets, commoner in the north.

Shortia (Schizocodon) soldanelloides Evergreen glossy mats, several shell-pink to white, fringed flowers. 9 inches. High mountain woods of all Japan to alpine meadows.

Shortia (Schizocodon) uniflora Leathery mats, 6 inch stems. 1 or few deeply toothed rosy-pink bells. High mountain woods of central and north Honshu.

Viola yezoensis Quite big purple-pencilled white flowers before white-downy leaves expand. Mountain woods of all Japan.

Viola faurieana Pale violet flowers before stems lengthen. Woods of central and north Honshu on the west side.

Viola other species.

Waldsteinia ternata Carpets of glossy trifoliolate leaves, loose sprays of yellow Strawberry-flowers. Mountain woods of central Honshu to Hokkaido; Sakhalin, Siberia.

Plants flowering in high summer

Actaea asiatica Black berries held horizontally on dark red stems. Mountain woods of all Japan.

Actaea erythrocarpa Bright red drooping berries. Mountain woods of north Honshu, Hokkaido.

Aegopodium alpestre White Umbellifer. Damp mountain woods of central Honshu to Hokkaido; Sakhalin, E. Siberia, Manchuria, China.

Anemonopsis macrophylla Spreading, 1 foot. Trifoliolate leaves, loose clusters of nodding lilac cups, darker outside. Mountain woods of central Honshu. Rare, endemic.

Angelica edulis Up to 10 feet. Mountain woods of central Honshu to Hokkaido.

Angelica other species, including *Angelica ursina*, mostly in damp, open places.

Asperula odorata Whorled leaves, clusters of white stars. Mountain woods of Hokkaido; Honshu, Sakhalin.

Caulophyllum robustum (Berberidaceae) 2½ feet. 2 big, grey-green, *Thalictrum*-like leaves, sprays of small yellow flowers. Mountain woods of all Japan.

Circaea alpina caulescens Open sprays of tiny flowers. Moist mountain woods of all Japan, rather common.

Circaea other species.

Diphylleia grayi (Berberidaceae) 1 to 2 feet. 2 big kidney-shaped leaves, rounded sprays of small white flowers, blue berries. High mountain woods of central Honshu to Hokkaido.

Filipendula kamtschatica Up to 6 feet. Pinnate leaves, wide flattish heads of creamy-white fluffy flowers. Forming colonies along streams in ravines of mountains of central Honshu to Hokkaido.

Galium japonicum Whorled leaves, white flowers. Damp mountain woods of all Japan.

Galium other species.

Laportea species Stinging members of the Nettle family.

Lilium medeoloides To 2 feet. Arching stems, single whorl of leaves, a few orange-red turkscaps spotted purple. Damp woods and meadows to alpine zone of central Honshu to Hokkaido; Kamchatka, China.

Lychnis gracillima 3 feet. Loose sprays of white flowers with 2-cleft petals. Mountain woods and thickets of central and north Honshu.

Lychnis wilfordii (*laciniata japonica*) Deep red, very fringed flowers. Central Honshu, Hokkaido (rare); Manchuria, north Korea.

Lychnis fulgens 2 feet. Rich red flowers with bifid petals. Mountain thickets. Central Honshu; China.

Mitchella undulata (Rubiaceae) Carpets of small paired evergreen leaves, twin, long-tubed white flowers, red berries. Mountain woods of all Japan.

Panax japonicus (Araliaceae) 2½ feet stems topped by whorled palmate leaves round clusters of small yellow-green flowers, red berries. Mountain woods of all Japan, rather rare.

Paris (Trillium) japonica 2½ feet. A whorl of narrow leaves, solitary white stars of long narrow rays. High mountains of north and central Honshu.

Paris tetraphylla 4 leaves, small green stars. Mountain woods of all Japan.

Paris verticillata 6 or 8 leaves. Mountain woods of all Japan.

Peltoboykinia tellimoides (Saxifragaceae) A few big, round, lobed leaves, 2 feet. Sprays of small creamy-white bowls. Mountain woods of north and central Honshu, rare. Endemic.

Peracarpa (Campanula) carnosa circaeoides Juicy, round-leaved mats, solitary white bells stained purple. Damp woods in mountains of all Japan; Kamchatka, Sakhalin.

Petasites japonicus giganteus Larger than the type. North Honshu, Hokkaido; Sakhalin. Damp woods along streams in ravines. Flowers in spring.

Polygnotum macranthum (giganteum) Mountain woods of all Japan.

Polygnotum sachalinense To 10 feet. Colonies along streams and ravines in mountains of west central and north Honshu, Hokkaido.

Rodgersia podophylla Big bronzy palmate leaves, tiers of small white fluffy flowers. Mountain woods of Honshu and Hokkaido.

Smilacina hondoensis Stout, 1 to 2 feet, in colonies. Foam-like pyramids, male and female on separate plants. Mountain woods of central and north Honshu.

Smilacina robusta Clumps of 5 foot, purplish stems, fluffy white pyramids. Mountains of central Honshu, rather rare.

Spuriopimpinella calycina (Umbelliferae) Celery-leaves, white flowers, slender. Damp mountain woods of all Japan.

Thalictrum filamentosum 2 feet. Flat-topped clusters of fluffy white flowers. Mountain thickets and woods of all Japan; Korea, Manchuria.

Tiarella polyphylla Lobed leaves, 9 to 24 inch spires of white or reddish, minute, fluffy flowers. Damp mountain woods of central Honshu to Hokkaido, and Shikoku; China, Himalaya, Taiwan. Forms clumps.

Tricyrtis latifolia 2½ feet. Erect, soft yellow, purple-spotted flowers. Mountain woods of all Japan.

Tricyrtis affinis (japonica) Shorter, white, purple-dotted flowers. Woods of Hokkaido, Shikoku, Kyushu.

Urtica platyphylla A Stinging Nettle up to 6 feet. Moist woods and river banks in lowlands and hills of central Honshu to Hokkaido.

Urtica other Nettles and members of the Nettle family.

Veratrum maackii parviflorum Broad pleated leaves, branched spires of green flowers. 3 feet. Mountain woods of central Honshu to Hokkaido.

Veratrum maackii japonicum (Veratrum maackii) Narrower leaves, fewer on stem, brown-purple stars. Mountain woods of Honshu and Hokkaido.

Plants flowering in autumn

Artemisia montana Resembles Mugwort (*Artemisia vulgaris*). Tall, with stolons. Leaves pinnately cut, cobwebby above, grey-woolly beneath, large sprays. Mountain woods of central Honshu to Hokkaido; Sakhalin.

Cacalia adenostyloides Tall Composite. Narrow sprays of rayless flowers. Mountain woods of central and north Honshu, Shikoku.

Cacalia delphiniifolia White to purplish sprays. Mountain woods, all Japan.

Cacalia hastata Large sprays. Mountain woods of central Honshu to Hokkaido; Kamchatka, Sakhalin, Korea, Manchuria.

Cacalia other species. Tall *Eupatorium*-like plants, white or yellowish flowers.

Carpesium abrotanoides and other species Tall Composites with yellowish, drooping, rayless heads of flowers.

Caryopteris divaricata Branching herb, 16 to 36 inches. Axillary clusters of pale blue-purple ½ inch long funnels with long stamens. Mountain woods of all Japan (flowering August, September).

Pterygocalyx volubilis (*Gentiana luteoviridis*) Scrambling. Blue-purple tubular flowers, sometimes white. Mountains of all Japan. Rare.

Tripterispermum (*Crawfordia*) *japonicum* (*Gentiana trinervis*) Creeping and scrambling, 16 to 32 inches. Stems and underside of leaves purplish, pale blue-purple trumpets. Mountain woods of all Japan; Sakhalin, Korea, China, Taiwan.

The Ferns

Adiantum pedatum Fronds bipinnate on dark wiry stems, 8 to 28 inches. Many oblong pinnules arranged in a fan. Mountain woods of Honshu, Hokkaido, Shikoku, rather common; Kamchatka, E. Siberia, Manchuria, Korea, China, North America.

Athyrium crenuloserrulatum Creeping. Triangular 10 to 16 inch blades on long stalks, bipinnately cut. Central Honshu to Hokkaido; Korea, Manchuria.

Athyrium filix femina longipes 2 feet, arching, bipinnate fronds. Mountain woods of Honshu, Hokkaido; Sakhalin.

Athyrium melanolepis Resembles *Athyrium filix femina*. Mountains of central and north Honshu.

Athyrium vidalii Clumps of bipinnately cut, broadly oval fronds on long stalks, 10 to 12 inches. Mountain woods of all Japan.

Athyrium wardii Clumps of bipinnate, oval, long-pointed fronds, 8 to 12 inches. Mountain woods of all Japan; Korea, China.

Athyrium crenatum Long-creeping. Triangular bipinnate fronds with few pinnae. Mountain woods of central Honshu to Hokkaido.

Blechnum castaneum Lance-shaped, 1 foot fronds, deeply pinnately cut. Fertile fronds much taller. Mountain woods of central and north Honshu.

Botrychium robustum 6 to 12 inches. Thick 5-angled fronds cut several times into threes, pyramidal fertile clusters. Mountains of central Honshu to Hokkaido.

Cystopteris fragilis 2¾ to 7 inches, lance-shaped, bipinnate fronds. Central Honshu to Hokkaido, Shikoku; Sakhalin.

Dryopteris (Arachnoides) maximowiczii 6 to 10 inches, broad triangular, tripinnate fronds. Woods of central Honshu to Hokkaido.

Dryopteris monticola Deciduous, abruptly pointed, bipinnately cut, oblong 16 to 32 inch fronds on long stalks. Mountain woods of central Honshu to Hokkaido, Shikoku; South Manchuria, China.

Dryopteris (Lastrea) nipponica Creeping. Deciduous, lance-shaped, pinnately cut fronds on long stalks, fertile fronds narrower. Central Honshu to Hokkaido; Korea, China.

Plagiogyria (Lomaria) matsumureana 2 feet, simply pinnate, crowded fronds some sterile, some narrower and spore-bearing. Mountain woods of all Japan, commoner in the north.

Polystichum braunii Clumps of bipinnate, spine-toothed fronds, narrower at base, 10 to 24 inches. Central Honshu to Hokkaido; Kamchatka, Manchuria, China, Siberia to Europe.

Polystichum microchlamys 3 foot fronds, bipinnate, pinnules awn-tipped. Central Honshu to Hokkaido; Kamchatka.

Epiphytic Ferns

Mecodium (Hymenophyllum) wrightii (A Filmy Fern.) Mats of bipinnately cut ½ to 1¼ inch fronds. Damp mountain woods among moss on rocks. All Japan.

Polypodium vulgare Common Polypody. Simply pinnate fronds. On tree trunks and rocks. Mountain woods of north Honshu, Hokkaido.

Vandenboschia (Trichomanes) radicans nipponica (A Filmy Fern.) Distant, bipinnately cut, narrow oval fronds, 2 to 4 inches. Epiphytic or sometimes terrestrial. Hokkaido, Honshu, Kyushu.

Woodsia manchuriensis Bipinnately cut, lance-shaped, 4 to 12 inch fronds. Shaded mountain rocks of all Japan; Amur, Manchuria, China.

Woodland grasses

Asperella longearistata 2½ to 3 feet, slender, narrow drooping heads of small spikelets. Mountain woods, all Japan, rather rare; Korea.

Brachypodium sylvaticum “Wood False-brome”. 1½ to 2½ feet, narrow head, long stiff spikelets. Woods, all Japan, very common; temperate Eurasia.

Bromus pauciflorus 2 to 3 feet, nodding, loose and open panicles of long, awned spikelets. Woods, all Japan, very common; China, S. Korea.

Brylkinia caudata Running, 8 to 16 inches, 1-sided spikes of long, awned spikelets. Mountain woods, all Japan, rather common; Sakhalin, S. Kuriles, Manchuria.

Calamagrostis hakonensis 1 to 2 feet, slender, narrow dull purple plumes. Mountain and hill woods, all Japan, rather common; S. Kuriles, China.

Cinna latifolia 2½ to 3¼ feet, nodding panicles of small spikelets. Mountain woods, Hokkaido, C. and N. Honshu; Kamchatka, Korea, Manchuria, Siberia to N.E. Europe, N. America.

Festuca extremiorientalis 2½ to 3¼ feet, related to *Festuca gigantea*. Nodding sprays of awned, rather short spikelets. Mountain woods, Hokkaido, C. and N. Honshu, rather common; E. Siberia, N. China, Korea.

Festuca parvigluma Running, slender, 1 to 2 feet, very open, nodding heads of small shining spikelets. Woods in low mountains, all Japan, very common; Taiwan, China.

Melica nutans “Mountain Melick”. Running, 8 to 20 inches, 1-sided, nodding spikes of round, purplish spikelets. Grassy, shady hill and mountain slopes, wood edges, all Japan, rather common; Kuriles, Sakhalin, Korea, China, Siberia to Europe.

Milium effusum “Wood Millet”. 2 to 3¼ feet, open and loose spires of very small spikelets. Wet grassy places in mountain woods, all Japan, rather common; S. Kuriles, Taiwan, cool Eurasia, N. America.

Muhlenbergia longistolon Running, 1½ to 3¼ feet, narrow panicles of slim, pointed, purple-green spikelets. Mountain woods, all Japan; Amur, Korea, China.

Muhlenbergia japonica 6 to 20 inches, similar, but no running rhizomes, creeping stems. Woods in lowlands and low mountains, all Japan, common; Ussuri, Korea, China.

Orthoraphium coreanum kengii Stiff-growing, 2 to 3 feet, narrow erect dense heads of awned spikelets. Mountain woods, all Japan; type in Korea, China.

Poa radula Related to *Poa chaixii*. 2 to 4½ feet, large open panicles of rather small spikelets. Hokkaido, C. and N. Honshu, woods in mountains; Kamchatka, Sakhalin, S. Kuriles, Ussuri.

Poa other species (*Poa nemoralis* is rare in mountain woods of C. Honshu).

Trees and bushes of wet mountain streamsid es and lowland river plains

Acer ginnala

Alnus pendula (*firma multinervis*) 25 to 40 feet. Rather narrow, pointed, toothed leaves, hanging clusters of "cones". Common in mountains of Hokkaido, Honshu.

Alnus matsumurae (*incana emarginata*) Small tree, or bush. Smooth purple-grey branches, rounded leaves, grey below. Rather common on high mountains of C. and N. Honshu.

Chosenia arbutifolia (*Salix eucalyptoides*) Tall upright tree, thick narrow leaves, slim reddish shoots with waxy-white blooms, dangling catkins before leaves. River plains of Hokkaido, local in C. Honshu, common; Korea, E. Siberia, Sakhalin, Okhotsk Sea region.

Fraxinus japonica (*pubinervis*) 50 feet. Stout twigs, pinnate leaves to 1 foot, petal-less flowers. Lowlands and mountains, C. and N. Honshu.

Fraxinus longicuspis (*borealis*) 20 to 30 feet. Slim shoots, small pinnate leaves turning purple, sprays of white flowers. Mountains of Honshu, Shikoku, Kyushu.

Fraxinus mandshurica japonica To 100 feet. Leaves to 15 inches long, flowers not showy. Wet streamsid es in mountains of C. and N. Honshu, Hokkaido. Type in N.E. Asia, Sakhalin, Manchuria, Korea.

Populus maximowiczii (suaveolens) To 100 feet. Spreading thick boughs, balsam-scented, oval, grey-backed leaves with twisted tips. Alluvial plains and river banks. C. and N. Honshu, Hokkaido; Korea, Manchuria, Ussuri, Amur, Kamchatka, Sakhalin.

Pterocarya rhoifolia In both warm and cool climate woods in mountain valleys of all Japan.

Salix bakko Small spreading tree closely related to *Salix caprea*. W. Hokkaido, C. and N. Honshu.

Salix gilgiana (purpurea sericea) Small tree, or bush, with long shoots, narrow leaves. S.W. Hokkaido, Honshu, Shikoku, Kyushu.

Salix jessoensis (hondoensis) Tree with brown-downy shoots, narrow leaves. Hokkaido, Honshu.

Salix petsusu (viminalis yezoensis) Related to Common Osier. Tree or bush. Slender shoots, rather narrow, long-pointed leaves. C. and N. Honshu, Hokkaido; Sakhalin.

Salix reinii (glabra) Bush. Thick dark brown shoots, broad, dark, toothed leaves, grey below, slender catkins. Rather common in C. and N. Honshu, Hokkaido.

Salix rorida (daphnoides) Tree. Glossy, reddish, bloomy shoots, smooth narrow leaves, “pussy-willow” catkins. Hokkaido, Honshu; Sakhalin, Amur, Ussuri, Korea.

Salix sachalinensis Large bush. Polished brown shoots, shiny, grey-backed leaves, “pussy-willow” catkins tinged pink. Rather common, Hokkaido, Honshu, Shikoku; Amur, Ussuri, Sakhalin, Kamchatka.

Salix sachalinensis “*Sekka*” or “*Setsuka*” Many shoots flattened. Cultivated.

Toisusu (Salix) urbaniana Tree. Red-brown shoots, narrow-oval, grey-backed leaves, dangling, narrow, silky catkins with leaves. C. and N. Honshu, Hokkaido; Sakhalin, Kuriles.

Salix other species of Willow.

WET GRASSLANDS OF LOWLANDS AND HILLS

Wet meadows, marshes and river banks

Agropyrum humidorum (Graminae) Clump-forming, 16 to 32 inches, purple-stained pale green spikes. Wet places in lowlands of Honshu, Kyushu, rather common; China.

Agrostis nipponensis S.W. Honshu, Shikoku, Kyushu, rather rare.

Agrostis other introduced species.

Achillea ptarmica macrocephala 1 to 3 feet, saw-edged leaves, white flowers. Hokkaido, C. and N. Honshu; Kamchatka, Sakhalin, E. Asia, Kuriles.

Achillea sibirica 2 to 3 feet, similar to *Achillea ptarmica* but denser-growing, bipinnate leaves, dense sprays of white flowers. Hokkaido, Honshu, mountains in Kyushu; S. Korea, Manchuria, China, Sakhalin, E. Siberia, Kamchatka, Aleutians, N. America.

Acorus gramineus (Araceae) Creeping, dense clumps, 10 to 20 inches, narrow shiny leaves, spadix yellow. Wet places along stream and pond edges, Honshu, Shikoku, Kyushu; China, Taiwan, India.

Adenophora palustris 2 to 3 feet, purplish leafy stems, narrow spires of blue bells. C. and W. Honshu, rare.

Aster rugulosus Creeping, 2 feet, wrinkled lance-leaves, branched heads of few rather large white daisies. Wet places, Honshu, Shikoku, Kyushu.

Aster tataricus 3 to 6 feet, long-stalked leaves, heads of many blue-purple flowers. Wet places, S.W. Honshu, Kyushu; Korea, Manchuria, N. China, Mongolia, Siberia.

Aster other species.

Caltha palustris barthei Wet places, Hokkaido, N. Honshu; Sakhalin, Kuriles.

Cardamine species Mostly with very small white flowers.

Carex species Tall growing.

Chelonopsis moschata (Scrophulariaceae) Creeping, 2 to 3 feet, arching stems, narrow, long-pointed leaves, axillary clusters of few, large, tubular, rose flowers. Wet streamsides and valleys, Hokkaido, Honshu, Shikoku.

Chrysoplenium species.

