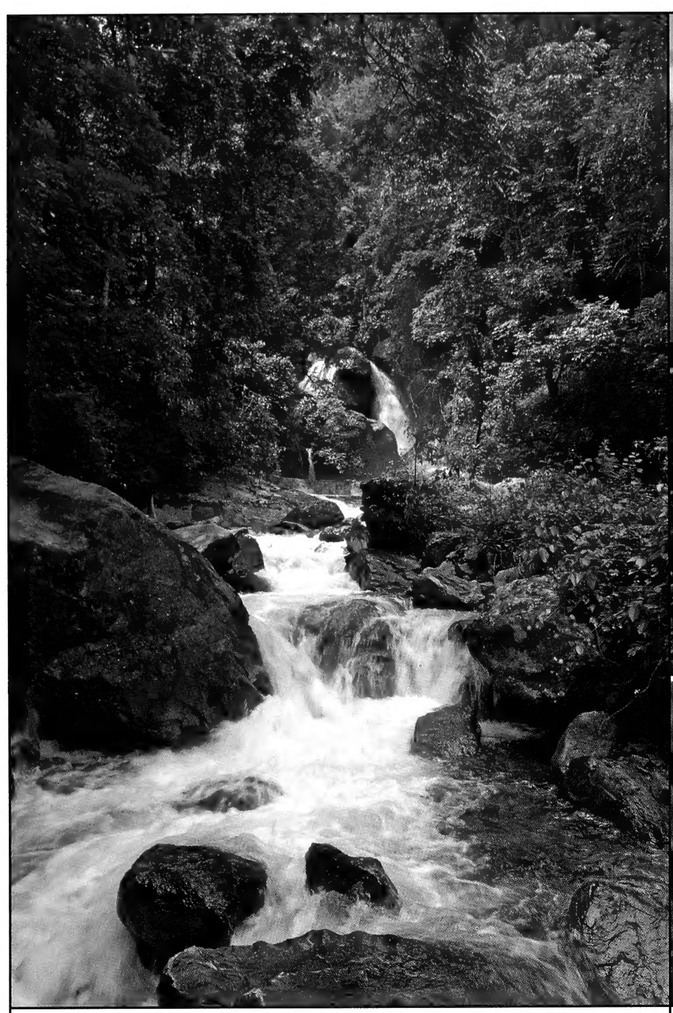
Missouri Botanical Garden

Research: China



▲ China has the richest flora of any country in the northern temperate zone. Such high diversity is due to the dissected topography and unique vegetational continuity, which ranges from tropical and subtropical, through temperate, to boreal forests. China has nearly 31,500 species of vascular plants, the third largest national flora (after Brazil and Colombia). This compares with about 20,000 species in the United States and Canada combined and 11,500–13,600 species in Europe. With an estimated 366,000 species of vascular plants in the world, China has about 9% of the world's total. The Missouri Botanical Garden is the coordinating center of the *Flora of China* project, which began in 1988 and will finish in 2013. The main products are a 47-volume flora and website that will catalog and describe in detail all 31,500 species and illustrate about two-thirds of them.

◀ **Gongga Shan** (Mt. Gongga; Minya Gonkar), located in western Sichuan (7,556 m), is the highest peak in the Hengduan Mountains of the eastern Qinghai-Xizang (Tibet) Plateau. The horizontal distance is only about 30 km from its peak to the river valley while the vertical distance is about 6,500 m. There are about 3,000 species of vascular plants including about 2,600 species of seed plants and 400 species of ferns and lycophytes in Gongga Shan. The mountain has long served as the east-west divide of the Sino-Himalayan Floristic Region.

The Hengduan Mountains' long geological history, their north-south aligned mountain ranges and rivers, and their great altitudinal diversity make them one of the regions with the richest temperate biodiversity in the Northern Hemisphere.

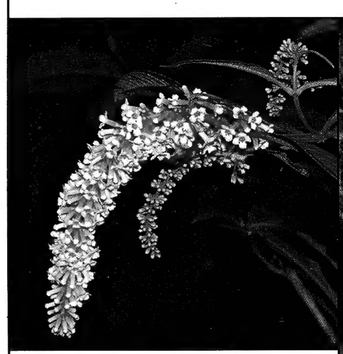
◀ *Monotropastrum humile* . This odd member of the heather family, the Ericaceae, is a holomycotroph, a plant that lacks green chlorophyll and that obtains all its nutrition from organic substances provided by fungi symbiotically associated with its roots (called a mycorrhiza). Such plants are often incorrectly referred to as "saprophytes," whereas a true saprophyte derives its nutrition from decaying organic matter. Fungi are true saprophytes.

◀ *Larix potaninii* forest. Occurring at elevations of 3,000 m to 4,200 m in western Sichuan and Gansu provinces, *Larix potaninii* forms one of the highest forest vegetation types in western China. *Larix potaninii* has golden yellow leaves in fall and is highly valued for its ornamental properties.

