

Plant Hunting on the Rooftop of the World

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Plant exploration has always played an important role in shaping the Arnold Arboretum's collections and has been the driving force behind the many Arboretum-sponsored trips to the Far East and within North America. Living plants grown from seeds gathered on these expeditions grow on the grounds of the Arnold Arboretum, in the collections of other botanical institutions in North America and abroad, in the stock inventories of nurseries across the country, as well as in our own home gardens. Although new plant material from expeditions is added to the living collections each year, the main goal of the majority of Arboretum-sponsored fieldwork is the creation of botanical inventories of eastern and south-eastern Asia in the form of herbarium vouchers. In fact, few people familiar with the Arboretum's collections in Jamaica Plain are aware of the institution's collection of approximately 1.4 million herbarium specimens housed in the Harvard University Herbaria in Cambridge, Massachusetts (<http://www.huh.harvard.edu/>).

In 1997, under the auspices of the Biotic Surveys and Inventory program of the National Science Foundation (NSF), the Arnold Arboretum began a three-year collaborative effort to inventory the plant and fungal diversity in the Hengduan Mountains of south-central China, one of the unique biological regions of the world. Lying at the eastern end of the Himalayas between the edge of the Qinghai-Xizang (Tibetan) Plateau and the central plain of China, these spectacular north-south trending ridges contain the most diverse vascular plant flora of any region of comparable size in the temperate zone. Identified as one of twenty-five biodiversity "hotspots" on earth,¹ this vast region, covering an area of approximately 300,000 square miles (500,000 sq km), contains over 12,000 species of vascular plants, with

almost 3,500 endemic species and at least 20 endemic genera.

Although some botanical exploration has previously been carried out in the Hengduan Mountains, the region has never been fully inventoried because of the sensitive political atmosphere in Tibet and because the rugged terrain makes much of the area extremely difficult to traverse. Elevations range from 3,300 feet (1,000 m) to over 25,000 feet (7,556 m) at the summit of Gongga Shan in western Sichuan. Average elevation is 10,000 to 13,000 feet (3,000 to 4,000 m) with precipitous drop-offs of 1,000 to 3,000 feet (300 to 900 m) not uncommon. No one, however, has yet identified the full extent of the geography and plant life of this particular "hotspot."

The term "hotspot," coined in 1988 by British ecologist Norman Myers, is used to designate areas that have a high number of endemic species (those whose distribution is limited to a single region) and that are under severe threat of destruction because of human activities. These threatened regions cover less than two percent of the earth's land area, but are home to more than sixty-five percent of all vascular plant species. Of the twenty-five designated hotspots, the Hengduan Mountains and the California Floristic Province are the only two located in the Northern Hemisphere. All other hotspots, with the exception of central Chile, the Cape Province of South Africa, and southwestern Australia, are located in the tropics.

The Hengduan Mountain region, as currently defined, constitutes only five percent of China's land area, occupying portions of southeastern Xizang (Tibet), western Sichuan, and northern Yunnan, but it contains almost half the total number of all Chinese flowering plant species. The extremes in climate and topography almost certainly contribute to the diversity of plant life

The upper reaches of the Mekong River and one of its tributaries.



The Hengduan Mountain region, one of the twenty-five biodiversity hotspots of the world.

there. More than a quarter of the world's *Rhododendron*, *Primula*, *Corydalis*, *Delphinium*, *Anaphalis*, *Gentiana*, *Saussurea*, and *Sorbus* species and over half the species of *Ligularia*, *Cremanthodium*, *Cotoneaster*, and *Pedicularis* have been recorded here. In addition, there may be as many as fifty species of endemic mosses.

A few numbers will illustrate the extent of some particularly species-rich groups in the spectacularly diverse Hengduan region (approximate numbers of species worldwide in paren-

theses²: *Rhododendron*—224 (850); *Androsace*—28 (100); *Primula*—113 (400); *Gentiana*—117 (350); *Saussurea*—101 (300); *Impatiens*—45 (850); *Pedicularis*—250 (350+); *Aconitum*—104 (100+); *Delphinium*—71 (250); *Arisaema*—39 (150); *Cotoneaster*—41 (50); *Astragalus*—98 (2,000); *Ilex*—44 (400); *Corydalis*—85 (300); *Sorbus*—36 (85); *Anaphalis*—33 (100).