Cirsium sieboldii 18 inches to 3 feet. Few long, narrow leaves, deeply pinnately cut, solitary, drooping, lilac thistle-heads on long stems. Wet places along rivers and streams in lowland Honshu, Shikoku, Kyushu.

Cirsium pectinellum 18 inches to 3 feet tall, slender stems, elliptic, pointed, short-spined pinnately cut leaves, drooping, deep rose-lilac thistle heads on long stems. Wet places in lowlands, Hokkaido.

Comarum (Potentilla) palustris 1 to 1½ feet, pinnate leaves, dull purple flowers. Wet places and ponds, lowlands and mountains, Hokkaido, C. and N. Honshu; Eurasia, N. America.

Corydalis decumbens Slender, grey-waxy, cut leaves, open spikes of rose to blue-purple flowers. River meadows, C. and W. Honshu, Shikoku, Kyushu; China, Taiwan.

Cyperus serotinus 2 to 3 feet, creeping, triangular stems, narrow greyish flat leaves, large heads of green to dark reddish spikelets above umbrella-bracts. Marshy places, all Japan; Korea, Manchuria, Taiwan, China, India, Europe.

Cyperus sanguinolentus 4 to 16 inches, clumped, sprays of reddish spikelets above umbrella-bracts. All Japan, common; warmer Eurasia.

Cyperus monophyllus Creeping, leafless, 3-angled stems, 3 to 5 feet, heads of light brown spikelets over bracts. 3 southern islands; Taiwan, China, Indochina.

Cyperus other species (*Cyperus haspan*, *Cyperus brevifolia* and others).

Digraphis (Phalaris) arundinacea Wet sunny places, all Japan; N. Hemisphere.

Duchesnia (Fragaria) chrysantha Resembles a Strawberry, yellow flowers, red fruits. Sunny grassy places in lowlands, especially round rice fields, all Japan; Korea, Manchuria, China to Malaysia.

Dysophylla (Mentha) yatabeana Creeping, 1 to 1½ feet, leafy stems, dense spikes of rose flowers. Wet places, 3 southern islands; Korea.

Eleocharis species (Cyperaceae) Rush-like growth, solitary spikelets.

Epilobium hirsutum villosum Rare in C. Honshu; Europe, Siberia.

Epilobium other species With small rose flowers, forming colonies, common.

Eriocaulon species Annuals. Small plants, awl-leaves, single round heads.

Eupatorium lindleyanum (kirilowii) 1½ to 2½ feet, leafy stems, dense heads of fluffy white flowers. Wet grassy places in lowlands and hills, Hokkaido, Honshu, Kyushu; Manchuria, Korea, China, Taiwan, Philippines.

Eupatorium chinense (japonicum) and variety *sachalinense* Resembles *Eupatorium cannabinum*, but white flowers. Up to 6 feet. All Japan; Sakhalin, Korea, Manchuria, China, Philippines.

Eupatorium fortunei Resembles *Eupatorium chinense*, but with cleft leaves, 3 to 5 feet. Grassy slopes and river beds, C. and W. Honshu, Shikoku, Kyushu; Korea, China.

Euphorbia adenochlora Stout, 16 to 20 inches, dense yellowish heads. Grassland near rivers in lowlands, Hokkaido, Honshu, Kyushu, common.

Galium dahuricum Creeping, slender, 1 to 2 feet, heads of white stars. Wet grass along rivers, lowlands of C. and N. Honshu; Manchuria.

Gentiana scabra stenophylla Rather sprawling, leafy stems, 1 to 3 feet, heads of purplish-blue trumpets. Wet meadows, thickets and grass in lowlands and hills, Honshu, Shikoku, Kyushu, common; the type in Korea, Manchuria, N. China.

Hemarthria sibirica (Graminae) Clump-forming, 3 to 4 feet, narrow flattened spikes. Wet places in lowlands, 3 southern islands, common; E. Siberia, Ussuri, Manchuria, Korea, China.

Hosta lancifolia (longissima) 1½ feet, dull leaves, small pale rose-purple flowers. Wet places, C. and W. Honshu, Kyushu, locally common.

Hypericum oliganthum Slender, sprawling, dotted narrow leaves, loose sprays of small yellow flowers. Wet places in lowlands. C. Honshu west, Shikoku, Kyushu; S. Korea.

Hypericum laxum Delicate, 2 to 8 inches, annual or perennial, oval leaves, many branches, sprays of small yellow flowers. Wet places in lowlands, common, 3 southern islands; Ryukyus, Korea.

Inula salicina asiatica 2 feet, slender, leafy, heads of single or few yellow daisies. Wet places, all Japan; Korea, Manchuria, E. Siberia, type in W. Siberia, Europe.

Inula britannica chinensis 1 to 2 feet, oval downy leaves, single or few yellow flowers. Wet lowlands along rivers, all Japan, common; Korea, Manchuria, China.

Inula ciliaris Similar, 10 to 20 inches. Wet places, C. Honshu.

Iris ensata spontanea 1½ to 2½ feet, red-purple flowers with yellow throat. Parent of *Iris kaempferi*. Wet places, Hokkaido, Honshu, Kyushu.

Iris laevigata 1½ to 2½ feet, blue-purple flowers, yellow streak on falls. Wet places and in shallow water, Hokkaido, Honshu; Manchuria, Korea, China.

Isachne globosa (Graminae) Clump-forming, 1 to 2 feet, loose, open, purplish heads. Wet places, all Japan; China, Taiwan, S.E. Asia.

Isachne nipponensis Creeping, 2 to 8 inches, similar, but green spikelets. C. Honshu and west, Shikoku, Kyushu, rather rare.

Juncus effusus decipiens 2 to 3 feet, loose lateral clusters of pale brown flowers. Wet places in lowlands and mountains, very common in all Japan; Ussuri, China, Korea, N. America, type Eurasia.

Juncus wallichianus To 1½ feet, with linear stem leaves, terminal heads of many greenish flowers. Swampy places. All Japan, common; Sakhalin, Ussuri, Taiwan, China to India.

Juncus other species.

Lathyrus quinquenervis (*Orobus*) Erect, 1½ to 2½ feet, leaves with tendrils, spikes of purple flowers. Wet grass and thickets on riverbanks, lowlands of Honshu, Kyushu; E. Siberia, Korea, Manchuria, China.

Leersia oryzoides (Graminae) 1½ to 2½ feet, open heads of small spikelets sometimes remaining partly in sheath. Wet places, all Japan; temperate world.

Lobelia chinensis Creeping, slender stems, lance-leaves, axillary white to rosy-purple, 5-lobed flowers. Wet lowlands, often rice fields, all Japan; Korea, China, Ryukyus, Taiwan, India, Malaysia.

Lobelia sessilifolia (*camtschatica*) 2 to 3 feet, creeping lance-leaves, dense spikes of lipped violet flowers. Wet places in lowlands and mountains, all Japan; Kuriles, Sakhalin, E. Siberia, Manchuria, Korea, Taiwan.

Lycopus species (Labiatae) Very small white flowers, several common species.

Lysichitum camtschaticense Big white spathes before huge smooth oval leaves. Swamps, Hokkaido, C. and N. Honshu, common; Ussuri, Kuriles, Sakhalin, Kamchatka.

Lysimachia fortunei Creeping, 16 to 28 inches, pellucid-dotted narrow oval stem leaves, dense spikes of small white flowers. Wet places round ponds and rivers in lowlands, 3 southern islands; Korea, China, Taiwan, Indochina.

Lysimachia vulgaris davurica 1½ to 2½ feet. Wet places, Hokkaido, Honshu, mountains in Kyushu; temperate E. Asia, type in Eurasia.

Lysimachia leucantha 1½ to 2 feet, narrow, black-dotted stem leaves, loose spires of small white flowers, lowlands of Honshu, Kyushu, rare; Korea.

Lythrum salicaria 2 to 3 feet, spikes of purple-red flowers. Wet places, lowlands and hills, all Japan, rather common; Eurasia, N. America, Australia.

Mazus miquelii Related to *Mimulus*. With stolons, 3 to 6 inch leafy stems, broad-ended, toothed leaves, heads of few, 5-lipped, pale purple flowers with yellow bee-guides. Wet places, especially round rice fields, 3 southern islands in lowlands.

Mazus japonicus Similar, flowers white to pale purple. Open ground and river-banks, lowlands, all Japan, very common; Korea, China, Ryukyus, India.

Mentha japonica Slender, smooth, 8 to 16 inches, spikes of whorled small pale purple flowers. Wet places in lowlands and mountains, Hokkaido, Honshu.

Menyanthes trifoliata Bogs and lake edges, Hokkaido, Honshu, Kyushu.

Miscanthus sacchariflorus (Graminae) 3 to 8 feet, leaves arching from stiff stems, heads of purplish fingers. Wet places in lowlands, all Japan, common; Ussuri, Manchuria, Korea, N. China.

Oenanthe javanica (Umbelliferae) White umbels. Wet places, ponds and ditches, all Japan, common; China, India, Malaysia, Australia.

Penthorum chinense (sedoides) (Crassulaceae) With stolons, 1 to 2½ feet, lance-leaves on stem, sprays of small yellow-green flowers. Mud along rivers in lowlands, S.W. Honshu, Shikoku, Kyushu; Korea, China, Manchuria, E. Siberia.

Polemonium yezoense 1 to 2½ feet, pinnately cut leaves, loose sprays of blue funnel-shaped flowers. Hokkaido.

Polygonum japonicum Creeping, 2 to 3 feet, lance-leaves, terminal nodding spikes of small white flowers. Wet grass in lowlands, all Japan, rather common; S. Korea, China.

Polygonum tenuicaule Creeping, long-oval basal leaves, flower-stem 2 to 5 inches with spike of white flowers. Enjoys damp soil and some shade. Honshu, Shikoku, Kyushu.

Primula sieboldii (cortusoides) White-downy, long-stalked, lobed, wrinkled, heart-shaped leaves, 6 to 16 inches, umbels of rose flowers, sometimes white. Wet grass along rivers in lowlands, S. Hokkaido, Honshu, Kyushu; Korea, Manchuria, E. Siberia.

Ranunculus ternatus 4 to 12 inches, 3-cut leaves, sprays of rather small yellow flowers. Grass along rivers in foothills, 3 southern islands, rather common; China, Taiwan.

Ranunculus repens "Creeping Buttercup". Wet places in lowlands, especially near the sea, Hokkaido, C. and N. Honshu; Eurasia, N. America.

Ranunculus quelpartensis 6 inches to 2½ feet, cut leaves, small yellow flowers. Wet places, lowlands and mountains, all Japan; Korea, China, S. Kuriles, Ryukyus.

Ranunculus other species.

Rumex longifolius A Dock. 2½ to 3 feet. Wet meadows in lowlands, Hokkaido, C. and N. Honshu, Kyushu; temperate Eurasia.

Rumex japonicus 1½ to 3 feet, leafy narrow spires. Wet meadows and ditches in lowlands, all Japan, common; Korea, Sakhalin, Kamchatka.

Rumex acetosa Sorrel. Damp meadows, all Japan, very common; N. Hemisphere.

Sanguisorba tenuifolia alba 1 to 3 feet, pinnate leaves, erect, cylindrical spikes of white, fluffy flowers, sometimes reddish. Wet meadows along streams in lowlands and mountains, all Japan; type in E. Siberia, Kamchatka, Sakhalin, Kuriles, Korea, Manchuria.

Sanguisorba officinalis Meadows in lowlands and mountains, Hokkaido, Honshu, Kyushu, rather common; Eurasia.

Saururus chinensis Creeping, 1½ to 3 feet, many heart-shaped stem leaves some half white, dense spikes of small yellow-white flowers. Along river and pond edges, 3 southern islands, common; Korea, China, Philippines.

Scirpus wichurae 3 to 5 feet, 3-angled stems, flat leaves, broken groups of red-brown spikelets above 2 or 3 bracts. Wet places in lowland and hills, all Japan, common; Korea, China to Himalayas.

Scirpus fluviatilis Creeping, 2½ to 5 feet, 3-angled stems, flat leaves, bracted sprays of brownish spikelets with translucent awn. Marshes and shallow water, all Japan; E. Asia, Australia, N. America.

Scirpus lineolatus Creeping, leafless, 3 to 12 inches, solitary, shiny, red-brown spikelets. Marshes, all Japan; Taiwan.

Scirpus juncooides Slender, clump-forming, 1 to 2 feet, pseudolateral heads of dark brown spikelets, leafless. Wet places, all Japan, rather common; Korea, Manchuria.

Scirpus triqueter Creeping, 1½ to 3 feet, leafless 3-angled stems, clusters of shiny rust-coloured spikelets beside one short bract. Marshes to shallow water, all Japan; Korea, Ussuri, Manchuria, China, Malaysia, India, S. Europe.

Scirpus other species.

Scrophularia species.

Scutellaria strigillosa yezoensis Creeping, 4 to 16 inches, single, large, axillary, blue-purple flowers. Wet places, Hokkaido, N. Honshu; Sakhalin, Kuriles, Korea, Manchuria.

Senecio pierotii 20 to 30 inches high erect, leafy, cobwebby stems, thick, narrow leaves, flat clusters on long stems of many yellow daisies. Wet places on lower slopes of mountains. Honshu, Shikoku, Kyushu.

Sium species (Umbelliferae).

Stachys japonica 1 to 2 feet, smooth, lance-leaves, spikes of whorled pinkish flowers. All Japan, common.

Stellaria species.

Symplocarpus renifolius (*Spathyema foetida*) (Araceae) Kidney-shaped leaves of 1 to 1½ feet, rounded purplish to green spathes before leaves. Wet places, Hokkaido, C. and N. Honshu; Amur, Ussuri, Sakhalin.

Symplocarpus nipponicus Similar, smaller, narrow leaves, spathes stained dark purple-brown. Wet places, Hokkaido, C. and N. Honshu.

Thalictrum simplex brevipes 2 to 3 feet, much cut leaves, large plumes of pale yellow small flowers. Grass along rivers in lowlands, Honshu, Kyushu; Korea, Manchuria, China, E. Asia, type N. Asia to Europe.

Triadenum japonicum Related to *Hypericum*. Creeping, 1 to 2 feet, soft, smooth lance-leaves, short spires of few rose flowers. Wet places, all Japan; Korea, Manchuria, Ussuri, Amur.

Tulipa (Amana) edulis 6 to 12 inches, slender, leaning, 2 linear greyish leaves, 1 to 3 white flowers dark purple striped inside. Lowland meadows along rivers, C. Honshu westward, Shikoku, Kyushu; China.

Utricularia racemosa Creeping, few minute spatula-like leaves from underground thread-like stems, and on flower stalks, which are 4 to 12 inches tall, bearing several small, lipped, half closed purple flowers. Muddy places in lowlands and hills, all Japan, rather common; Korea, China, Taiwan, India.

Utricularia bifida Similar, yellow flowers. Muddy places, lowlands and hills, 3 southern islands; China, India, Malaysia, Australia.

Utricularia other biennial species.

Veronica americana Related to *Veronica beccabunga*. Wet places, Hokkaido; Sakhalin, Kuriles, E. Siberia, N. America.

Veronica other terrestrial species.

Viola verecunda Creeping, sprawling, stemmed, small white flowers purple lined. Wet grass, lowlands and hills, all Japan, very common; Korea, Manchuria, Amur, China, Taiwan, Sakhalin.

Viola other species. (*Viola raddeana*, stemmed, erect, narrow leaves, 1 to 2 feet, pale purple flowers. Wet places, Hokkaido, E. C. Honshu, Kyushu; Korea, Manchuria, Amur.)

SWAMP AND WATER PLANTS

Plants of swamps

Plants growing in mud under shallow water at the edges of slow rivers, lakes and ponds, mostly in the lowlands and hills.

Acorus calamus Creeping, sword-leaves, 1½ to 2½ feet, spadix from side of "leaf". Shallow water along rivers, all Japan: Siberia, E. Asia, N. America.

Alisma plantago-aquatica "Water Plantain". Wet places and shallow water, Hokkaido, N. Honshu; temperate N. Hemisphere.

Alisma canaliculatum Similar but narrower leaves. Wet places, all Japan.

Carex species.

Cyperus species.

Digraphis (Phalaris) arundinacea Wet sunny places at edge of water, all Japan, common; cool N. Hemisphere.

Eleocharis species

Glyceria acutiflora Running, 8 to 28 inches, narrow panicles, partly enclosed. Ponds, ricefields, 3 southern islands, common; Korea, Ryukyus, China, N. America.

Glyceria depauperata Close to *Glyceria fluitans*. Similar but smaller. Pond and river banks, Hokkaido, Honshu.

Glyceria ischyronoura 2½ to 3¼ feet, long, rather narrow panicles. Ponds and river banks, all Japan, common; Korea.

Glyceria leptolepis Close to *Glyceria aquatica*. 2½ to 4½ feet, large nodding panicles of rather small spikelets. Ponds and river banks, Hokkaido, Honshu, Kyushu, rather rare; Ussuri, Manchuria, Korea, China, Taiwan.

Phragmites communis "Reed". 3 to 9 feet. Wet lowlands in shallow water, all Japan, very common in wide colonies; nearly cosmopolitan in temperate regions.

Polygonum amphibium Creeping, smooth, oblong, pointed leaves, dense axillary spikes of reddish flowers. Ponds and shallow lakes, Hokkaido, N. Honshu; temperate N. Hemisphere.

Sagittaria trifolia Close to *Sagittaria sagittifolia* Wet places, ricefields, river edges, ponds, all Japan, common; Korea, China, India.

Sagittaria aginashi Similar, but with axillary bulbils. Ponds, river edges, all Japan.

Sagittaria pygmaea 4 to 10 inches, rosettes of linear leaves, few flowers. Ponds, ricefields, mud, C. and W. Honshu, Shikoku, Kyushu; Korea, Taiwan, China.

Scirpus lacustris creber "Bullrush". 3 to 6 feet, leafless, terminal clusters of red-brown spikelets. Ponds and lake edges in quite deep water, all Japan; Sakhalin, Kuriles, Korea to Europe.

Scirpus lacustris zebrinus Transverse yellow-white bands—

Scirpus lacustris pictus Longitudinal white lines—

—Cultivated.

Sparganium stoloniferum Close to *Sparganium ramosum*. 2 to 3 feet, branched heads of burrs. Shallow water in lowlands, all Japan; Korea, China to Turkestan and Afghanistan.

Sparganium stenophyllum 1½ to 2 feet, spikes of burrs. Shallow lowland ponds, Hokkaido, Honshu, Kyushu; N. China, Ussuri.

Sparganium other species.

Typha latifolia "Reedmace". Ponds and river edges in lowlands, all Japan; temperate N. Hemisphere.

Typha orientalis Similar, smaller. 3 southern islands; Ussuri, China, Philippines.

Typha angustata Narrow leaves. Shallow ponds and river edges in lowlands, Hokkaido, Honshu, Kyushu; warm Eurasia.

Zizania latifolia "Manchurian Wild Rice". Creeping, 3 to 7½ feet, blue-green leaves, narrow pyramids of long, purplish or green awned spikelets. Ponds and river edges, all Japan, very common; E. Siberia, Korea, China, Ryukyus, Taiwan, Indochina (*Zizania caducifolia*).

Plants with floating leaves

Brasenia schreberi (Nymphaeaceae) "Water Shield". Creeping; shield-shaped leaves purplish beneath, inch-wide red-purple flowers closing and lying on the water at night. Lakes and ponds, all Japan; E. Asia, India, Australia, W. Africa, N. America.