◀ *Davidia involucrata*. First discovered in Baoxing (Mupin) County in western Sichuan, *Davidia involucrata*, known as dove tree or handkerchief tree, is famous for its large white bracts. It is a medium-sized deciduous tree and naturally occurs in Guizhou, Hubei, Hunan, Sichuan, and Yunnan. It is a favorite tree in horticulture.

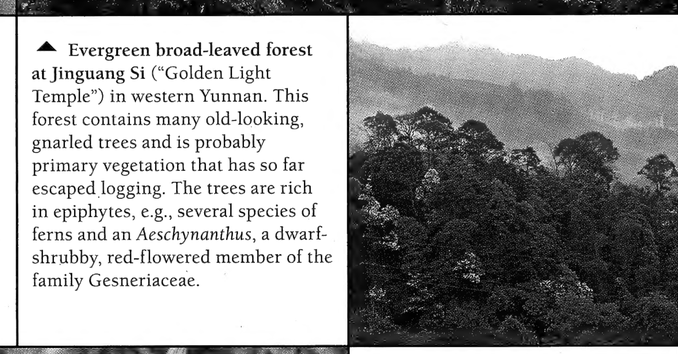
▲ **Emei Shan (Mt. Omei)**. One of the densely forested valleys running off this famous holy mountain in Sichuan province. The trees include species in the Lauraceae, a family with ca. 450 species in China and widely represented in the evergreen broad-leaved forests of the temperate to tropical areas. The moist, shady forest floor and rock faces support a rich flora, including species of *Begonia*, *Impatiens* (balsam), Gesneriaceae, *Zingiberaceae* (ginger), and ferns.

▶ *Rosa moyesii*. Discovered and named by the famous botanist and explorer Ernest H. Wilson, *Rosa moyesii* occurs in scrub and on slopes, at elevations of 2,700 m to 3,800 m, in Shaanxi, Sichuan, and Yunnan provinces. Its flowers are beautiful, and its fruits and leaves contain large amounts of flavonoids, which are beneficial for human health.



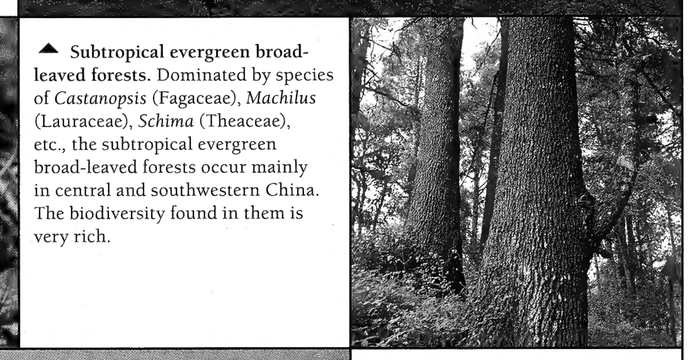
▲ *Buddleja davidii*. This species is a wild ancestor of the butterfly bush commonly cultivated in the West. It is probably endemic to southern China, where it is quite widespread; records from Japan probably refer to introduced plants. China is the world's richest origin of cultivated plant species, with thousands of wild species having been introduced into gardens over the last few centuries, e.g., bamboos, camellias, orchids, primulas, rhododendrons, and roses.

◀ *Meconopsis horridula*. Doggedly growing in grassy slopes, scree, rock ledges, and stabilized moraines at 3,600 m to 5,400 m in western Gansu, Qinghai, western Sichuan, and Xizang in China, and in Bhutan, northeast India, northern Myanmar, and Nepal, *Meconopsis horridula* has striking blue flowers that blossom in the cold plateau.



▲ **Evergreen broad-leaved forest at Jinguang Si** ("Golden Light Temple") in western Yunnan. This forest contains many old-looking, gnarled trees and is probably primary vegetation that has so far escaped logging. The trees are rich in epiphytes, e.g., several species of ferns and an *Aeschynanthus*, a dwarf-shrubby, red-flowered member of the family Gesneriaceae.