Hydrocharis dubia Floating rounded leaves, white, yellow-eyed, 3-petalled flowers above water. Ponds, 3 southern islands, common; S.E. Asia, Australia.

Marsilia quadrifida 2 to 6 inches, 4-foliolate leaves floating from running root, stalked spore-cases from leaf stems. Ricefields, ponds, all Japan, common; Europe to N. India and E. Asia.

Nuphar japonicum Spear-shaped leaves above water, rather small yellow flowers. Ponds, lakes, shallow streams, S.W. Hokkaido, Honshu, Shikoku, Kyushu; common.

Nuphar pumilum Floating leaves, yellow flowers. Rocky highland ponds and lakes, E. Hokkaido, N. Honshu; Siberia to Europe.

Nymphaea tetragona Rounded heart-shaped mottled leaves red beneath, starry white flowers. Rocky highland ponds and shallow lakes, all Japan; E. Siberia, Manchuria, China, Korea, India, N. America.

Nymphaea tetragona angusta Flowers with more petals. Ponds and lakes at lower altitudes, 3 southern islands.

Nymphoides (Limnanthemum) peltata Running; oval floating leaves, yellow, fringed flowers. Ponds and shallow lakes in lowlands, 3 southern islands, common; temperate N. Hemisphere.

Nymphoides (Limnanthemum) indica Small white flowers, lobed leaves. Ponds and shallow water in lowlands, 3 southern islands, common; Korea, China, S.E. Asia to Australia and Africa.

Ranunculus nipponicus Close to *Ranunculus aquatilis*. Lobed floating leaves, thread-like submerged ones, white, yellow-eyed flowers. Mountain ponds, C. Honshu.

Ranunculus nipponicus major No floating leaves. Ponds and streams, Hokkaido, Honshu.

Ranunculus other similar species.

Species of *Lemna* ("Duckweed"), *Azolla*, *Salvinia*, *Trapa* (annual).

Submerged plants

Ceratophyllum demersum "Hornwort". Long stems with many thread-leaves. Ponds and shallow lakes, all Japan, common; cosmopolitan.

Hippuris vulgaris "Maretail". Creeping; erect stems rising out of the water with whorls of leaves resembling an *Equisetum*. Wet places and shallow ponds, Hokkaido, C. and N. Honshu; cool N. Hemisphere, Chile.

Hydrilla verticillata Whorls of narrow leaves on long stems. Ponds, all Japan, common in south; Eurasia, Malaysia, Australia, Madagascar.

Isoetes japonica Dense tufts of quill leaves, 8 inches to 3 feet, with spore cases at base. Slow-running streams, 3 southern islands, rather rare; Korea.

Myriophyllum species Common "Water Milfoils".

Najas species Tufts of toothed thread leaves on long stems.

Potamogeton species Many and common "Pondweeds".

Ruppia rostellata Related to *Ruppia maritima*. Slender stems with thread leaves from sheaths, floating, flowers on waved stalks. Ponds and shallow streams, S. W. Honshu, Shikoku, Kyushu; Eurasia, Africa, N. America.

Utricularia species "Bladderworts". Floating branches with many thread leaves and bladders, heads of lipped pale yellow flowers above water. *Utricularia japonica* is close to *Utricularia vulgaris*, common in lowlands and hills, all Japan.

Vallisneria asiatica With stolons, strap leaves, spathed flowers from roots. Ponds, shallow rivers, all Japan, common; Korea, China, Indochina, Taiwan. Much used in aquaria.

Zanichellia palustris indica Floating stems, thread-leaves in opposite pairs, small flowers in axils. Creeping rhizomes. Ponds, Honshu, Kyushu; Ryukyus, India, type cosmopolitan.

MOUNTAIN MEADOWS AND ROCKY RAVINES BELOW ALPINE HEIGHTS

The meadows are often open and sunny, but sometimes part shady at the edges of the woods, and where thickets of bushes grow. The meadows spread on the wider, flatter valley bottoms, which are damp or wet, and also on gentle slopes between the forests, and forest clearings, where

the soil has much humus and seldom dries out in the rainy climate. On the more sterile, sandy slopes of the isolated volcanoes, grass meadows are replaced by bushland, often mainly of low *Rhododendrons*.

In steeper places the rivers cut bouldery gorges between cliffs of granite or other hard rock, which trickle with water in many places, and may be sunny, or in shade for much of the day.

Mountain meadows

Aconitum japonicum 12 to 40 inches, arching stems, 3- to 5-cleft leaves, branching heads of few blue-purple flowers. S.W. Hokkaido, 3 southern islands, common.

Adenophora divaricata 24 to 40 inches, whorled leaves, large loose sprays of blue bells. C. and N. Honshu; Korea, Manchuria.

Allium schoenoprasum foliosum Mountains, Hokkaido, Honshu, Shikoku.

Anaphalis margaritacea angustior 12 to 28 inches, creeping, grey-white woolly. Sunny slopes in mountains, rarely alpine, Hokkaido, C. and N. Honshu, rather common.

Anthoxanthum japonicum (Graminae) 8 to 24 inches, slender, nodding heads. Mountains, C. and N. Honshu.

Aquilegia buergeriana and varieties 12 to 24 inches, yellow flowers tinged purple-brown, straight-spurred. All Japan.

Aquilegia (Isopyrum) adoxoides Leaves cut into 3s, purplish beneath, nodding, small pale rose, nearly spurless flowers. Mountains, C. and S.W. Honshu, Shikoku, Kyushu, common; S. Korea, China.

Aruncus dioicus kamtschatica 12 to 32 inches. All Japan, rather common; Kamchatka, Kuriles, Sakhalin, Manchuria, Korea, China.

Aster ageratoides varieties in mountains, very common.

Astilbe microphylla 12 to 32 inches, much divided leaves, narrow plumes of pale rose flowers. Sunny, grassy places in mountains, Honshu, Shikoku, Kyushu, rather common.

Astilbe thunbergii 16 to 32 inches, leaves 3 times cut into 3s, branched white plumes. Grassy slopes and thickets in mountains, 3 southern islands, variety in Hokkaido.

Bupleurum longiradiatum 8 to 40 inches, long stalked, narrow leaves, many yellow-green umbels. Mountains, all Japan.

Calamagrostis epigeios 24 to 60 inches, "Bush Grass", damp grassy mountain slopes, common. All Japan; Eurasia.

Calamagrostis arundinacea 24 to 60 inches, yellowish, violet-stained plumes. Mountains and hills, all Japan, very common; Eurasia.

Carex species.

Cirsium senjoense 28 to 40 inches high, cobwebby stems, long-narrow, spine-toothed leaves, loose clusters of small, nodding, rosy-lilac thistle-heads, Akaishi and Shirane mountains, Honshu.

Cirsium buergeri 1 to 2 yards tall, downy, long, narrow, stout-spined leaves, open heads of small erect, rose-lilac thistle-flowers. Mountains of Kinki and west Honshu, Kyushu.

Cirsium nipponense 18 inches to 3 feet high, narrow, spiny-edged leaves, solitary, nodding large, rose-lilac thistle-heads. Mountains of north and central Honshu.

Cirsium suffultum 3 feet tall, cobwebby, long, narrow, pinnately cut, white-veined and spiny leaves, few, nodding, rosy-lilac thistle-heads. Shikoku, Kyushu, common.

Cirsium purpuratum Stout, 18 inch to 3 feet stems, cobwebby, large, pinnately cut basal leaves, large, nodding lilac-pink thistle-heads from brown bracts. On gravel and sand slopes of mountains of central east Honshu.

Clematis stans (*heracleifolia stans*) 20 to 36 inches, often woody based, leaves 3-cut, axillary sprays of narrow, nodding, pale purple-blue bells with recurved ends, forming large heads. Sunny places in mountains, Honshu, variety in Shikoku, Kyushu.

Clematis speciosa Similar and closely allied, longer flowers, Shikoku, Kyushu.

Convallaria keiskei 8 to 14 inches, resembles *Convallaria majalis*. Highlands and mountain meadows, Hokkaido, Honshu, Kyushu.

Corydalis ochotensis raddeana Juicy, sprawling, much divided leaves, loose spikes of pale yellow flowers. Mountains, all Japan; E. Siberia, Ochotsk.

Cypripedium macranthum 10 to 16 inches, 3 to 5 white-hairy leaves, rose to rosy-purple flowers. Grassy mountain slopes, Hokkaido, Honshu, rather rare; Kamchatka, Siberia to E. Europe, Korea, Manchuria, N. China.

Dracocephalum argunense Close to *Dracocephalum ruyschianum*. 6 to 16 inches, shiny, narrow leaves on stems, dense spikes of purple-blue long funnels. Sunny dry slopes in mountains, Hokkaido, C. and N. Honshu.

Epilobium (Chamaenerium) angustifolium "Rosebay Willow-herb". Forms colonies in grassy places, Hokkaido, central and north Honshu, cooler North Hemisphere.

Erigeron acris and varieties 6 to 22 inches, branched, spatula to oblong leaves, loose sprays of small rose-purple daisies on long stems. High mountains, Hokkaido, C. and N. Honshu, Shikoku; Kamchatka, Kuriles, Sakhalin, Manchuria, China, Siberia to Europe, N. America.

Erigeron thunbergii 4 to 15 inches, clumps of spatula-leaves, large, solitary blue-purple daisies. Grassy places, lowlands and mountains, C. and N. Honshu.

Euphorbia species.

Festuca rubra "Red Fescue". Mountains, Hokkaido, C. and N. Honshu.

Fragaria nipponica Close to *Fragaria vesca*. Mountains, C. Honshu, Kyushu.

Fragaria yezoensis Similar, E. Hokkaido, S. Kuriles.

Filipendula multijuga (Spiraea palmata) and varieties 12 to 40 inches, pinnate leaves, flattened heads of fluffy rose flowers. Mountains, all Japan.

Galium verum asiaticum "Ladies Bedstraw". Grassy slopes in mountains, Hokkaido, Honshu, Kyushu; the type in Eurasia.

Galium other species.

Gentiana triflora japonica 12 to 32 inches, slender erect leafy stems, spires of long dark blue trumpets. Lowlands and mountains, Hokkaido, N.W. Honshu.

Gentiana other species, several biennial.

Geranium soboliferum 24 to 32 inches, large rose-purple flowers. Grassy slopes in mountains, C. Honshu, rare; Korea, Manchuria.

Geranium eriostemon 12 to 20 inch, deeply lobed leaves, small rose-purple flowers. Mountains, Hokkaido, C. and N. Honshu, rather rare.

Geranium yesoense (dahuricum) 12 to 32 inches, lobed leaves with cut segments, large rose-purple flowers. Mountains of C. and N. Honshu, Hokkaido, variety near seashores of Hokkaido and N. Honshu.

Geranium shikokianum Similar, S.W. Honshu, Shikoku, Kyushu, varieties in mountains.

Helionopsis orientalis Mountain thickets and meadows to alpine regions.

Hieracium umbellatum japonicum 16 to 32 inches, toothed leaves, flat heads of yellow dandelions. Grassy slopes in mountains, Hokkaido, Honshu, Shikoku; S. Kuriles, Korea, Sakhalin, the type in Eurasia.

Hypericum ascyron 20 to 32 inches, branching, narrow leaves, few large, yellow to reddish flowers at top of stems. Grassy places in mountains, Hokkaido, Honshu, Kyushu; E. Siberia, Korea, China, N. America.

Iris gracilipes 6 inches, fringed pale lilac flowers, crested white and orange. Mountains of S.W. Hokkaido, C. and N. Honshu, Kyushu.

Iris sanguinea (orientalis) 2½ to 3 feet, unbranched, large blue-purple flowers, veined white on haft. Mountain meadows, Hokkaido, Honshu, Kyushu; E. Siberia, Korea.

Lilium concolor partheneion 12 to 32 inches, narrow leaves, erect, orange-yellow to red, spotted funnels, woolly outside (1½ inches long). Mountain meadows Honshu, Shikoku, Kyushu, rare; Korea, Amur, Manchuria.

Lilium leichtlinii tigrinum (maximowiczii) With stolons, no bulbils, few orange-red, spotted turkscaps, woolly outside. Honshu, Shikoku, Kyushu; Korea, Manchuria.

Lilium lancifolium (tigrinum) “Tiger Lily”. 3 to 6 feet, with bulbils, no stolons, many orange-red, spotted turkscaps. All Japan; Korea, Manchuria, China. Sometimes with *Lilium auratum*.

Lilium auratum “Golden-rayed Lily”. 3 to 4½ feet, heads of big, white, wide open funnels, crimson spotted and yellow rayed. Hills and mountain meadows, Honshu.

Lithospermum erythrorhizon Erect, 16 to 28 inches, leafy, spikes of small white flowers Grassy slopes in hills and mountains, all Japan.

Lloydia triflora 4 to 10 inches, single leaf, several green-veined white flowers. Thickets and meadows in mountains, Hokkaido, Honshu, Shikoku; Kamchatka, Sakhalin, Siberia, Kuriles, Korea, Ussuri, N. and C. China.

Metanartheceum luteoviride (Alettris) 8 to 16 inches, narrow leaves, broader at top, spikes of small yellow-green flowers. Mountain meadows, all Japan.

Patrinia gibbosa 20 to 28 inches, oval toothed leaves, sprays of small yellow flowers. Mountains of Hokkaido, N. Honshu.

Patrinia scabiosaefolia 24 to 40 inches, creeping. pinnate leaves, mostly on stem, flat-topped sprays of small yellow flowers. Sunny, grassy places in hills and mountains, all Japan, common; Kuriles, Sakhalin, E. Siberia, Korea, Manchuria, Taiwan.

Pedicularis species.

Phyteuma japonicum 20 to 40 inches, creeping, narrow oval leaves, terminal spikes of open blue-purple stars. Mountains of Honshu, Kyushu; Korea, Amur, Ussuri, Manchuria.

Platanthera sachalinensis (Orchidaceae) 16 to 24 inches, 1 to 3 large stem leaves, dense spikes of small greenish spurred flowers. Grassy mountain slopes, all Japan; Sakhalin, S. Kuriles.

Platycodon grandiflorum 16 to 40 inches, heads of big blue bells, balloon-shaped in bud. Grassy slopes in hills and mountains, all Japan; Ussuri, Manchuria, Korea, N. China.

Polygonatum involucreatum 8 to 16 inches, few leaves, paired, tubular, hanging, white flowers with green tips. Mountain meadows, all Japan, rather rare; Ussuri, Korea, Manchuria.

Polygonatum odoratum thunbergii 20 to 40 inches, large stout form of common Solomons Seal. Meadows and thickets in mountains, Honshu.

Polygonum cuspidatum (sieboldii) 2 to 6 feet, oval-leafy, arching, often spotted stems, spikes of small white flowers. Sunny places in hills to high mountains, with an alpine form, all Japan, very common; Korea, China, Taiwan.

Polygonum bistorta Grassy slopes in highlands and subalpine regions, all Japan, rather common; alpine and cold N. Hemisphere.

Potentilla stolonifera 2 to 12 inches, pinnate leaves, small yellow flowers, long stolons. Sunny slopes in mountains, all Japan; Kuriles, Sakhalin, Kamchatka. (Close to *Potentilla fragarioides*.)

Potentilla cryptotaenia 20 to 40 inches, trifoliate leaves dying before flowering, many ½ -inch yellow flowers. Mountains, Hokkaido, Honshu, Kyushu.

Ranunculus acris japonicus Grassy lowlands and mountains, S.W. Hokkaido, Honshu, Shikoku, Kyushu.

Saussurea triptera 12 to 14 inches high, large heart-shaped leaves, close clusters of pale purple, rayless *Centaurea*-like flowers on tall stems. Mountains of central Honshu, varieties in alpine regions.

Saussurea ussuriensis 1 to 4 feet high, leafy stems, closely related to *Saussurea triptera*. Mountains of Honshu, Kyushu; Ussuri, Manchuria, Korea, N. China.

Saussurea pulchella Biennial. 1 to 5 feet tall, pinnately cut leaves, clusters of many lilac-pink, upright button-flowers. Grassy slopes in mountains, all Japan.

Scabiosa japonica Biennial. 12 to 32 inches, branched, twice pinnately cut leaves, large blue flowers with rays. Sunny, grassy places in mountains, all Japan, common.

Serrulata coronata insularis 12 to 56 inches, creeping, pinnately cut leaves, pale rose-purple, rayless heads. Mountains, Honshu, Shikoku, Kyushu; the type in Siberia, Korea, Manchuria.

Solidago virgaurea 6 to 28 inches, yellow daisies. Open grassy slopes or woods in mountains, all Japan, very common; Eurasia.

Spodiopogon sibiricus (Graminae) Running, 32 to 48 inches. Mountain slopes, all Japan, rather common; Siberia, Korea, Manchuria, China.

Synurus excelsus Stout, 3 to 6 foot cobwebby stems, large hastate leaves, white-woolly beneath, large dark brown-purple thistle-flowers drooping from big, round, whitish heads of bracts. Honshu, Shikoku, Kyushu.

Thalictrum minus hypoleucum 12 to 40 inches, much divided leaves into 3s, large sprays of small yellow-green flowers. All Japan (with varieties).

Thalictrum baicalense 20 to 40 inches, leaves much divided into 3s, dense, narrow plumes of small creamy-white flowers. Mountains of Hokkaido, C. and N. Honshu; E. Siberia, Korea, Manchuria.

Thalictrum aquilegifolium Grassy places, highlands to alpine meadows, all Japan, common.

Tylophora (Vincetoxicum) aristolochioides (Asclepiadaceae) Slender, scrambling and tangled, big pointed leaves, round heads of small dark purple stars. Mountains, all Japan, rather common.

Veronica rotunda subintegra (Related to *Veronica spuria*.) 16 to 32 inches, narrow oval leaves on stems, few terminal spikes of blue-purple flowers. Mountains of 3 southern islands, rare; E. Siberia, Korea, Manchuria.

Veronica subincanovelutina (Related to *Veronica longifolia*.) Erect, 20 to 32 inches, white-downy, narrow, toothed leaves, few long, terminal spikes of blue-purple flowers. Hills and mountains, Hokkaido, W.C. Honshu.

Viola selkirkii (kamchatica) Slender, heart-shaped hairy leaves, pale violet flowers, 2 to 3 inches. Mountains, Hokkaido, C. and N. Honshu; cool N. Hemisphere.

Viola hirtipes Narrow heart-shaped white-downy leaves, 2½ to 4¾ inches, pale rose-purple violets. Mountains, all Japan; Korea, Manchuria, Ussuri.

Viola other species.

Mountain streamsides, wet meadows, and rocky ravines

Adenophora takedae 12 to 28 inches, slender, sloping stems, narrow leaves, open, leafy sprays of blue bells. Rocks in mountain ravines, E.C. Honshu.

Adenostemma lavenia (Compositae) 12 to 40 inches, branching, oval leaves, loose sprays of small, rayless flowers. Wet places in lowlands and mountains, common, 3 southern islands.

Agastache rugosa (Labiatae) 16 to 40 inches, oval leaves, dense spikes of purple flowers. Grassy places, especially along streams in mountain valleys, all Japan; Korea, Manchuria, E. Siberia, China, Taiwan.

Agrostis clavata (Graminae) Clump forming, 12 to 28 inches. Wet grassy places in mountains, all Japan, rather common; Kamchatka, Sakhalin, Siberia to N.E. Europe.

Astilbe japonica 20 to 32 inches, leaves cut into 3s, white plumes. Rocks in mountain ravines, S.W. Honshu, Shikoku, Kyushu.

Caltha palustris membranacea 6 to 20 inches, wet places in mountains, Honshu, Kyushu, the type in N. Hemisphere.

Cardamine species Pinnate leaves, spikes of very small white flowers. Mostly northern, in wet places along streams and ravines in mountains.

Chionographis koidzumiana (Liliaceae) 4 to 12 inches, clumps of oval, long-stalked leaves, slender spikes of small, thin-petalled, pale green flowers. Moist places along mountain streams, S.C. Honshu, Shikoku, Kyushu, rare. (*Chionographis japonica*, deep shade on moist banks in leaf-mould.)

Conandron ramondioides (Gesneriaceae) Creeping, 4 to 12 inches, large, toothed leaves, sprays of lilac, yellow-eyed, nodding, flat flowers. Wet cliffs in mountains, 3 southern islands, rather common.

Dianthus shinanensis (Related to *Dianthus barbatus*.) 8 to 16 inches, narrow, deep green leaves on stems, dense, flat-topped heads of rose-purple flowers. Valleys and ravines in mountains, C. Honshu.

Epilobium species Small rose flowers, colonies on stream banks in mountains.

Filipendula kamtschatica Colonies along streams and in ravines in mountains, C. Honshu to Hokkaido; Kamchatka.

Hakenochloa macra (Graminae) Creeping, 16 to 28 inches, greyish leaves, open yellow-green panicles. Wet mountain cliffs, E.C. Honshu, rather rare.

Hypericum pseudopetiolatum Loose clumps, 4 to 16 inches, slender, branched, dotted leaves, heads of small yellow flowers. Wet places in mountains, S.W. Hokkaido, 3 southern islands, rather common.

Ligularia dentata (*Senecio clivorum*) 16 to 40 inches, long-stalked kidney-shaped leaves, flattened heads of big, orange-yellow daisies. Mountain meadows, Honshu; China.

Ligularia angusta Slender, 40 to 53 inches, grey-green, square-based leaves, spires of nodding, 3-rayed, yellow daisies. E. and C. Honshu.

Ligularia stenocephala 40 inches, slender, long-stalked, spear-shaped leaves, spires of 1- to 3-rayed yellow daisies. Wet places in mountains, 3 southern islands; China, Taiwan.

Ligularia japonica 40 inches, heart-shaped cut and lobed leaves, flattened heads of large yellow daisies. Mountains, S.W. Honshu, Shikoku, Kyushu; Korea, China, Taiwan.

Ligularia sibirica 3 to 6 feet, kidney-shaped leaves, spires of 5- to 9-rayed yellow daisies. Wet places in mountains, 3 southern islands; E. Siberia, Sakhalin, Korea, Manchuria, China.

Lobelia sessilifolia (camtschatica) Creeping, 20 to 40 inches erect, densely leafy stems, lance-leaves, dense spikes of violet trumpets with lobed spreading lips. Wet places in lowlands and mountains, all Japan.

Mimulus nepalensis japonicus 4 to 12 inches, oval leaves, pale yellow, lipped trumpets. Wet streamsides in mountains, all Japan, common; Korea, the type in China, Himalaya.

Mitella pauciflora (Saxifragaceae) Creeping mats, 6 to 10 inches, heart-shaped, hairy, lobed leaves, spikes of feathery small flowers like a dwarf *Tiarella*. Along streams and ravines in mountains, 3 southern islands.

Mitella acerina Similar, smooth leaves, 6 to 12 inches. Mountain wet streamsides W.C. Honshu.

Mitella japonica Similar, longer leaves, 8 to 14 inches. Wet streamsides and ravines in mountains, S.W. Honshu, Shikoku, Kyushu.

Mitella other species.

Parnassia foliosa 6 to 12 inches, stems with heart-shaped, long stalked leaves, solitary, fringed white flowers. C. and W. Honshu, Shikoku, Kyushu.

Primula japonica 16 to 32 inches, whorls of rose-purple to carmine flowers, rarely white. Wet places along mountain streams, all Japan; Taiwan.

Ranunculus quelpartensis 6 to 32 inches, leaves cut into 3s, sprays of small yellow flowers. Wet places in lowlands and mountains, all Japan, common; S. Kuriles, Korea, China, Ryukyus.

Sanguisorba tenuifolia and varieties 32 to 52 inches, branching, pinnately cut leaves, erect or nodding spikes 2½ inches long, white to blood red (in variety *purpurea*). Wet meadows and streamsides, all Japan, lowlands and mountains with alpine variety; type in Kamchatka, E. Siberia, Sakhalin, Kuriles, Korea, Manchuria.

Sanguisorba officinalis Meadows in lowlands and mountains, Hokkaido, Honshu, Kyushu; Eurasia.

Saxifraga fortunei and varieties 2 to 4 inches, kidney-shaped, stalked, lobed leaves, pyramids of white flowers, 2 lower petals longer. Wet rocks and along streams in mountains, all Japan; Sakhalin, S. Kuriles, Korea, Manchuria, Ussuri, China.

Saxifraga cortusaefolia Resembles *Saxifraga fortunei*. Wet shaded places, rocks, along streams in mountains, C. and S.W. Honshu, Shikoku, Kyushu, rather rare. (spotted flowers)

Saxifraga nipponica Resembles *Saxifraga fortunei*, spring-flowering, flowers with yellow spots near base. 8 to 16 inches. C. and N. Honshu in mountains, rare.

Saxifraga japonica 6 to 32 inches, long-stalked heart-shaped leaves, loose sprays of small white flowers. Wet rocks, stream banks, ravines in mountains, Hokkaido, C. and N. Honshu, Shikoku.

Saxifraga fusca 8 to 12 inches, kidney-shaped, long-stalked leaves, loose sprays of small red-brown flowers. Streams and ravines, Hokkaido, N Honshu; S. Kuriles.

Saxifraga stolonifera (sarmentosa) Long red stolons, kidney-shaped leaves pale-veined above, purple-red beneath, 8 to 16 inch stems, broad sprays of spotted white flowers with lower 2 petals longer. Wet soil and rocks, 3 southern islands; China.

Trigonotis guilielmii (Boraginaceae) Creeping, 8 to 16 inches, oval leaves, branched spikes of white or pale blue Forget-me-not flowers. Wet places in mountains, Hokkaido, Honshu.

Trigonotis brevipes With stolons, 4 to 16 inches, dense spikes of very small pale blue flowers. Wet mountain streamsides and ravines, Honshu, Shikoku, Kyushu, rather common.

Trollius hondoensis (asiaticus ledebourii) Open deep yellow flowers with long stamens. Wet meadows and streams in mountains, C. and N. Honshu.

Valeriana fauriei (Close to *Valeriana officinalis*.) 16 to 32 inches, pinnate leaves mostly on stems, flattened heads of small rose flowers. Mountains, all Japan, rather rare; Sakhalin, S. Kuriles, Korea, Manchuria, Taiwan.

Veronica laxa (Related to *Veronica melissaefolia*.) Creeping, 12 to 20 inches, oval toothed leaves, loose axillary spikes of pale rose-purple flowers. Grassy places in mountain valleys, all Japan; China, Himalaya.

COLD-CLIMATE CONIFER FORESTS

I. THE HIGH MOUNTAIN CONIFER FORESTS

The Summer-green forests merge into those of conifers at about 5,000 feet on the mountains of central Honshu, lower in the north. These conifers are confined to Honshu and a few higher peaks in Shikoku and Kyushu. In central and eastern Hokkaido, at the northern limit of Summer-green woods, other tall conifers, outliers of the Boreal Coniferous Forests, replace them.

Very few other trees can grow in the zone of the mountain conifer forests, and none can compete with them where they are well-grown and mature. Where they have been destroyed, or grow thinly, such as near their top limit, or around bogs and marshes which sometimes fill flat valley bottoms, Birches, mostly white-trunked, with a few other trees, form quick-growing stands, often acting as pioneers on bared slopes as the conifers grow up again. In the open and scattered upper forests near the tree-line, the buff-barked Birch (*Betula ermanii*) becomes common, and extends above the conifers, where it becomes low and bushy, forming a belt of thin, open copses and scrub with other shrubs.

The conifer forests are not continuous on the snowy west side of Honshu, but grow only here and there, and are usually of the Larch (*Larix leptolepis*) and the Arbor-Vitae (*Thuja standishii*). The place of the conifers is taken over many of the high slopes by woods of *Betula ermanii* with the low Mountain Ash *Sorbus matsumurana* and the small maple *Acer tschonoskii*. Under the heavy snowfall on the mountains of this district, the Alpine and Subalpine zones descend lower than on the east, and there are many Sphagnum bogs.

Where the conifers stand thickly there is little underwood. Only along the bouldery banks of the torrents in gorges through the woods, and the edges of the bogs and wet meadows in the side valleys, do shrubs find enough light. The ground plants, in the thick carpet of moss and fallen needles among the boulders under the dense stands, grow in scattered patches, and many of them are almost universally found in forests of Spruce and Fir in the Northern Hemisphere. But debris collects in the bottoms of many of the side valleys, making them fairly flat, with a central, deeper cut stream, and these flats are covered by wet, flowery meadows, or even bogs and marshes. Also, under and among the light Birch woods near the timber-line and over, such meadows and bogs occupy the flatter parts. Moors of low bushes and subshrubs grow on the more steep and stony slopes among the topmost scattered conifers and Birches.

Trees of the canopy

Abies veitchii To 70 feet. Pyramidal, needles forward and upward, young smooth, upright cones bluish-purple. Common, usually with *Tsuga*, sometimes pure stands. Central Honshu, Shikoku.

Abies mariesii Compact pyramids, blunt needles covering tops of twigs, young cones purplish. More scattered, sometimes pure groves. Central and north Honshu.

Picea hondoensis To 80 feet. Stiffly pyramidal, needles on sides and tops of twigs, young cones pendant, bright crimson. Usually with *Abies veitchii* on high mountains of central Honshu.

Picea polita Tiger-Tail Spruce. Very tall, stiff, short, horizontal branches, long, spine-tipped needles, young cones yellow-green. Singly among other conifers, central Honshu, Shikoku, Kyushu.

Picea bicolor Slender branches, needles surrounding twigs, young cones purplish-red. Singly and not so common, central Honshu.

Tsuga diversifolia To 80 feet. Thick, red-brown trunks, sweeping branches, double-ranked needles on slender twigs, round cones. Common, sometimes in pure groves, central and north Honshu, Shikoku, Kyushu.

Smaller trees and large bushes

Acer tschonoskii Small tree or large bush. 5-lobed and pointed, round leaves turning yellow, spikes of pale yellow small flowers. In conifer forests and up to subalpine zone, specially common in the west. Central and north Honshu.

Acer ukurunduense High mountains of central Honshu to Hokkaido, Shikoku; E. Siberia, Sakhalin, Korea, Manchuria, to subalpine thickets.

Acer mono (pictum)

Alnus matsumurae (incana emarginata) Small tree or large bush, dark grey-purple branches, rounded leaves, rather common in wet places. High mountains of central and north Honshu.

Alnus maximowiczii (viridis sibirica) Small tree or usually a large bush. Close to European Green Alder. Forms thickets in upper part of conifer zone to lower alpine zone in damp places. High mountains of central Honshu to Hokkaido.

Betula platyphylla japonica White-barked, allied to European Silver Birch. Locally common in highlands of central Honshu to Hokkaido.

Betula ermanii Tree, or large bush with several trunks at higher altitude. Buff or grey-white bark, stiffer twigs and slightly larger leaves than Silver Birch. Among upper conifers, to subalpine thickets of central and north Honshu, Hokkaido, Shikoku; Kamchatka, Sakhalin, E. Siberia, Korea.

Betula grossa (ulmifolia) Tree with smooth dark grey bark. Not very common in the mountains of Honshu, Shikoku, Kyushu.

Betula other rare species.

Prunus ssiori Tree, nearly white bark, bristle-toothed, pointed leaves, slim spikes of small white flowers, chains of black fruits. Mountain woods of central Honshu to Hokkaido; Sakhalin, Manchuria.

Prunus nipponica 6 to 12 feet. Bush or small tree, broad leaves with point, umbels of few pink flowers, black fruit. High mountains of central Honshu to Hokkaido, variety in Sakhalin. Often in subalpine scrub.

Prunus grayana (padus japonica) Tree allied to Bird Cherry. Hills and mountains of all Japan to the conifer zone.

Sorbus matsumurana A Mountain Ash. Small tree, pinnate leaves of many leaflets, flat trusses of white flowers, round red berries. Mountains to subalpine scrub. Central Honshu to Hokkaido.

Sorbus sambucifolia Bush to 6 feet. Stout, glossy pinnate leaves, flat clusters of white or pinkish flowers, oval red fruit. Often part of subalpine scrub. High mountains of central Honshu to Hokkaido; Kamchatka, Sakhalin, Ochotsk coast.

Taxus cuspidata Still present here and there in conifer forests in Hokkaido.

Smaller bushes and subshrubs of the forests and subalpine thickets

Daphne miyabeana Small evergreen shrub, glossy leaves, heads of white flowers, vermilion berries. Among rocks in high mountains of central Honshu to Hokkaido. Rare.

Daphne kamtschatica jezoensis Low shrub. Thick leaves appear in autumn, dropping in summer, yellow flowers in axils. West side of central Honshu, Hokkaido.

Euonymus tricarpus (sachalinensis tricarpus) Deciduous bush, hanging, small, dark purple flowers, pinkish fruits with orange seeds. High mountain thickets of central Honshu to Hokkaido.

Gaultheria miqueliana Creeping, small, evergreen shrub, short chains of round white flowers, white fruit. Conifer woods and subalpine thickets of central Honshu to Hokkaido; Sakhalin, Aleutians.

Gaultheria adenostrix Creeping, small, evergreen, red-brown-hairy shrub, solitary white bells, red hairy fruit. Conifer woods and subalpine thickets of Hokkaido, Honshu, Shikoku.

Ilex rugosa Dwarf, long-creeping, evergreen Holly, leaves dense, toothed, red berries. Conifer woods of central Honshu to Hokkaido, Shikoku, Kyushu; Sakhalin.

Ilex sugerokii Evergreen shrub, glossy, not prickly leaves, red berries. High mountains of central Honshu to Hokkaido.

Lonicera coerulea emphylocalyx Twiggy shrub with peeling bark, creamy-white funnels, blue-black berries. Central Honshu to Hokkaido. The type from west Europe to Japan, North America.

Lonicera alpigena glehnii Stout-branched shrub, small, 2-lipped yellow flowers on long stems, red berries. Hokkaido to high mountains of central Honshu; Sakhalin.

Lonicera ramosissima fudzimoriana Twiggy, slender shrub, pale yellow funnels, red berries. High mountains of central and north Honshu.

Lonicera tschonoskii Shrub, white, 2-lipped flowers, red berries. Subalpine region in central Honshu.

Lonicera chamissoi Small shrub, 2-lipped deep red flowers, red berries. Central Honshu in alpine region to Hokkaido; Kamchatka, Amur, Ochotsk coast.

Oplopanax japonicus (horridus japonicus) Stout, densely prickly shrub to 3 feet. Big palmately lobed leaves, umbels of greenish flowers in spires, red fruit. Conifer forests of central Honshu to Hokkaido, Shikoku (Araliaceae).

Potentilla (Dasiphora) fruticosa Small shrub, yellow flowers. Alpine region of central Honshu to Hokkaido; north and mountains of Northern Hemisphere.

Potentilla (Dasiphora) fruticosa mandschurica Low shrub, flowers white. Subalpine region of central Honshu, Shikoku; rare; E. Siberia, N. China.

Rhododendron brachycarpum Evergreen, 3 to 6 feet. Dense clusters of white to pinkish, green-spotted funnels. Conifer woods in mountains of central Honshu to Hokkaido.

Rhododendron metternichii pentamerum (degronianum) Reaches the conifer zone. Woods in high mountains of central and north Honshu.

Rhododendron albrechtii Deciduous shrub, 3 to 6 feet. Slender, leaves clustered at branch ends, heads of deep rose to rose-purple flowers. Mountains of central Honshu to Hokkaido.

Rhododendron nipponicum Deciduous, 3 to 6 feet. Shining, peeling red-brown bark, thick branches, umbels of few white trumpets. Mountains of north and west Honshu, rather rare.

Rhododendron wadanum Deciduous, 6 to 12 feet. Mountains of central and north Honshu.

Ribes japonicum Rather stout bush, 5-cleft leaves, greenish flowers, long strings of black berries. Mountain woods of Hokkaido, Honshu, Shikoku.

Ribes sachalinense Stout, procumbent shrub, 5-cleft leaves, greenish flowers, strings of dark red oval berries. Hokkaido to central Honshu, Shikoku; Sakhalin.

Rosa acicularis Upright, long-branched to 3 feet. Slender prickles, solitary pink flowers, long-oval hips. High mountains of central Honshu to Hokkaido; Kamchatka, Siberia, Sakhalin, Korea.

Rubus yabei (idaeus nipponicus) Close to the Raspberry. Woods and thickets in high mountains of central and north Honshu.

Rubus vernus (spectabilis vernus) Unarmed shrub. Trifoliate leaves, solitary, nodding, deep pink flowers, round yellowish-red fruit. Subalpine region of central and north Honshu.

Salix reinii Stout shrub, broad leaves, slender catkins. Central Honshu to Hokkaido in the conifer zone.

Salix other species.

Spiraea betulifolia Shrub, 2 to 3 feet. Red-brown shoots, broad leaves, dense, terminal, flat-topped sprays of white flowers. High mountains of central Honshu to Hokkaido; E. Siberia, Sakhalin, Kamchatka.

Spiraea salicifolia Suckering shrub, 3 to 6 feet. Lance-leaves, terminal spires of pink flowers. Wet boggy places in mountains of central Honshu to Hokkaido; Northern Hemisphere.

Spiraea media sericea Shrub, 4 to 6 feet. Oblong leaves, umbels of white flowers in clusters. Hokkaido, Honshu (extreme north); Sakhalin, Manchuria, Korea. The type S.E. Europe to Siberia.

Spiraea chamaedrifolia pilosa Suckering shrub, 6 to 8 feet. Zigzag branches, double-toothed leaves, umbels of many white flowers. Central Honshu to Hokkaido; Sakhalin, N. Korea, Manchuria, Siberia.

Tripetaleia bracteata High mountains of central Honshu to Hokkaido, common northward.

Vaccinium vitis-idaea Creeping dwarf evergreen, short strings of reddish-white bells, red berries. Conifer woods and subalpine slopes, all Japan, common in north, rare in south; Sakhalin to Europe, North America.

Vaccinium praestans Dwarf, creeping, deciduous shrub, 1 to 3 white or reddish terminal bells, red berries. Conifer woods of central Honshu to Hokkaido; Kamchatka, Sakhalin, Amur, Ussuri.

Vaccinium ovalifolium (axillare) Deciduous shrub to 3 feet. Solitary, urn-shaped, nodding, pale green flowers near twig-tops, bloomy blue-black berries. Central Honshu to Hokkaido in subalpine thickets; E. Asia, N. America.