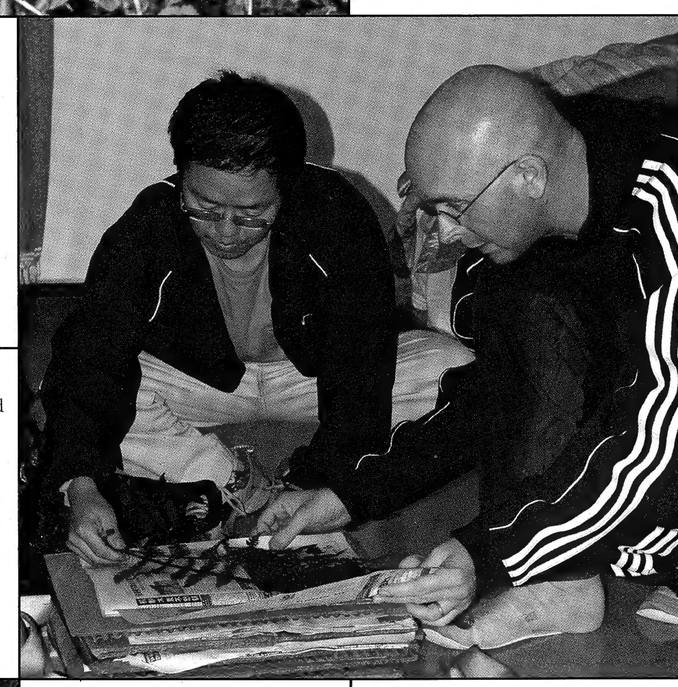
▶ *Cypripedium tibeticum*. This orchid grows in sparse forests, forest margins, scrubby slopes, grassy slopes, and stony places at 2,300 m to 4,200 m in Gansu, Guizhou, Sichuan, Xizang, and Yunnan in China and in Bhutan and India (Sikkim). *Cypripedium tibeticum* is short and robust, with a blackish-purple lip and staminode. It is a beautiful ornamental plant.



▲ **Subtropical evergreen broad-leaved forests.** Dominated by species of *Castanopsis* (Fagaceae), *Machilus* (Lauraceae), *Schima* (Theaceae), etc., the subtropical evergreen broad-leaved forests occur mainly in central and southwestern China. The biodiversity found in them is very rich.

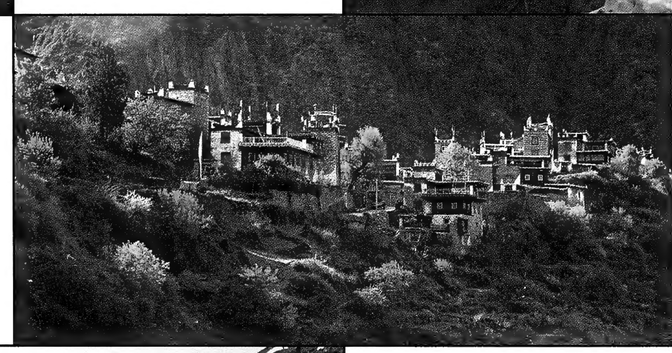
▲ *Briggsia longifolia*. A member of the widespread and mostly tropical family Gesneriaceae, this species grows on rocks and as an epiphyte on trees in southwestern China and northern Myanmar. The genus *Briggsia* has a little over 20 species distributed in the Sino-Himalayan region. In China the Gesneriaceae have around 500 species and rising; several new species are being discovered and described each year.

◀ *Rhododendron lutescens*. Distributed in southwestern China, at elevations of 1,700 m to 2,800 m, *Rhododendron lutescens* has terminal or axillary flowers, a yellowish corolla, and long stamens. *Rhododendron* is the largest genus in China, with 571 species included in the *Flora of China* in 2005. Since then, several new species have been discovered and described as new to science.



▲ *Pinus yunnanensis*, Yunnan pine. It is unusual to encounter such large trees of this species, which is more often seen forming secondary forests. These trees are by a temple, where it is likely that they have been protected. Such "sacred areas" are very important for plant conservation because they often contain relics of the primary vegetation in areas otherwise radically modified by human activities.

▲ *Magnolia wilsonii*. Named after Ernest H. Wilson, *Magnolia wilsonii* occurs in forests in Guizhou, central and western Sichuan, and northern Yunnan, at elevations between 1,500 m and 3,000 m. Wilson discovered it in Kangding County, Sichuan, in 1906. There are more than 100 species of *Magnolia* in China, with about 60% of them endemic.

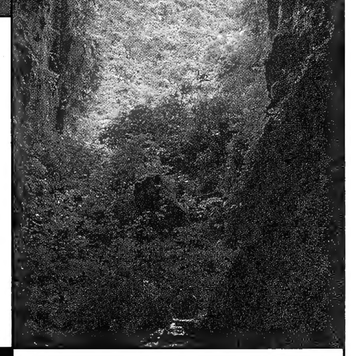


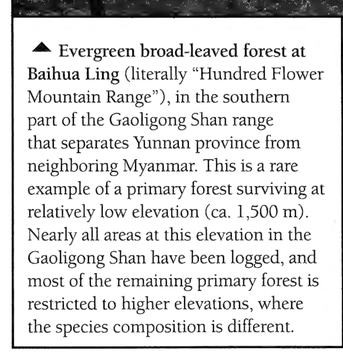
◀ **Traditional Tibetan village**. On July 5, 1908, Ernest H. Wilson stayed a night at a farmer's house at this Tibetan village in Danba County, Sichuan, and called the house "my apartment." After more than 100 years, the farmer's descendants live in another house in the same location in this village.