Vaccinium uliginosum Deciduous shrub to 30 inches. Urn-shaped, greenish-pink flowers, bloomy blue-black berries. Subalpine moors of central Honshu to Hokkaido; Northern Hemisphere.

Vaccinium yatabei (myrtillus yatabei) Deciduous small shrub. Solitary greenish-white, urn-shaped flowers, red berries. Conifer forests of central Honshu, rare.

Vaccinium other species.

Viburnum urceolatum procumbens Deciduous shrub with long-creeping stems, oval leaves, heads of white flowers, oval red fruit. Damp conifer woods of central and north Honshu.

Weigela (Diervilla) middendorffiana Shrub, 2 to 4 feet. Terminal clusters of sulphur-yellow lipped trumpets, orange-spotted on low-lip. Thickets on subalpine slopes of north Honshu, Hokkaido; Sakhalin, Amur, Ussuri, Ochotsk coast.

The ground plants

Anemone debilis Non-running, to 6 inches. Solitary small white flowers over 3-cut ruff. Damp mountain conifer woods, central Honshu to Hokkaido; Kamchatka, Sakhalin, E. Siberia, Manchuria.

Athyrium spinulosum Creeping. Long-stalked, broad-based, tripinnate fronds widely spaced. Mountain conifer woods, central Honshu. Rare.

Calamagrostis langsdorffii Colonies, 3 to 4½ feet, greyish leaves, nodding, rusty plumes. Wet places in forests and openings, Honshu, Hokkaido, Shikoku (subalpine); Siberia, Korea, Sakhalin.

Calamagrostis sachalinensis 12 to 24 inches, greenish plumes. High mountain conifer woods, central Honshu to Hokkaido; Kamchatka, Sakhalin.

Calypso bulbosa speciosa (Orchidaceae) To 6 inches. Solitary rosy flowers, white lip spotted rosy-brown. Mountain conifer woods, central and north Honshu, very rare; Eurasia, North America.

Carex species.

Circaea alpina caulescens Moist mountain woods, all Japan to conifer zone.

Clintonia udensis (alpina) (Liliaceae) Narrow basal leaves, 8 to 24 inches, flat-topped spires of erect white funnels. Damp conifer woods in high mountains, central Honshu to Hokkaido; E. Siberia to China.

Coptis trifolia (Ranunculaceae) Creeping evergreen, 3 to 5 inches. Trifoliate leaves, small yellow-eyed white flowers. Conifer woods and most bogs, central Honshu to Hokkaido; Northern Hemisphere.

Cornus canadensis Creeping evergreen to 6 inches, white bracts, red berries. Conifer woods, central Honshu to Hokkaido, common; Kamchatka, Sakhalin, Amur, Korea, North America.

Cystopteris sudetica Creeping. Doubly pinnate, long-stalked, broad-based fronds to 6 inches. Conifer woods in high mountains, central Honshu, rare; North Korea, Siberia to Europe.

Dryopteris linneana (*Gymnocarpium dryopteris*) Oak Fern. Creeping, to 6 inches high. Doubly pinnate fronds, pinnae cut again. Conifer woods, central Honshu to Hokkaido; Siberia to Europe, Himalaya, North America.

Dryopteris (*Lastrea*) *phegopteris* Beech Fern. Similar but fronds once pinnate, pinnae cut again. Conifer woods, central Honshu to Hokkaido, Shikoku, Kyushu, common in the north; China, Himalaya, Siberia to Europe, North America.

Dryopteris (*Arachniodes*) *mutica* Leathery, glossy, tripinnate fronds to 2½ feet. Mountain conifer woods, central Honshu to Hokkaido, Shikoku; Sakhalin.

Dryopteris austriaca To 2½ feet. Few fronds, tripinnate, lowest pinnae the largest. Mountain conifer woods, central Honshu to Hokkaido, Shikoku, Kyushu; Manchuria to Himalaya, Siberia to Europe, Kamchatka, North America.

Dryopteris amurensis Long-stalked, tripinnate fronds, widest at the bottom. Conifer woods, central Honshu to Hokkaido, rare; Amur, Sakhalin.

Epipogium aphyllum (Orchidaceae) Saprophytic, pale brown. Conifer woods Honshu, Hokkaido, very rare.

Galium species.

Glyceria alnasteretum (Graminae) Creeping, to 3 feet. Nodding, purplish panicles of spikelets. Wet places in cool conifer woods, central Honshu to Hokkaido; Kamchatka, Sakhalin.

Goodyera repens Spikes of small white flowers. Mountain conifer woods, central Honshu to Hokkaido, rare. Europe, Siberia, Himalaya, North America.

Linnaea borealis Creeping, woody, evergreen mats, twin, nodding flesh-pink flowers, 4 inches. Damp mountain conifer woods, central Honshu to Hokkaido; Northern Hemisphere.

Listera species Orchids. 2 leaves in mid-stem, spikes of small green flowers. Conifer woods, central Honshu to Hokkaido.

Lycopodium annotinum Creeping, branches ascending to 8 inches. Conifer woods of all Japan, rather common. Kamchatka to Europe, North America.

Lycopodium obscurum Underground creeping stems, above ground branches tree-shaped. Damp conifer woods in mountains, rather common, all Japan.

Lycopodium other species.

Maianthemum dilatatum Creeping mats of glossy leaves, 4 to 10 inch spikes of small white stars. Conifer woods, all Japan, rather common.

Maianthemum bifolium Similar but smaller. Damp mountain conifer woods, central Honshu to Hokkaido, rare; Sakhalin, N. Korea, Europe, North America.

Mitella nuda (Saxifragaceae) Creeping, rounded leaves, 6 to 10 inch spikes of white flowers with pinnate petals (like a dwarf *Tiarella*). Mountain woods, Hokkaido, central Honshu, rare; Manchuria to Siberia, North America.

Neottia asiatica A saprophytic Orchid. Conifer woods, central Honshu to Hokkaido, very rare.

Oxalis acetosella Mats of Clover-like leaves, pencilled white flowers, 2 to 3 inches. Conifer woods, central Honshu to Hokkaido; Europe and Asia.

Platanthera ophrydioides (Orchidaceae) 2 or 3 basal leaves, spikes of pale green, spurred flowers. To 12 inches. Conifer woods, all Japan, rather common; Sakhalin.

Platanthera tipuloides To 12 inches. One leaf, spikes of small, long-spurred yellow-green flowers. Conifer woods and grassy openings in mountains, Hokkaido, Honshu, local in Shikoku, common in the north. Variety in mountain bogs.

Pteridophyllum racemosum (Papaveraceae) *Polemonium*-like leaves, spires of white, 4-petalled flowers. Conifer woods, central and north Honshu, rare.

Pyrola renifolia Creeping mats of dull evergreen leaves, 4 to 8 inch spikes of few green-white round flowers. Damp mountain conifer woods, central Honshu to Hokkaido; Sakhalin, Korea, Amur, Manchuria.

Pyrola secunda 3 to 5 inch one-sided spikes of green-white flowers. Damp conifer woods, central Honshu to Hokkaido; Northern Hemisphere.

Pyrola incarnata Wide mats of evergreen, glossy, long-oval leaves, 4 to 10 inch spikes of deep rose flowers. Thickets and shaded grassy places in mountains, central Honshu to Hokkaido; Kamchatka, E. Siberia, Manchuria, Korea, North China, North America.

Pyrola other species.

Rubus pedatus Slender, unarmed, creeping herb. Solitary white flowers on 2 to 5 inch branchlets, trifoliate, double-toothed leaves, yellowish red fruit. Damp conifer woods in mountains, central Honshu to Hokkaido; North America.

Rubus ikenoensis (*japonicus*) Sprawling shoots from woody base, slender bristly prickles, leaves of 5 leaflets, few, nodding white flowers, red fruit. High mountain woods, central and north Honshu.

Rubus pseudojaponicus (*triflorus*) Similar, but unarmed, more slender. High mountain woods, central Honshu to Hokkaido.

Sasa kurilensis Long-creeping, 3 to 6 feet. Narrow-oblong, glossy leaves, prominent nodes. High mountains of central Honshu to Hokkaido; Sakhalin. A *Bamboo* of open slopes.

Smilacina yezoensis Colonies of stout, leafy stems, males with pyramids of little green-white flowers, females narrower. Damp conifer woods, central and north Honshu.

Streptopus amplexifolius papillatus Growth like a *Polygonatum*, 1½ to 3 feet, but the hanging white bells have spreading segments. Damp mountain conifer woods, central Honshu to Hokkaido, rather rare; Kamchatka, Amur to China.

Trientalis europaea Creeping, 3 to 10 inches. Leaves whorled at top, erect white stars. North and central Honshu, Hokkaido, Shikoku; Sakhalin, Siberia to Europe, North America, Alaska. Conifer woods.

Veronica tenella Creeping. Spikes of pale blue flowers. Woods and grassy openings in conifer forests. Central Honshu to Hokkaido; Sakhalin, Siberia to Europe, North America.

Viola blandaeformis (blanda violascens) Stemless, long-creeping rhizomes, slender, kidney-shaped leaves, white flowers with purple-striped lip on 1½ to 2½ inch stems. Wet places in conifer woods, central Honshu and west, Hokkaido; Kamchatka.

Viola other species, mostly in openings.

II. THE NORTHERN CONIFER FORESTS OF HOKKAIDO

The transition from Summer-green forest to conifer forest

The Summer-green forests end as river valley woods in the mountains of central Hokkaido. Climbing the mountain sides from the valley bottom conifers at first make up nearly a half of the canopy, and equal the deciduous trees in height, standing above a dense growth of young trees. There are few lianes or climbers in these woods. Further up the slopes the conifers become more and more predominant, and the Summer-green trees disappear, leaving only yard-high Bamboo brakes filling the many sunny gaps in the forest on the humus-rich sandy soil. Birches climb the highest of the Summer-green trees, and form stands after forest fires. The conifer forests end in a zone of elfinwood of Dwarf Pine above.

Canopy trees of the river valley woods

Kalopanax septemlobus (Acanthopanax ricinifolius)—

Fraxinus mandshurica—

—The main trees.

Quercus mongolica grosseserrata (crispula)—

Quercus other species—

Juglans ailanthifolia (*sieboldiana*)—

Cercidiphyllum japonicum—

—More scattered, but growing large.

Populus maximowiczii (*suaveolens*)—

Ulmus laciniata (*montana laciniata*)—

—In the valley bottoms.

Smaller trees

Acer mono

Acer other species

Tilia japonica

Tilia maximowicziana

Maackia (*Cladastris*) *amurensis*—

Phellodendron amurense—

—Not very common.

Prunus sargentii

Prunus other species.

Alnus pendula (*firma multinervis*)—

Salix species—

—By the water.

Abies sachalinensis—

Picea jezoensis (ajanensis)—

—Tall conifers joining the Summer-green trees on the slopes.

THE NORTHERN CONIFER FORESTS OF HOKKAIDO

The conifer forests of Hokkaido are an extension of the Northern Coniferous Forests of East Siberia and Sakhalin. Summer-green trees are still to be found in favourable places in the lowlands in the conifer zone, usually as subordinates.

Though many of the ground plants and shrubs are common to the high mountain conifer woods of Honshu, and indeed of much of the Northern Hemisphere, some are not found south of Hokkaido. The main conifers forming the canopy do not extend to the rest of Japan, but are common on Sakhalin.

The conifer forests occupy the mountainous parts of central and eastern Hokkaido, descending nearly to sea-level in the north and east, with outliers in the mountains of the southern peninsula. Among the highest conifers near the timber-line, and above, is a belt of open woods of *Betula ermanii*, with thickets of shrubs, and meadows or moorland, as in the high mountains of central and north Honshu. Sphagnum-moss bogs are common in the wettest places, especially in the north-east, where they also descend to sea-level. The high-mountain Birch gives way to elfinwood of Dwarf Pine at higher altitudes still.

Trees of the canopy

Abies sachalinensis Medium up to 100 feet. Close to *Abies sibirica*. Smooth grey bark, needles dense on top of shoots, young cones olive-green with protruding bracts. Spring frost-tender in Britain. S. Kuriles, Sakhalin.

Picea jezoensis (ajanensis) Medium to 100 feet. Narrowly pyramidal, grey bark, shining brown young shoots, densely crowded, flattened needles white beneath, young cones crimson-red. S. Kuriles, Sakhalin, E. Siberia.

Picea glehnii Medium-sized, slender conical tree, red-brown flaking bark, 4-angled, densely crowded needles (on top of shoots), young cones violet. Boggy places, N. and E. Hokkaido, S. Sakhalin (also on Mount Hayachine in Rikuchu, N. Honshu).

The most characteristic smaller trees and bushes

Most of the smaller trees and bushes in the conifer forests and subalpine thickets of Hokkaido are those that also grow on the high mountains of central and north Honshu, though a few of these do not cross into Hokkaido, and a few found in Hokkaido are absent from Honshu.

Acer species

Acer ukurunduense

Alnus maximowiczii Siberian Green Alder. Common thicket-former on damp slopes.

Betula ermanii Common in openings and streamsides in conifer woods, and as open scattered stands above tree-line, with bush thickets, moors, and damp meadows.

Betula other species.

Chosenia arbutifolia (*Salix eucalyptoides*) Common on river plains, often with *Populus maximowiczii* and *Salix* species.

Euonymus (*Kalonymus*) *sachalinensis* (*planipes*) Shrub or small tree, 10 to 20 feet. Leaves colour vividly, fruit rosy-red. Central Honshu to Hokkaido.

Euonymus (*Kalonymus*) *sachalinensis tricarpus* Thickets in high mountains, central Honshu to Hokkaido; Sakhalin.

Ilex rugosa

Juniperus sibirica

Lonicera chrysantha 5 to 10 feet or more. Paired cream flowers on one stalk, fading yellow, coral-red fruit. Hokkaido; E. Siberia, Sakhalin, Korea.

Lonicera chamissoi Small shrub, two-lipped deep red flowers, berries red. Hokkaido; Kamchatka, Sakhalin, Amur, Ochotsk sea coasts.

Lonicera sachalinensis (maximowiczii sachalinensis) Erect shrub to 10 feet. Paired, two-lipped, dark purple flowers on long stalks, dark purple fruit. Hokkaido; Sakhalin, N. Korea, Manchuria.

Lonicera other species – *Lonicera coerulea edulis (Lonicera edulis)*.

Prunus padus Bird Cherry. Hokkaido; Sakhalin to Europe.

Prunus other species.

Rhododendron dauricum Semi-evergreen, 4 to 6 feet, early-flowering. Rosy-purple, open funnels. Hokkaido; E. Siberia, N. China, Korea.

Rhododendron parvifolium Erect, twiggy, evergreen shrub to 3 feet. Rose-purple funnels. Boggy places in lowlands of N.E. Hokkaido, rare; E. Siberia, Sakhalin, Korea.

Rhododendron other species.

Ribes latifolium (petraeum tomentosum) Erect shrub, 5-lobed leaves, strings of purple-red flowers, red berries. Hokkaido; Sakhalin, S. Kuriles.

Ribes triste Procumbent shrub, rounded 3- to 5-lobed leaves, purplish flowers, dark red berries. Hokkaido; E. Asia, Sakhalin, S. Kuriles.

Ribes horridum (lacustre horridum) Shrub, long, densely prickly shoots, 5-cleft leaves, hairy, black-red gooseberries. Hokkaido (Tokachi); E. Siberia, N. Korea, Sakhalin.

Ribes other species.

Rosa acicularis

Rosa davurica (cinnamomea davurica) (or *amblyotis*) 3 to 5 feet, big, flat, paired prickles, 1 to 3 deep pink flowers, smooth, oval, red hips. Hokkaido, Honshu (Shinano) rare; Sakhalin, E. Siberia, Korea, Manchuria.

Rubus idaeus aculeatissimus Raspberry. Hokkaido; E. Asia, North America.

Salix hultenii angustifolia Resembles *Salix caprea*. Hokkaido; Kamchatka, Sakhalin, Kuriles. Wet places.

Salix taraiensis (hastata) Large shrub, broad leaves, “pussy-willows”. N.E. Hokkaido; Sakhalin. Wet places.

Salix hidewoi Like *Salix reinii*. Hokkaido; S. Kuriles. Wet places.

Salix other species.

Sorbus sambucifolia

Sorbus matsumurana.

Spiraea betulifolia aemiliana High mountains, Hokkaido; Kamchatka, Kuriles.

Vaccinium ovalifolium (axillare)—

Vaccinium other species—

—Also in the high mountains of Honshu.

Weigela (Diervilla) middendorffiana

The most common ground plants

The ground plants of the conifer forests of Hokkaido, like the bushes, are also the same as those of Honshu, with a few northern species appearing.

Calamagrostis langsdorffii

Carex species

Chimaphila umbellata (Pyrolaceae) Dry woods, mostly near sea. Evergreen sub-shrubby, 6 to 12 inches. Whorled, toothed leaves, umbels of white to pinkish, nodding, saucer-shaped flowers. Central Honshu to Hokkaido, rare; Sakhalin to Europe, North America.

Circaea alpina

Clintonia udensis (alpina)

Coptis trifolia

Cornus canadensis

Dryopteris amurensis

Dryopteris austriaca

Dryopteris linneana

Dryopteris phegopteris

Glyceria alnasteretum

Linnaea borealis

Lycopodium annotinum

Maianthemum bifolium

Maianthemum dilatatum

Mitella nuda

Osmunda asiatica (cinnamomea)

Orchidaceae

Oxalis acetosella

Pyrola incarnata

Pyrola secunda

Pyrola other species

Sasa kurilensis

Trientalis europaea

In Hokkaido but absent from Honshu

Anemone yezoensis Close to *Anemone debilis*, broader leaflets. Hokkaido, Sakhalin.

Fragaria yezoensis Close to *Fragaria vesca*. E. Hokkaido, S. Kuriles. Openings.

Moneses uniflora Hokkaido, very rare. Siberia to Europe, China, Sakhalin, Korea, North America.

Platanthera metabifolia Near to the Butterfly Orchid, white, long-spurred. Hokkaido; Sakhalin, Kuriles.

Stellaria longifolia Slender, tufted, mostly erect, 8 to 16 inches. Small white flowers. Mountain woods of Hokkaido. Cold Northern Hemisphere.

Streptopus streptopoides (ajanensis) Creeping colonies of slender leafy stems 6 to 12 inches. Small solitary flowers. Damp conifer woods in mountains. Hokkaido; E. Siberia, W. North America.

Trillium kamtschaticum Large white flowers. Hokkaido; Kamchatka, Sakhalin, Korea, Manchuria, Kuriles.

THE UPPER VALLEY MEADOWS AND OPEN SLOPES ON HIGH MOUNTAINS

There is much land-slipping down the mountain-sides, caused by underground water in the wet climate, the debris of which often blocks the upper valleys of the side streams. They then collect sediment, and become flat-bottomed, wide, and wet, sometimes with bogs or lakes. Where drier they are occupied by meadows, with Birch copses and bush thickets.

The stable slopes above the wet valley bottoms, among the open Birch woods and slip-scars, are also grassy with many flowering plants, or with low shrubs in stonier places. Such meadows also

spread between the scattered conifers near the timber-line, and on open slopes among the conifer forests below.

Aconitum senanense To 2 feet, zigzag stems, few blue-purple flowers. Alpine, south-central Honshu.

Adenophora triphylla hakusanensis 12 to 20 inches, whorled, narrow leaves, sparse sprays of drooping, closed, blue bells. Alpine, Hokkaido, Honshu.

Adenophora pereskiaefolia 12 to 20 inches, whorled kidney-leaves, dense sprays of drooping blue bells. Alpine, Hokkaido, N. Honshu.

Aletris foliata (Liliaceae) Clumps of narrow leaves, 8 to 16 inches, loose spikes of small yellow-green tubular bells. Mountain meadows to lower alps, Hokkaido, C. and N. Honshu, Shikoku.

Anaphalis alpicola Tufts of grey-woolly lance-shaped leaves, dense heads of white button-flowers on 4 to 8 inch stems. Alpine slopes of central and north Honshu, Hokkaido.

Artemisia pedunculosa With stolons, tufts of toothed, lace-shaped green leaves, one-sided spires of hanging button-flowers on 6 to 14 inch leafless stems. Alpine rocky slopes, central Honshu,

Calamagrostis species

Cimicifuga foetida simplex 16 to 36 inches, leaves cut into 3s, fluffy white spikes. Mountain meadows to alps, all Japan; Sakhalin, Kuriles, Kamchatka.

Cirsium species Many are local, confined to certain mountain regions, or even single mountains.

Cirsium ganjuense Broad and large pinnately cut leaves, one or two upright small rosy-lilac thistle-heads. Alpine slopes, Mounts Hayachine and Iwate in Rikuchu, north Honshu.

Cirsium ugoense 12 inches high, very leafy, large pinnately cut, spiny leaves, few, sessile, lilac-pink thistle-heads among leaves. Grassy alpine slopes, north Honshu.

Cirsium kamtschaticum Stout leafy stems, 3 to 6 feet tall, broad, pointed, spiny leaves, several, nodding, lilac thistle-heads on long stems. In mountain scrub, Hokkaido, Kuriles, Kamchatka, Aleutians.

Cirsium chokaiense White-downy, 3 to 4½ feet tall stems, pointed, large, deeply pinnately cut, spiny leaves, few big, nodding, maroon-red thistle-heads. Mount Chokai in north Honshu.

Clematis ochotensis Woody base, twice ternate leaves, slender, scrambling stems, solitary, small purple bells. Alpine, Hokkaido, C. and N. Honshu; Korea, Sakhalin, Manchuria, E. Siberia, Kamchatka.

Conioselinum filicinum (Umbellifer) 16 to 32 inches, much-cut, pointed leaves, white umbels. Alpine, Hokkaido, C. and N. Honshu; S. Kuriles.

Deschampsia caespitosa festucaeformis Alpine form of "Tussock Grass". High mountains, Hokkaido, C. and N. Honshu, common.

Dianthus superbus speciosus Dwarf alpine form. Blue-green leaves, pale rose fringed flowers. Hokkaido, C. and N. Honshu.

Geranium yesoense (dahuricum) nipponicum (high mountain variety) Sprawling, rose-purple flowers. Mountains of Hokkaido, C. and N. Honshu.

Geranium eriostemon reinii form *onoei* (smaller alpine form) The type 12 to 20 inches, big rose-purple flowers. Mountains Hokkaido, C. and N. Honshu, rather rare.

Gymnadenia conopsea (Orchiaceae) Grassy places in high mountains, Hokkaido, C. and N. Honshu, rather common; Eurasia.

Hemerocallis middendorffii and variety *esculenta* 16 to 28 inch stems (long than leaves), short heads of bright yellow-orange funnels. Meadows in high mountains, Hokkaido, C. and N. Honshu; Sakhalin, Kuriles, Amur, Manchuria, Korea, N. China.

Hemerocallis dumortieri 10 to 20 inches, soft orange-yellow trumpets, brown outside. Mountains, Hokkaido, C. and N. Honshu; Korea, Manchuria, E. Siberia.

Heracleum dulce (lanatum) 3 to 6 feet. Stout, branching, umbels of rather big white flowers. Among the Birches and grassy high mountain slopes. Hokkaido, Honshu, common; Sakhalin, Kuriles, Kamchatka, Aleutians, Alaska.

Leontopodium japonicum (alpine varieties) Mats of green, lance-shaped leaves, few white-woolly star bracts around few yellow button-flowers on 10 to 22 inch stems. Alpine rocky slopes, Honshu, Shikoku.

Polygonum bistorta Grassy slopes, highlands and subalps, all Japan, rather common; mountains and cooler Eurasia.

Primula modesta Allied to *Primula farinosa*. Leaves yellow-mealy beneath, 3 to 6 inches, heads of small rosy flowers. Mountains, Hokkaido, C. and N. Honshu; S. Kuriles.

Primula jesoana 8 to 16 inches, shallowly lobed leaves, 1 or 2 whorls of rose-purple saucer-shaped flowers. High mountains, W. Hokkaido, C. and N. Honshu, rare.

Primula takedana Deeply lobed kidney-leaves, 6 inches, white funnels. High mountains, N.W. Hokkaido.

Primula other species.

Ranunculus acris subcorymbosus Alpine, Hokkaido, N. Honshu, Kamchatka—

Ranunculus acris nipponicus Alpine, Hokkaido—

—High mountain forms of the common tall Buttercup.

Rumex montanus Resembles Sorrel. High mountains to alps, Hokkaido, C. and N. Honshu; Siberia, Europe.

Sanguisorba albiflora 12 to 28 inches, pinnate leaves, erect spikes of fluffy white flowers often tinged red. Alpine meadows, N. Honshu, rather common.

Sanguisorba obtusa 12 to 20 inches, pale rose, nodding spikes. Alpine meadows, N.E. Honshu, local and rare.

Sanguisorba hakusanensis 16 to 32 inches, branching, long drooping spikes of rose-purple flowers Alpine meadows, west-central Honshu; variety in Korea.

Saussurea nikoensis and other species.

Saussurea riederi yezoensis Dense clusters of *Centaurea*-like rose-pink flowers on very leafy stems, broad, pointed, toothed leaves. Alpine meadows, north Honshu, Hokkaido, Kamchatka, Kuriles.

Thalictrum aquilegifolium Grassy places, highlands to alpine meadows, Hokkaido, Honshu, Shikoku, Kyushu; Eurasia.

Tilingia ajanensis (Umbelliferae) 3 to 8 inches, much divided shiny leaves, umbels of white flowers. Alpine slopes, Hokkaido, C. and N. Honshu; Sakhalin, Kuriles, Kamchatka, E. Siberia, Ochotsk.

Tilingia other species.

Veratrum longibracteatum 8 to 24 inches, upper part of stem leafless, spires of green, rarely purple-brown stars. Alpine slopes, C. and N. Honshu.

Viola brevistipulata Creeping colonies, heart-shaped leaves, 12 inch stems, yellow violets. High mountains, Hokkaido, C. and N. Honshu.

Viola alliariaefolia Similar, leaves kidney-shaped, stems erect, 4 to 8 yellow flowers. Alpine, Hokkaido.

Wet meadows, stream-sides and ravines

Aconitum gigas Allied to *Aconitum lycoctonum*. 1½ to 3 feet, tall narrow pale yellow flowers. Wet shaded places in high mountains, Hokkaido, C. and N. Honshu; Sakhalin.

Angelica genuflexa 3 to 5 feet, thin leaves with pointed segments, white umbels. Mountain streams and ravines, Hokkaido, C. and N. Honshu; Sakhalin, Kuriles, Kamchatka, west N. America.

Boykinia lycoctonifolia (Saxifragaceae) Creeping. Long-stalked, lobed 15 to 16 inches, sprays of small yellow-green flowers. Wet grassy slopes in high mountains, Hokkaido, C. and N. Honshu.

Calamagrostis deschampsoides 8 to 16 inches, slender, thread-leaves, purplish shiny plumes. Wet slopes, C. and N. Honshu, rare; Sakhalin, Kamchatka, N. Kuriles, Siberia, N.E. Europe, N. America.

Calamagrostis other species.

Cardamine species Small white flowers. Wet places, often by streams or springs.

Carex species.

Cortusa matthioli 8 to 14 inches, wet rocks in ravines, often shady. Local in mountains of Hokkaido; Eurasia.

Epilobium species Small rosy-pink flowers. Forming colonies in wet places.

Fritillaria camtschatcensis To 20 inches, shiny leaves, heads of nearly black bells. Damp alpine slopes, Hokkaido, C. and N. Honshu, descending to rocky seashores in E. Hokkaido; Kuriles, Kamchatka, Aleutians, west N. America.

Isopyrum nipponicum (Ranunculaceae) Creeping. 4 to 10 inches, leaves cut into 3, pale yellow-green, half-open flowers. Wet places in mountains, west side of C. and N. Honshu.

Ligularia sibirica kaialpina 12 to 20 inches, rounded heart-shaped leaves, trusses of yellow daisies. Wet places in high mountains, C. Honshu; the type in Korea, Sakhalin, Manchuria, E. Siberia, China.

Ligularia hodgsonii 12 to 32 inches, kidney-leaves, spreading heads of large yellow daisies. Mountains, Hokkaido, N. Honshu; Sakhalin, S. Kuriles.

Macropodium pterospermum (Cruciferae) 16 to 36 inches, leafy stems, long spires of many narrow-petalled white flowers. Wet grassy alpine places, Hokkaido, C. and N. Honshu; rare Sakhalin.

Mimulus sessilifolius 8 to 12 inches, erect, smooth oval leaves, 1 inch long pale yellow trumpets, brown-spotted at base. Wet grassy places, Hokkaido, C. and N. Honshu, high mountains; S. Kuriles, Sakhalin.

Moliniopsis (Molinia) japonica Clumps 12 to 36 inches. Wet places in lowland to alp, sometimes in moss bogs, Hokkaido, Honshu, Kyushu; Korea, S. Kuriles.

Orchis aristata (latifolia) 4 to 16 inches, leaves often purple-spotted, spikes of rose-purple flowers. Damp alpine grassy slopes and meadows, Hokkaido, C. and N. Honshu; Korea, Kuriles, Sakhalin, Aleutians, Alaska.

Polemonium acutiflorum nipponicum 16 to 32 inches, pinnately cut leaves, loose sprays of blue funnels. Wet alpine slopes, C. Honshu, rare; the type in Sakhalin, Alaska, the cold N. Hemisphere.

Saussurea nikoensis and other species.

Scirpus maximowiczii 6 to 16 inches, flat leaves, nodding heads of dark grey spikelets. Wet places in high mountains, Hokkaido, C. and N. Honshu; S. Kuriles, Sakhalin, Ussuri, Korea.

Scirpus hondoensis 6 to 16 inches, leafless stems, lateral heads of pale green spikelets. Marshy places on pond-edges in high mountains, C. and N. Honshu.

Scirpus caespitosus 2 to 12 inches, clumps, leafless, single tawny spikelet. Wet slopes, moors in high mountains, Hokkaido, C. and N. Honshu.

Scirpus other species.

Trautvetteria japonica (Ranunculaceae) 10 to 24 inches, erect, rounded, long-stalked, palmately cut leaves, flat-topped heads of many small white flowers. Wet places in mountains, Hokkaido, C. and N. Honshu.

Open meadows and rocks in the hill and low mountain conifer forests of Hokkaido.

Damp meadows

Angelica ursina 3 to 10 feet, stout, big leaf segments, wide umbels of white flowers. Hokkaido, N. Honshu; Sakhalin, Kuriles, Kamchatka. Damp wood-edges.

Calamagrostis langsdorffii Wet places in forest openings and burnt wood, Hokkaido, Honshu, alpine slopes of Shikoku; Siberia, Sakhalin, Kamchatka, Korea, Kuriles.

Filipendula kamtschatica 3 to 6 feet, pinnate leaves, flattened sprays of white to pale pink small flowers. Often in colonies along streams and ravines. Hokkaido, C. and N. Honshu; Kamchatka.

Fritillaria camtschatcensis

Veratrum oxysepalum 2 to 5 feet, leafy, spikes of green stars. Boggy places, Hokkaido; Kamchatka, Sakhalin, Ussuri, Dauria.

Viola langsdorffii Creeping colonies, stems 8 to 12 inches, heart-shaped leaves, large pale violet flowers. Wet grassy places, Hokkaido, local in C. Honshu; Sakhalin, Kuriles, Kamchatka.

Rocky slopes and cliffs

Sedum cauticum Mats of greyish, rounded, flat leaves on short stems, dense rounded heads of rose-purple stars. Hokkaido (Tokachi and Hidaka).

Sedum pluricaule yezoense (*telephium pluricaule*) Clumps of 2 to 3 inch stems, greyish sessile leaves broader at the top, dense flattish heads of rose-purple stars. Hokkaido; Sakhalin, Amur.

SPHAGNUM-MOSS BOGS AND WET MOORS

Sphagnum-moss bogs and wet moors are widespread on the high mountains of the west side of Honshu, with its snowy, wet climate, and also the north and east coastal areas of Hokkaido, where they occur much lower, and where summer fogs are frequent. They occupy badly drained hollows and flat places in the woods and above.

Andromeda polifolia 4 to 12 inches, narrow leaves, umbels of urn-shaped white to rose flowers. Bogs, Hokkaido, C. and N. Honshu; N. Hemisphere.

Calla palustris Creeping, heart-shaped stalked leaves, white spathes, red berries. Shallow ponds and swamps in moors, Hokkaido, N. Honshu; N. Eurasia, N. America.

Carex curta Clumps, 8 to 24 inches, greyish leaves, rounded heads of grey-green spikelets. Alpine bogs and wet meadows, Hokkaido, C. and N. Honshu; arctic and alpine N. Hemisphere.

Carex limosa Creeping, 8 to 16 inches, hanging copper-brown spikelets. Hokkaido, C. and N. Honshu; Sphagnum-bogs of N. Hemisphere.

Carex middendorffii 12 to 28 inches, stout, grey-green narrow leaves, Hokkaido, C. and N. Honshu, common; Sphagnum bogs in Ussuri, Kuriles, Sakhalin, Kamchatka.

Chamaedaphne calyculata Evergreen shrub, 12 to 40 inches, oblong leaves, axillary, one-sided spikes of white tubular flowers. Bogs, Hokkaido; cold N Hemisphere.

Chrysoplenium alternifolium sibiricum Creeping mats, rounded long-stalked leaves, heads of small yellow flowers. Bogs, N.E. Hokkaido; Sakhalin, Kuriles, Siberia, N. China, Himalaya, N. America.

Cirsium homolepis (inundatum homolepis) 18 inches to 2 feet high, large, pinnately cut, spiny leaves, erect rosy-lilac thistle-heads in open clusters. Ozegahara moor, central Honshu, wet places.

Drosera rotundifolia 2 to 6 inches, long-stalked, red-glanded, round leaves, spikes of white flowers. Bogs and wet places in mountains, Hokkaido, Honshu, Shikoku, Kyushu, rather common; N. Hemisphere.

Drosera anglica Similar, long narrow leaves, Bogs, Hokkaido, C. Honshu, rare; Eurasia.

Eleorchis (Arethusa) japonica (Orchidaceae) Single narrow leaf, 8 to 12 inches, solitary (rarely 2) large rose-purple flowers. Bogs, Hokkaido, C. and N. Honshu, rare; S. Kuriles.

Eriophorum gracile Creeping, slender, 8 to 20 inches, 3-angled leaves, 2 to 5 cottony heads. High moors, Hokkaido, C. and N. Honshu; cool N. Hemisphere.

Eriophorum vaginatum Dense clumps, 8 to 20 inches, solitary cottony heads. High moors, Hokkaido, C. and N. Honshu; N. Hemisphere.

Eriophorum scheuchzeri Creeping, 4 to 12 inches, solitary cottony heads. High moors, Hokkaido, rare; Siberia to Europe, N. America.

Gentiana makinoi 12 to 24 inches, leafy stems, rather short dark blue trumpets on upper stem not fully opening. Wet slopes and bogs, high mountains, C. Honshu.

Gentiana triflora horomuiensis Bogs, Hokkaido.

Geum (Sieversia) pentapetala Wet places and sphagnum bogs, high mountains, Hokkaido, C. and N. Honshu (west side).

Habenaria yezoensis (Orchidaceae) Slender, 10 to 20 inches, leafy stems, long spikes of white flowers with greenish lip and wings. Bogs, Hokkaido; S. Kuriles.

Iris setosa (apogon) 12 to 28 inches, branching stems, thin leaves, blue-purple flowers. Mountain bogs, Hokkaido, C. and N. Honshu; Korea, Kuriles, Sakhalin, E. Siberia, Aleutians.

Juncus ensifolius 12 to 20 inches, creeping clumps, few thin leaves, round heads of black-brown flowers. Moors, Hokkaido, C. and N. Honshu; Kuriles, N. America.

Ledum palustre Gregarious, 12 to 20 inches, rusty-hairy evergreen shrub, narrow leaves, dense heads of white flowers. Boggy alps and high moors, Hokkaido, N. Honshu; cool N. Hemisphere.

Ledum palustre decumbens Prostrate. High alpine moors, Hokkaido; Korea, Kuriles, Siberia, N. America.

Lysimachia thyrsiflora Creeping, 12 to 24 inches, black-spotted leaves, dense axillary heads of small yellow flowers half way up stem. Bogs and wet places, Hokkaido, C. and N. Honshu; cool N. Hemisphere, Kuriles, Sakhalin, Korea.

Menyanthes trifoliata Creeping, trifoliolate leaves, 8 to 16 inch stems, rather small white flowers full of hairs. Bogs and lake edges, Hokkaido, Honshu, Kyushu, rather common; cool N. Hemisphere.

Narthecium asiaticum 8 to 20 inches, short narrow leaves, spikes of small yellow stars. Bogs, wet rocks, and streamsides, Hokkaido, C. and N. Honshu.

Oxycoccus (Vaccinium) japonicus Creeping, wiry stems, evergreen small leaves, grey beneath, nodding, rosy, reflexed flowers, red berries. Sphagnum bogs, Hokkaido, C. and N. Honshu; N. Hemisphere.

Oxycoccus (Vaccinium) microcarpus Similar, more slender. Kuriles, Sakhalin, N. Korea, N. Hemisphere.

Phyllodoce aleutica Wet alpine slopes, Hokkaido, C. and N. Honshu; Sakhalin, Kuriles, Kamchatka, Alaska.

Rhynchospora alba (Cyperaceae) 4 to 24 inches, thread leaves, small heads of whitish spikelets. Wet places and bogs, Hokkaido, Honshu, Kyushu, rare; Eurasia, N. America.

Rhynchospora yasudana 6 to 12 inches, grassy leaves, narrow heads of dark brown spikelets. High moors and wet slopes in high mountains, Hokkaido, C. and N. Honshu.

Rubus chamaemorus "Cloudberry". Creeping herb, unarmed stems 6 inches, 5-lobed leaves, solitary big white flowers, orange-red fruits. Sphagnum bogs, Hokkaido, N. Honshu; N. Hemisphere.

Scirpus caespitosus Dense clumps, 2 to 12 inches, leafless, single tawny spikelet. Wet slopes and moors in high mountains, Hokkaido, C. and N. Honshu; Sakhalin, Kuriles, cool N. Hemisphere.

Scirpus hudsonianus Similar. Sphagnum bogs, Hokkaido; N. Korea, Kamchatka, circumpolar.

Tofieldia japonica 8 to 16 inches, long narrow sword leaves, spikes of small white flowers in 3s, purple anthers. Bogs and wet slopes, C. and N. Honshu.