▶ *Rheum alexandrae*. Growing in alpine meadows at elevations between 3,000 m and 4,600 m in southwestern China on the Qinghai-Xizang (Tibet) Plateau, *Rheum alexandrae* has stems that are rich in vitamin C and is a locally loved vegetable.

▲ **Dr. Libing Zhang (left) and Nicholas Turland** pressing a herbarium specimen of a fern, *Polystichum discretum*, collected in western Yunnan. China is the world's richest country in pteridophytes (ferns and lycophytes), with some 2,400 species, of which just over 200 belong to *Polystichum*, the largest fern genus in China. Field work to gather primary data, including collecting herbarium specimens and DNA samples, is an important element of the Garden's research program in China.

▶ **Karst cave**. Inside view of Ganjiao, a karst cave in southern Guizhou where a single-cave-endemic *Polystichum speluncicola* (Dryopteridaceae) was discovered in 2008 by Libing Zhang and Hai He. Only one population with around 20 individuals was found, which makes it one of the most endangered species in the world.

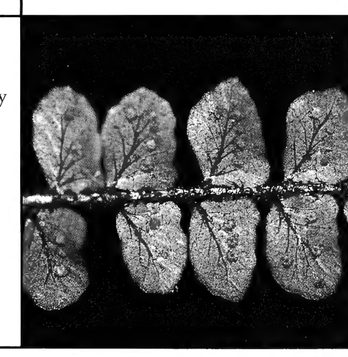




▲ **Evergreen broad-leaved forest at Baihua Ling** (literally "Hundred Flower Mountain Range"), in the southern part of the Gaoligong Shan range that separates Yunnan province from neighboring Myanmar. This is a rare example of a primary forest surviving at relatively low elevation (ca. 1,500 m). Nearly all areas at this elevation in the Gaoligong Shan have been logged, and most of the remaining primary forest is restricted to higher elevations, where the species composition is different.

◀ *Primula sonchifolia*. Growing in meadows or forest margins at 2,300 m to 4,600 m in southwestern China and northern Myanmar, *Primula sonchifolia* has a lavender-blue to purplish blue, rarely white, corolla. Like many species in the genus, it has a heterostylous breeding system, whereby some plants have a short style and long stamens and others have a long style and short stamens to facilitate cross-pollination.

◀ *Omphalogramma vinciflorum*. The genus *Omphalogramma* (Primulaceae) contains approximately 13 species, confined to the eastern Himalayas, western China, and northern Myanmar. Nine species are native to China. Its flowering rosette has a solitary large flower, which differs from *Primula* in being zygomorphic. *Omphalogramma vinciflorum* has a purple corolla and occurs in Gansu, Sichuan, Xizang, and Yunnan, at 2,200 m to 4,600 m.



◀ *Polystichum fengshanense*. This newly discovered cave fern, *Polystichum fengshanense* (Dryopteridaceae), is endemic to nine karst caves in northern Guangxi, China, and is considered to be Critically Endangered (CR) based on IUCN Red List criteria. Numerous new and critically endangered cave ferns from southern China have been discovered by Libing Zhang, an Associate Curator at the Garden, and his collaborators.

MBG Asia/Pacific Region Researchers (authors of text):
Text by Nicholas Turland, Associate Curator and Co-Director, Flora of China Project; and Dr. Libing Zhang, Associate Curator

Photos by: Nicholas Turland, Dr. Chunlei Xiang, Kaipu Yin, and Dr. Libing Zhang

Science and Conservation at the Missouri Botanical Garden

With operations in over 35 countries around the globe, the Missouri Botanical Garden collaborates with local institutions wherever Garden botanists conduct research and field work, providing technical expertise, assistance with fund raising, and better communication with the worldwide scientific community.

The research division consists of 46 Ph.D. botanists assisted by 144 support staff and 20 graduate students. Studies concentrate on the plants of Meso- and South America, sub-Saharan Africa, Madagascar, China, Vietnam, and North America.

Individual Garden scientists are specialists in the plants of particular regions, in the systematics and evaluation of major plant families, and in the interactions between plants and people.

The Garden serves as the headquarters for the Center for Plant Conservation and for several major collaborative publications, such as *Flora of China* and *Flora Mesoamericana*.

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Trollius chinensis

Trollius chinensis is a species of globeflower endemic to northern China. It belongs to the buttercup family, Ranunculaceae, and was originally described by the Russian botanist, Alexander von Bunge, in 1833. The Chinese name is "jin lian hua" (金莲花), which literally translates as "golden lotus flower." A perennial herb growing to about 80 cm tall and flowering in June and July, it grows on grassy slopes at elevations of 1,000 m to 2,200 m in Hebei, Henan, Jilin, Liaoning, Nei Mongol, and Shanxi provinces of northern China.

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