Veratrum oxysepalum 20 to 60 inches, leafy stems, branched heads of green stars. Bogs, Hokkaido; Kamchatka, Sakhalin, Dahuria, Ussuri.

Veratrum stamineum 20 to 40 inches, branched spikes of white stars. Wet meadows and bogs in mountains, Hokkaido, C. and N. Honshu.

THE ALPINE ELFINWOOD, MEADOWS, ROCKS, AND TUNDRA

Open alpine tundra only occurs on some of the highest peaks, many of them old volcanoes, scattered over the islands of Japan, though alpine plants descend lower on several volcanoes which have erupted in more recent times. Most of the alpine plants of Japan also grow in east Siberia, Kamchatka, and even the Aleutians and Alaska, as well as a number from the Arctic. The sides of many of the isolated old volcanoes in the alpine zone are of sand and gravel which dries out quickly, though the atmosphere is usually dank or rainy in the growing season. Where soil collects in gullies it is generally peaty and wet, which is also the case on the great granite or other non-volcanic massifs. The soil among the rocks and cliffs on these mountains is also peaty and sandy.

In the thickets scattered among the topmost Birches are bushes of the Dwarf Pine *Pinus pumila*, characteristic of the alpine region. The Pines extend up the well-drained rocky slopes, and eventually cover whole mountain-sides with dense elfinwood. The elfinwood starts at about 8,000 feet or

higher in central Honshu, 6,500 feet in the north of that island, and 5,000 feet in Hokkaido, sometimes lower, but is absent from the more recently erupted volcanoes. It is interrupted by screes, washouts and landslips, and by very steep slopes where it is patchy, and ends at the edge of marshy or boggy valley bottoms. The Pines form closed, man-high thickets, their branches spreading along the slopes and rising at their ends. In places where it is not so dense, other low bushes find room, especially the Green Alder on damp slopes, and on the older scars, a ground cover of dwarf shrubs, with lichens or grassy patches.

Due to the foggy and cool summers, several plants, normally only found in the alpine region, descend to sea-level on the coastal rocks in the north and east of Hokkaido.

The Dwarf Pine elfinwood

Few plants can grow under the Pines where the elfinwood is dense, except the more shade-enduring ones of the conifer forests.

Pinus pumila (cembra pumila) Spreading bush to 6 feet. Needles densely crowded, 5 to a sheath, curved, dark green with blue-white backs. Central Honshu to Hokkaido; Kamchatka, E. Siberia.

Alnus maximowiczii Green Alder—

Sorbus sambucifolia Bushy Mountain Ash—

—The commonest bushes in openings.

Rhododendron aureum Prostrate, evergreen shrub with thick branches, leathery leaves, heads of pale green-yellow flowers. Central Honshu to Hokkaido in the alpine region, rare; Kamchatka, E. Siberia, Sakhalin, Korea.

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Arctous (Arctostaphylos) alpinus japonicus Creeping mats to 2 inches high, spatula-shaped leaves withering in winter, umbels of nodding white urn flowers, purple-black fruits. Dry alpine slopes, central Honshu to Hokkaido; Sakhalin, the type from Siberia to Europe, North America. "Black Bearberry".

Athyrium alpestre Clumps of bipinnate fronds, 20 to 30 inches tall. Alpine slopes, C. Honshu, Hokkaido, locally common. Kamchatka, Siberia to Europe, North America.

Carex species.

Cassiope lycopodioides Dwarf, prostrate, evergreen, densely scale-leaved shrub, leaves in four ranks, solitary, nodding, white or pink bells on stalks. Central Honshu to Hokkaido; Kamchatka, Sakhalin, N. Pacific.

Dryopteris austriaca

Hierochloa alpina (Graminae) Creeping, 6 to 12 inches, panicles of shining yellow-brown spikelets. Alpine, C. Honshu, Hokkaido; Arctic and high mountains of Northern Hemisphere.

Ledum palustre decumbens Prostrate, rusty-hairy shrub, narrow, leathery leaves, heads of many white flowers. High moors in alpine Hokkaido, Korea, Siberia, North America.

Linnaea borealis

Lycopodium annotinum

Maianthemum dilatatum

Streptopus amplexifolius

Trientalis europaea

Vaccinium vitis idaea

Calamagrostis langsdorffii—

Glyceria alnasteretum—

—Grasses forming colonies in wet gullies.

High alpine tundra and sandy, gravelly slopes

Open alpine tundra is confined to the highest peaks, and many of the plants are local or rare in Japan. Some mountains, such as Mount Hayachine in N.E. Honshu (Rikuchu), Mount Shibutsu in

W.C. Honshu (Echigo), and Mount Apoi in S.C. Hokkaido are of serpentine and have some endemics.

Arctica (Andromeda or Cassiope) nana Creeping, evergreen, cushion-forming, 3 to 4 inches. Glossy leaves in whorls, clusters of urn-shaped, nodding white flowers. Dry slopes and cliffs, central Honshu to Hokkaido, rather rare; Kamchatka.

Arctous (Arctostaphylos) alpinus

Artemisia trifurcata Creeping clumps of silky-grey much-cut leaves, 5 to 7 inches. Hokkaido (Mount Daisetsu); Kamchatka, Siberia, North America.

Artemisia other species.

Bryanthus gmelinii Prostrate mats, 3 inches. Wiry stems, evergreen, crowded narrow, recurved leaves, spikes of pink, lobed saucers. Dry, gravelly or rocky slopes, central Honshu to Hokkaido; Kuriles, Kamchatka.

Campanula lasiocarpa (algida) Mats of wedge leaves on stalks, to 9 inches, pale blue, erect, solitary funnels. Gravelly and sandy slopes, central Honshu to Hokkaido; Sakhalin, Kuriles, Aleutians, Alaska, Kamchatka. Also in grass-subshrub-lichen tundra.

Campanula chamissonis (pilosa dasyantha) 3 inch mats, narrow, crowded, glossy leaves on stalks, solitary blue bells, hairy in mouth. Gravelly and sandy slopes, central Honshu to Hokkaido; Sakhalin, Kuriles, Aleutians, Alaska.

Cassiope lycopodioides

Cerastium species.

Deschampsia flexuosa "Wavy Hair-grass". Narrow leaves, purplish, cloud-like plumes, 1 to 1½ feet. Bare ground on volcanoes and alpine zone. Hokkaido, C. and N. Honshu, Shikoku, Kyushu, common; Eurasia, North America, S. Chile and Fuegia.

Diapensia lapponica obovata Creeping, matted, evergreen subshrub, to 3 inches, rounded, crowded, leathery leaves, solitary small white trumpets. Dry slopes and cliffs, central Honshu to Hokkaido; Sakhalin, Kuriles, Kamchatka, Alaska, E. North America.

Dicentra peregrina pusilla To 3 inches. Greyish, doubly pinnately cut leaves, 3 or 4 rosy-purple lockets. Gravelly to sandy slopes, mainly on volcanoes. Central Honshu to Hokkaido, rare; Kuriles, Sakhalin, Kamchatka, E. Siberia.

Dryas octopetala asiatica Dry alpine slopes, central Honshu, Hokkaido, rare; Kamchatka, Kuriles, Sakhalin, Ussuri, N. Korea.

Empetrum nigrum japonicum Dense mats, 4 to 7½ inches, narrow, leathery shiny leaves, small flowers, black-purple berries. Broad mats in alpine tundra, central Honshu to Hokkaido. Type in Northern Hemisphere.

Hackelia (Eritrichium) nipponica Dense tufts of narrow, shaggy leaves, 3 to 4 inches. Sprays of saucer-shaped blue flowers. Gravelly or sandy slopes, central Honshu, Hokkaido, rare; Sakhalin.

Harrimanella (Cassiope or Andromeda) stelleriana Dwarf, prostrate, wiry, evergreen, densely leafy subshrub to 6 inches. Narrow-spatula, glossy leaves, solitary white or pinkish, 5-lobed bells. Dry, rocky slopes, C. Honshu, Hokkaido, rare; Kamchatka, Kuriles, North America.

Juniperus communis nipponica (sibirica) Prostrate. N. Honshu, Hokkaido, alpine slopes. Varieties in Siberia to Europe, North America, Sakhalin, Kuriles, Kamchatka.

Kobresia (Elyna) bellardii (Cyperaceae) Tufts of hair-like leaves, chestnut brown shiny spikelets, 4 to 10 inches. Dry alpine slopes, C. Honshu, Hokkaido, rare; Siberia to Europe, N. America.

Loiseleuria procumbens Evergreen, densely leafy, woody mats, sprays of rosy-pink stars. Dry slopes and cliffs, C. and N. Honshu, Hokkaido; Northern Hemisphere.

Oxytropis japonica Short-creeping, woody tufts to 4 inches. Silky pinnate leaves. Few purple flowers on silky spikes. Sandy or gravelly slopes, central Honshu.

Oxytropis yezoensis Similar, woolly. Sandy or gravelly slopes, Hokkaido.

Papaver fauriei "Iceland Poppy". Very rare in gravelly alpine places on Rishiri Island off N.W. Hokkaido. Greenish-yellow flowers.

Penstemon frutescens Clusters of 4 to 8 inch stems, thick, fleshy narrow oval leaves, few long, pale purple, 2-lipped trumpets. Gravelly or sandy alpine slopes, N. Honshu, Hokkaido; Kuriles, E. Siberia, Kamchatka, Sakhalin, Aleutians. The only *Penstemon* outside of N. America.

Phyllodoce (Menziesia) coerulea Heather-like subshrub, 5 to 9 inches, evergreen; urn-shaped, nodding, blue-purple flowers in terminal clusters. N. Honshu, Hokkaido; Northern Hemisphere to arctic.

Phyllodoce (Menziesia) nipponica 3 to 8 inches, evergreen, heath-like subshrub, nodding rose to white bell-shaped flowers in groups. Rocky alpine places, Hokkaido, Honshu, Shikoku.

Poa komarovii shinanoana Resembles *Poa alpina*. Grassy slopes and rocks, also arctic waste. C. Honshu. Type in Kamchatka.

Polygonum nakaii Branching stems, 7 to 16 inches. Oval Dock-like leaves, pale green plumes. Gravelly or sandy alpine slopes, C. and N. Honshu, Hokkaido.

Polygonum weyrichii alpinum 12 to 30 inches. Big Dock-like leaves, creamy plumes. Gravelly or sandy alpine slopes, N. and C. Honshu, Hokkaido. The type descends to gravelly sea shore in Hokkaido.

Polygonum other species.

Rhododendron aureum

Rhododendron camtschaticum Deciduous creeping subshrub, 4 to 8 inches. Veined, broad-ended leaves, 1 to 3 rosy-crimson, wide-lobed flowers, spotted upper lobes, on new wood. Alpine of Hokkaido, N.E. Honshu; Sakhalin, Ochotsk Sea coast, Kuriles, Kamchatka, Aleutians, Alaska.

Salix pauciflora Small prostrate shrub, small round-oval, shiny leaves, round male catkins. Alpine, Hokkaido (Mount Daisetsu).

Salix yezoalpina Prostrate, smooth rounded leaves, densely hairy catkins. Hokkaido.

Salix hidakamontana Prostrate, 4 to 8 inches, rounded corrugated leaves, Hokkaido.

Salix nakamurana Prostrate, oval leaves with prominent nerves. Alps of C. Honshu.

Dry, rocky slopes and rocks in alpine tundra

Arabis lyrata kamtschatica Green, lyre-shaped leaves in tufts, spikes of few white or pinkish flowers. Rocky dry slopes in high mountains, Hokkaido, C. and N. Honshu; N.E. Asia, N. America.

Artemisia glomerata Creeping mats of white-silky, fine-cut leaves, 3 to 6 inches. Cliffs and rocks, local in C. Honshu; Kamchatka, Siberia, Sakhalin, Alaska.

Artemisia schmidtiana 6 to 12 inches, creeping, white-hairy, much-cut leaves. High mountains, Hokkaido, west side of C. and N. Honshu, descending to the sea; S. Kuriles, Sakhalin.

Artemisia other species.

Draba sachalinensis Grey felty rosettes, 4 to 10 inches, white flowers. Rocky mountain slopes, Hokkaido, C. Honshu; Sakhalin.

Draba sakuraii Loose felty rosettes, 3 to 8 inches, white flowers. Rocky, dry slopes in high mountains, north-central Honshu.

Draba shiroumana Smooth, spatula-leaves, 2 to 4 inches, small white flowers. Dry rocky or gravelly slopes and rocks. C. Honshu, rare.

Lloydia serotina (Liliaceae) Needle-leaves, 3 to 6 inches, pencilled white stars. Rocky alpine slopes and cliffs, Hokkaido, C. and N. Honshu; Northern Hemisphere.

Minuartia (Alsine) verna japonica Moss-like cushions, 1½ to 5 inches, white stars. Alpine rocky slopes and cliffs, Hokkaido, C. and N. Honshu; type in Eurasia, N. Africa.

Minuartia (Alsine) arctica Hokkaido; arctic Northern Hemisphere.

Minuartia (Alsine) arctica hondoensis Smaller cushions, larger flowers. Dry slopes and rocks, high mountains of C. and N. Honshu.

Saxifraga cherlerioides (Related to *Saxifraga bronchialis*.) Dense mats, narrow, pointed, overlapping leaves, bristly; yellow, orange-spotted flowers, 6 inches. Alpine rocky slopes and rocks, Hokkaido, C. Honshu, rare. Type in Siberia, N. America.

Saxifraga nishidae Cushions of dense, 3-lobed leaves, 2 to 3 inches, few spotted flowers. Alpine rocky slopes, Hokkaido, rare.

Saxifraga merkii Densely tufted fleshy leaves to 4 inches, sprays of white stars. Alpine gravel and sand slopes, Hokkaido, C. Honshu; Kamchatka, Kuriles, Amur.

Sedum japonicum senanense Mats of crowded, narrow-spatula leaves, sprays of small yellowish stars, 4 to 6 inches. Alpine slopes, C. Honshu.

Sedum kamtschaticum Creeping mats of evergreen, spatula-leaves, woody stock, loose sprays of orange-yellow stars. Rocks in mountains, all Japan, especially north; Sakhalin, Kamchatka, Ussuri.

Thymus quinquecostatus Allied to *Thymus serpyllum*. White-hairy stems and leaves, rose-purple spikes. Rocky, sunny slopes in high mountains, also near sea. Hokkaido, Honshu, Kyushu; Korea, N. China, Manchuria, Mongolia, Siberia.

Tofieldia coccinea (Liliaceae) Grassy leaves, 2½ to 4½ inches. Spikes of white to brown very small stars, C. Honshu to Hokkaido; Korea, Ochotsk sea coasts, N. America.

The grassy tundra

Where peaty soil collects among the rocks and stones of the alpine tundra, grasses and herbaceous plants become more common. The soil may be damp, with a moss carpet, or drier with much tall lichen. Bushy plants still grow here and there, especially *Rhododendron aureum* and small Willows.

Adenophora nikoensis (*polymorpha*) 8 to 16 inches, narrow alternate leaves, spikes of few, hanging, blue bells. Alps, C. and N. Honshu.

Agrostis borealis Tufts, 4 to 12 inches. High mountains, C. and N. Honshu, Hokkaido, rather rare; alpine and cold N. Hemisphere.

Allium maximowiczii Allied to *Allium schoenoprasum*, 12 to 20 inches, alpine meadows, C. Honshu; Dahuria, Ussuri, N. Korea.

Allium splendens (*lineare*) 6 to 16 inches, linear, flat leaves, umbels of rose-purple flowers. Alpine meadows, C. Honshu, Hokkaido; Kuriles, Kamchatka, E. Siberia, Sakhalin, N. Korea.

Androsace lehmanniana (Allied to *Androsace chamaejasme*.) Rosettes, with stolons, hairy leaves broad at top, umbels of yellow-throated white flowers; 1½ to 2 inches. Hokkaido, N.E. Honshu, rare; N. Korea, Sakhalin, N. China, Siberia, Alaska, Turkestan.

Aquilegia flabellata pumila (akitensis) Blue-green leaves, purple-blue flowers with pale yellow centres, 6 to 10 inches. The wild form in alps of C. and N. Honshu, Hokkaido.

Arnica unalascensis Creeping, 5 to 14 inches, big, solitary yellow daisies. Central Honshu to Hokkaido; Kuriles, Kamchatka, Aleutians.

Artemisia arctica Running, 8 to 20 inches, silky, bipinnate, stalked leaves. Hokkaido, N. Honshu; Sakhalin, Siberia, Kuriles, N. America.

Bupleurum nipponicum Stolons, 8 to 16 inches, narrow leaves, yellow umbels. High mountains, C. and N. Honshu.

Calamagrostis purpurascens Allied to *Calamagrostis arundinacea*. 4 to 16 inches, loose tufts, spike-like purplish panicles. C. Honshu to Hokkaido in alps; Kuriles, Kamchatka, E. Siberia, N. America.

Calamagrostis other species.

Callianthemum insigne hondoense (Ranunculaceae) Grey-green leaves twice cut into 3, white many-petalled flowers with orange-red centres. 4 to 10 inches. Local and rare, C. Honshu (Mount Kitadake in Kai).

Carex species.

Erigeron thunbergii glabratus (Aster consanguineus) Clumps of rosettes, 4 to 16 inches, solitary, big mauve-blue daisies. Alps, C. and N. Honshu, Hokkaido; Sakhalin, Korea, Manchuria, Kamchatka, Siberia.

Geum calthaefolium nipponicum 4 to 12 inches, shiny leaves, yellow flowers. Alpine slopes, C. and N. Honshu, Hokkaido; Kamchatka, Aleutians, N. America.

Hedysarum vicioides (*alpinum japonicum* or *ussuriense*) Clumps, 10 to 32 inches, spikes of pale yellow flowers. C. and N. Honshu, Hokkaido; N. Korea, E. Siberia.

Hieracium japonicum Creeping mats, 4 to 12 inches, brown-hairy, heads of few ½ to ¾ inch yellow flowers. Alpine grassy slopes, C. and N. Honshu.

Hierochloa alpina (Graminiae) 6 to 12 inches, very short leaves, shiny, yellow-brown spikelets. Alps of C. Honshu; Hokkaido; alpine and arctic North Hemisphere.

Hypericum kamtschaticum Clumps, smooth oval, dotted leaves, 4 to 12 inches, yellow flowers ¾ to 1 inch across. Alps, C. and N. Honshu, Hokkaido; Kuriles, Kamchatka.

Japonolirion osense (Liliaceae) Running, grassy leaves, narrow spikes of small, greenish stars, 4 to 12 inches. Alpine meadows, Hokkaido, local in C. Honshu, rare, endemic.

Leontopodium fauriei Resembles *Leontopodium alpinum*, white-woolly. Alpine, N. Honshu.

Leontopodium other species White-woolly, star-shaped bracts round flowers, mostly local.

Luzula rostrata Umbels of red-brown flowers. Alps, N. and C. Honshu, Hokkaido.

Luzula oligantha Resembles *Luzula campestris*. Small clumps, 4 to 8 inches, dark brown flowers. Alps, N. and C. Honshu, Hokkaido; Kuriles, China, Korea, Kamchatka.

Mertensia pterocarpa Running, erect stems 4 to 16 inches, long-stalked, oval heart-shaped leaves, blue funnels. Alps, Hokkaido, rare.

Patrinia sibirica (Valerianaceae) Basal leaves spatulate, upper pinnate, sprays of small yellow flowers. Alps, Hokkaido; E. Siberia, Sakhalin, Kuriles.

Pedicularis oederi 3 to 6 inches, pinnately cut leaves, spikes of yellowish flowers. Alps, Hokkaido; Sakhalin, colder North Hemisphere.

Pedicularis verticillata Monocarpic. 2 to 6 inches, densely downy, short heads of red flowers. Alps of C. Honshu, Hokkaido; Korea to Europe, N. America.

Pedicularis chamissonis japonica Pinnately cut leaves, 8 to 24 inches, reddish flowers. Alps of C. and N. Honshu, Hokkaido; Sakhalin, S. Kuriles, type in Kamchatka, Aleutians.

Pedicularis apodochila Pinnately cut leaves, 2 to 6 inches, red flowers. Alps of Hokkaido, C. and N. Honshu.

Pedicularis yezoensis 12 to 24 inches, pinnate double-toothed leaves, pale yellow flowers. High mountains to alps, Hokkaido, C. and N. Honshu; Sakhalin.

Polygonum viviparum 4 to 12 inches, spikes of white to rose flowers with bulbils. C. and N. Honshu, Hokkaido; alpine and arctic Northern Hemisphere.

Potentilla (Dasiphora) fruticosa Shrubby to 4 foot, yellow flowers. In damp or drier rocky places in alps of N. and C. Honshu, Hokkaido; alpine and colder North Hemisphere.

Potentilla (Dasiphora) fruticosa mandshurica Lower, hairier, flowers white. Alps of C. Honshu, Shikoku, rare; E. Siberia, N. China.

Potentilla matsumurae (gelida) Trefoil leaves, 6 inches, sprays of $\frac{3}{4}$ inch wide yellow flowers. Dry alpine slopes, C. and N. Honshu, Hokkaido, rather common.

Potentilla nivea Trifoliate leaves white-woolly beneath, slightly smaller flowers, 4 to 8 inches. Dry alpine slopes and rocks, Hokkaido, Honshu, rare; Northern Hemisphere.

Prunella (Dracocephalum) prunelliformis Paired leaves, stems to 18 inches, spikes of rosy-purple, hooded flowers. Alpine slopes, C. and N. Honshu.

Pulsatilla nipponica Silky leaves (when young) much cut into 3s, nodding, pale yellow bells, white-silky outside, on 4 to 12 inch stems. Alpine slopes, Hokkaido, C. Honshu, rare.

Ranunculus Local and rare species.

Saussurea sagitta Smooth, arrow-shaped leaves, few cobwebby heads of pale purple tuft-flowers on slender stems, 12 to 17 inches. Alps, C. and N. Honshu.

Saussurea yamagisawae $2\frac{1}{2}$ to 12 inches. Cobwebby, toothed leaves, dense cobwebby sprays of purplish tuft-flowers. Alps, Hokkaido.

Saussurea other species.

Senecio takedanus (flammeus alpinus) 8 to 16 inches, cobwebby, umbels of 4 or 5 dark orange-red daisies. Alpine slopes, C. Honshu, rare.

Senecio kawakamii 7 to 12 inches, rosettes of overlapping basal leaves, umbels of yellow daisies. Alpine slopes, Hokkaido; Sakhalin, S. Kuriles.

Taraxacum yuparense Pinnate leaves, orange-yellow flowers on 8 to 17 inch stems. Alps, Hokkaido (Ishikari and Hidaka).

Taraxacum trigonolobum Leaves only pinnately cut, yellow flowers 1½ inches across. Alps, Hokkaido; Kuriles, Kamchatka, Aleutians, Alaska.

Taraxacum alpicola Leaves tongue-shaped, somewhat cut, deep yellow flowers, 1½ inches across. Alps of C. and N. Honshu.

Taraxacum other species.

Veronica schmidtiana and varieties Leafy stems 4 to 8 inches, rosettes of basal juicy leaves, spikes of pencilled pale purple-blue flowers. Alps of C. and N. Honshu, Hokkaido; Sakhalin, S. Kuriles.

Veronica stelleri longistyla Mats of rounder leaves, downy 3 to 6 inch spikes of pale blue-purple flowers. Alps, Hokkaido; type in Kamchatka, Kuriles, Aleutians, Alaska.

Veronica nipponica Similar. Alpine slopes, C. and N. Honshu (Japan Sea side), variety in E.C. Honshu.

Wet places in the alpine tundra

Along rivulets, and on flats and hollows. There is a thick ground mat of mosses, and the soil, though wet, is not a bog.

Anemone narcissiflora Wet alpine slopes, Hokkaido, N. and C. Honshu; alpine and colder North Hemisphere.

Carex species.

Fauria crista galli (*Menyanthes* or *Villarsia*) (Gentianaceae) Creeping, long-stalked, fleshy, kidney-leaves, 6 to 16 inch sprays of white, lobed trumpets. Wet alpine slopes, Hokkaido, west side of C. and N. Honshu; S. Kuriles, west North America.

Gentiana glauca 2 to 4 inches, mats of rosettes, pale blue $\frac{3}{4}$ - inch trumpets. Alps, Hokkaido, rare; Kuriles, Kamchatka, Ochotsk, W. N. America.

Gentiana jamesii 2 to 5 inches, red-purple creeping stems, few, stemless, dark purple-blue, narrow, half-closed flowers. Wet alpine places, C. Honshu (Iwashiro); Korea, Kuriles.

Gentiana nipponica Similar, smaller, open blue trumpets. Wet alpine places, Hokkaido, N. and C. Honshu.

Gentiana algida Rosettes of thick leaves, 6 inch leafy stems, clusters of upright pale yellow funnels. Alps of N. and C. Honshu, variety in Hokkaido; Korea, Siberia, N. America.

Geum (*Sieversia*) *pentapetalum* Prostrate, twiggy, evergreen subshrub, 4 to 8 inches, shiny pinnate leaves, solitary large white flowers. Wet slopes and sometimes Sphagnum bogs in high mountains, Hokkaido, C. and N. Honshu; Kuriles, Sakhalin, Kamchatka, Aleutians.

Juncus beringensis 6 to 16 inches, dark brown lateral flowers. Wet alpine slopes, Hokkaido, C. Honshu; Kamchatka, Bering Sea coasts.

Juncus kamtschatcensis 4 to 8 inches, few slightly flattened basal leaves, red-brown flowers at top of stem. Swampy places in alps and subalps, Hokkaido, N. Honshu; Kuriles, Kamchatka.

Juncus other species.

Oxyria digyna Wet, barren alpine slopes, Hokkaido, C. Honshu, rare; alpine and arctic N. Hemisphere.

Parnassia palustris tenuis (Saxifragaceae) 4 to 20 inches, long-stalked, rounded leaves, solitary, large white flowers. Hokkaido, C. Honshu; alpine and cold Eurasia. Wet places in alps.

Phyllodoce aleutica Evergreen, sprawling, woody mats, 4 to 12 inches, few, nodding, pale yellow-green, urn-shaped flowers. Wet alpine slopes, Hokkaido, C. and N. Honshu (especially the west), rather common; Sakhalin, Kuriles, Kamchatka, Alaska.

Plantago hakusanensis 3 to 5 inches, oblong leaves, narrow spikes. Wet alpine slopes, west side of C. and N. Honshu.

Primula cuneifolia 2 to 6 inches, fleshy, wedge-leaves, umbels of rose-purple flowers with bifid petals. Wet alpine slopes, Hokkaido, variety in C. and N. Honshu; Kuriles, Sakhalin, Ochotsk, Aleutians, Alaska.

Primula nipponica Similar, smaller, white flowers with yellow eye, not fully opening. Wet alpine slopes, N. Honshu.

Primula yuparensis Allied to *Primula farinosa*. 1½ to 2½ inches, 2 or 3 pale rose-purple flowers. Alps, Hokkaido (Mount Yubari), rare.

Primula other species.

Salix species.

Saxifraga cernua 2 to 6 inches, lobed kidney-leaves, red bulbils on stem, one or few white flowers. Wet rocks in high mountains to alps, C. Honshu, rare; mountains and colder N. Hemisphere.

Saxifraga reniformis 2 to 10 inches, creeping, long-stalked kidney-leaves, dense sprays of white or mauve-stained flowers. Wet ravines, to alps, Hokkaido, local and rare; Sakhalin, Kuriles, Kamchatka.

Sedum (Rhodiola) roseum Damp rocky places in alps, Hokkaido, C. and N. Honshu, descending to rocks near the sea in Hokkaido; alpine and colder N. Hemisphere.

Stellaria species.

Swertia perennis cuspidata and varieties 5 to 12 inches, erect stems, sprays of dark blue star-flowers veined dark purple. Wet places in alps, Hokkaido, C. and N. Honshu; the type in Siberia to Europe, N. America.

Trollius riederianus and variety *japonicus* 4 to 8 inches, stamens longer than petals, flowers yellow, wide open. Alpine meadows, Hokkaido, variety in Hokkaido and N. and C. Honshu; Kuriles, Sakhalin, Kamchatka.

Viola biflora Wet places, wet shady rocks, high mountains of Hokkaido, C. and N. Honshu, Shikoku, Kyushu; cooler N. Hemisphere.

APPENDICES

CORRESPONDENCE – Don Elick, Shizuoka, Honshu, Japan

Japanese climate

All but truly subtropical plants from the islands of the South China Sea are amazingly cold-resistant if they have a proper summer behind them, but they must have a long season of warmth and moisture, that is from late April to late September, to make adequate growth, and then two more months of warm dry autumn to get ready for winter. (It is biting cold summers, frost in May, and no autumn at all in the Japanese sense, that make the less adaptable Japanese plants difficult in England.)

Our winters on the Pacific side of Japan are rainless, sun-drenched, and made bitter cold by the wind factor. Humidity drops to desert level and day after day the wind from Siberia roars over the central ranges. This same wind brings the back (west) side of Japan some of the world's heaviest snowfalls, though the snow never reaches my garden – it stops short about 20 miles to the north.

Our weather works like clockwork – the onset and end of frost are predictable almost to the day – here my last frost is about March 15, by mid-April minimum night temperatures are never under 45, and by mid-May it is as hot as English August. The monsoon sets in on June 15, and for six weeks or so (till the end of July) we swelter in an Oriental sauna while the rice grows. This is the time of death and destruction in my garden – then true summer comes – 90 to 95 by day and barely better by night. there is not much rain, only an occasional thunderstorm or cloudburst if we have an early typhoon, but it becomes bearable by the beginning of October, and then we have two months of idyllic, soft, hazy, nearly hot autumn days. This year the first killing frost was on December 12, and there will be only the rare frostless night from now until mid-March. Out of the wind in sun-pockets it is warm at midday, but the air is dry and harsh, and discouraging of any premature growth. My rock garden in an exposed site does not wake up until a full month after the

rock gardens in the London area, so firmly does the winter wind and dry air put plants into dormancy.

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Hostas

The *Hosta* I sent seed of does not key out in Ohwi, but is probably *Hosta longissima*. The leaves reach 25 cm, the racemes are many-flowered, up to 40, and a rich vibrant purple. It blooms late in September. It has a wide distribution, and I have nearly identical collections from sites as far apart as 250 miles, and from 500 to 2,500 metres. Yours came from snow-melt meadows in the alpine zone of Mount Hakusan (in Ichikawa).

Ohwi's variety *brevifolia* is almost certainly the same taxon as his *Hosta albomarginata*. Both are properly *Hosta lancifolia* as you call it, and *Hosta longissima* should probably be treated as its subspecies.

Hostas are amazingly adaptable, but in the wild they generally grow in the rich, damp, shaded sites you say you must give yours. Only a few true bog species grow in the open, and this in mountain sunlight, with long days of storms and mists – our mountains in summer are rainy and dank. Hostas are everywhere in this country, though the species are very local. Actually they can be grouped roughly by preference of site – a few grow in true bogs or snow-melt meadows – i.e. *Hosta lancifolia*, the smaller species such as *Hosta longipes* and the *Hosta venusta* group on wet cliffs or shaly slopes and the big-leaved ones in rich woodland. My local big species are not at all distinguished. A nice medium-sized species which may be *Hosta tardiflora* grows about 15 miles to the north of here on the wet cliffs of the Tenryu River gorge. I have never seen a variegated *Hosta* in the wild.

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Asarums

Variegation is the natural state of the *Asarum* – all the Japanese species – and plain forms are rare. My local species is *Asarum nipponicum* var. *brachypodium*. The variegation is infinite and no two plants are exactly alike, though there are 3 or 4 more or less standard pattern types. The most frequent is heavily marbled like a Cyclamen, some are evenly netted in silver, some have a broad silver band down the centre of the leaf, and a few are salt-and-pepper speckled.

Here they grow in all sorts of soils, but always in shade. They do seem to be best in poor woodland in thin stony humus, and they must have shelter from drying winds.

Kirengeshoma

A very rare and probably evolutionarily perishing plant, now firmly established in cultivation around the world, and does far better in the garden than it ever does in the wild. Japanese are astonished to see the flourishing plants in Glasnevin, Munich and Montreal. It is said to be a relict species, and I expect that it is struggling for survival here in a climate that is much too hot for it now. There are only a few poor stands on Mount Ishizuchi in central Shikoku, and scattered populations near the summits of a couple of Kyushu mountains. There are a few poor plants on the mountain in the photo I sent you – Mount Yufu, north Kyushu, a recently extinct volcano (2 peaks, 1000 and 1900 metres – 3280 and 6230 feet) with Inose Bog at its foot.

Inose Bog, and Mount Yufu

The photo of Inose Bog was taken in mid-May, showing how slow the bog is to come into growth. There are no ponds or pools. It is of squelchy peat criss-crossed with shallow drainage rivulets. It is the home of thousands of *Hosta lancifolia*, and the wild parent of *Iris kaempferi* (*Iris ensata spontanea*), with drifts of *Primula sieboldii* in late April, and a big yellow *Ligularia* in August. Also Helleborines, Platantheras, Epipactis and solid carpets of *Pogonia japonica*. It is bitter cold in winter, being about 900 metres (2950 feet) high, and stiflingly hot in summer, with a long autumn that enables growth until the end of November.

On the lava cliffs near the summit of Mount Yufu are immense colonies of a small *Hosta* which may be *Hosta venusta* (though botanists say this is only on Quelpart Island). The *Hosta* and *Rhododendron kiusianum* (a parent of Kurume Azaleas) are dominant on the summit, and the green, mossy appearance of the summit crags is mainly due to the *Rhododendron*, showing how densely it covers the rocks. Except for the black-green spires of planted *Cryptomeria*, the lower forest is mainly broad-leaved evergreen scrub of no interest – *Aucuba* and others, but the herbaceous undergrowth has many choice plants, *Arisaema* species in quantity, *Epimediums*, and the almost legendary *Iris rossii*. None of the really big *Hosta* species, as they demand a good, deep, well nourished soil of the sort that is found only on the higher areas of the truly substantial mountain masses. These random and abrupt volcanic peaks are all but sterile grit, and even with the heavy summer rainfall and the long season of warmth and humidity, cannot support anything like real forest trees.

Polygonatum humile

Ardisia species (carpets under Bamboo and Camellia thickets)

Cymbidium virescens

Chionographis japonica (which grows in pure deep leafmould, in dense shade or steep moist banks, mid-May)

TRICYRTIS

Brian Matthew, *The Plantsman* vol. 6, part 4, March 1985

Group I (subgenus *brachycyrtis*). *Tricyrtis macrantha* group. Flowers drooping, tubular, yellow; unblotched leaves; pendent or arching stems.

Group II *Tricyrtis flava*. Flowers yellow, erect, flat, axillary; usually erect stems.

Group III *Tricyrtis latifolia*. Flowers yellow or greenish-yellow, funnel-shaped, terminal; erect stems; leaves with faint blotches or none.

Group IV *Tricyrtis hirta*, *Tricyrtis formosa*, *Tricyrtis affinis*. Flowers white or purplish, heavily spotted, terminal or axillary; erect or arching; leaves with or without blotches.

Group I *Tricyrtis macrantha*. Long, usually simple, trailing stems; broad leaves not wrapped round stem; coarsely hairy stems and leaves; tubular flowers to 1½ inches long. Vertical rock faces in damp shade, very rare, only in ravines in Tosa Province, Shikoku.
Tricyrtis macranthopsis. Similar but longer clasping leaves, not so hairy. Wild stems 3 to 5 feet long. Best of the group. Near waterfalls and on cliffs. Rare, only on Kii Peninsula, central Honshu.

Tricyrtis ishiana. Similar, but flowers grouped at ends of stems; leaves clasping; stems and leaves smooth. In shady, damp ravines in Suruga and Sagami provinces, central Honshu. Rare.

Group II *Tricyrtis flava*. Erect, 4 to 20 inches high; heavily blotched stem-clasping leaves; axillary flowers on long stalks, 1½ inches across, bright yellow spotted red-brown and with orange central ring. Common in damp woods of east Kyushu (Osuzu mountains).

Tricyrtis nana. Very similar, but only 2 to 4 inches high; leaves blotched dark green (or bronze in stronger light), in basal rosettes; paler yellow flowers. In mountain woods (example at 1,312 feet), local in Honshu, Shikoku, Kyushu. Tender in Britain.

Tricyrtis ohsumiensis. Stocky, erect, 8 to 12 inches tall, densely leafy; leaves broad, waxy, dark green blotches; flowers lemon-yellow, not so spotted, with deep yellow central ring, on short stalks from leaf-cups. From one or two mountains in Kyushu in tall grass and at edges of clearings. Fairly easy to grow in Britain, but liable to scorch.

Tricyrtis perfoliata. Long, arching or drooping, zigzag stems; unspotted, shiny, stem-clasping leaves; lily-shaped, 1½ inch wide, yellow, upright flowers, spotted purple

and ringed, in upper axils. Vertical rock faces near waterfalls (where it is common) in gorges of Nanuki River in Osuzu mountains of Kyushu, very rare, but not too difficult in Britain.

Group III *Tricyrtis latifolia* (synonymous spp. *Tricyrtis puberula*; *Tricyrtis bakeri*; *Tricyrtis makinoana*). There are several forms. Erect growth; terminal branched heads of upright, yellow to yellow-green, finely spotted with purple, funnel-shaped flowers, stem-clasping (but not wrapping), thin, unblotched (or very faintly), slightly glandular-hairy leaves. 16 to 36 inches tall, early flowering and easy to grow in Britain, even in fairly open places. On lower mountain-slopes in woods, widespread in China and Japan, further inland in Honshu than others.

[[Typescript ends here. No page for Group IV]]

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MISCELLANEOUS

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More beautiful in flower, and valuable in gardens, are the large tabular bushes of *Viburnum plicatum* var. *tomentosum* (*Viburnum tomentosum*), spreading their boughs horizontally in the mountain thickets and open woods, and bearing numerous flat trusses of white bloom like saucers, all on the upper side of the branches, and each with an outer ring of big sterile florets. The berries are red, ripening to black. A form with only sterile florets, arranged in a ball, is grown in gardens (and often known as *Viburnum tomentosum* var. *plicatum*).

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The Ryukyu islands stretch southward away from the Kyushu coast to Formosa, acting as stepping-stones for plants from the Tropics and Polynesia, several of which reach their northern limit in Japan, while in the north the Kurile Chain links Hokkaido to Kamchatka.