The table on the opposite page compares the levels of diversity and endemism in the Hengduan region with those of other nontropical areas, providing another indication of its richness.³

Four of the great rivers of Asia, the Yangtze (Jinsha Jiang), the Mekong (Lancang Jiang), the Salween (Nu Jiang), and the Brahmaputra (Yarlung Zangbo Jiang), flow through the valleys of these dramatic mountains. All of these rivers originate on the 16,500-foot (5,000-m) high Qinghai-Xizang (Tibetan) plateau, and, far downstream, all are of great economic importance to the people who live along them. The rapidly increasing human impact on the region threatens not only the diversity of plants and animals there, but also the survival of indigenous cultures that define much of eastern and southeast Asia.

In the summer of 2000, the third year of the NSF project, fieldwork was conducted for two



Three species of *Saussurea*, a member of the aster family: above, a cushion form growing on scree slopes at 17,000 feet, left and center, two species grow among boulders at 15,000 feet

Region	Area (km ² x 1000)	Number of genera	Genera endemic (%)	Number of species	Species endemic (%)
Hengduan Region	500	1467	20 (1.4)	8559	1281 (15.0)
California	411	878	26 (3.0)	5046	1517 (30.1)
California Floristic Prov.	324	795	50 (6.3)	4452	2125 (47.7)
British Isles	308	545	0 (0)	1443	17 (1.2)
Cape Province, South Africa	0.47	533	1 (0.2)	2256	157 (7.0)
Carolinas	217	819	1 (0.1)	2995	23 (0.8)
Gray's Manual range	3238	849	6 (0.7)	4425	599 (13.5)
Japan	377	1098	17 (1.5)	4022	1371 (34.1)
Texas	751	1075	7 (0.7)	4196	379 (9.0)

months in southeast Xizang (Tibet) by a team of four American, one Tibetan, and four Chinese botanists. Dave Boufford, assistant director of the Harvard University Herbaria and an author of the NSF grant proposal, headed the American team. I was fortunate to be part of that team, along with Rick Ree, who received his Ph.D. from Harvard this year and works on the genus *Pedicularis* (lousewort), and Brian Perry, a doctoral student at Harvard in mycology. Four Japanese botanists traveled and collected with the group as well, but were not working under the auspices of the NSF grant.

The logistics of the expedition were coordinated by Wu Sugong of the Chinese Academy of Science Institute of Botany in Kunming in Yunnan Province. Professor Wu had done fieldwork in the area in the 1970s and 1980s and helped compile the two-volume checklist *Vascular Plants of the Hengduan Mountains*.⁴ His position was not an enviable one, since efforts to arrange permits, lodging, and rations were continually complicated and delayed by landslides, broken-down vehicles, massive roadway

construction projects, obstinate local officials, and inclement weather.

The expedition team assembled at the Kunming Botanical Garden on June 28, 2000. There we handed over our passports to a young Tibetan woman, Yang Zhen, who was to fly them to Lhasa to obtain permits for travel in the Tibet Autonomous Region. While waiting for her return, we drew up the final itinerary and gathered equipment: plant presses, ventilators, portable dryers, kerosene burners, a fifty-gallon drum of kerosene, food, camping gear, and even an extra pair of springs for the rather rickety bus that was to transport much of our equipment. Little did I suspect how valuable these springs would prove to be weeks later down the incredibly rough road.

Finally, on July 4, with three SUV's and a small bus, we began our journey north. The fully loaded truck remained in Kunming to wait for our passports and the all-important permits to arrive from Lhasa. For the next several days we headed north, stopping in the towns of Dali,



Wu Sugong and Dave Boufford

Zhongdian, and Deqen. In Dali, a popular Chinese tourist destination situated next to Lake Erhai, we encountered a few Tibetan vendors whose wares included fruiting bodies of the *Cordyceps* fungus, a dried tiger penis ("For your health!"), and the antlers of an unidentified antelope. We took advantage of the town's internet café, which would be the last we saw until we reached Lhasa on August 17.

During the eighth and ninth centuries, Dali was the capital of a separate kingdom, Nanzhou. The local Bai people—who ruled from 902 until 1252, when Kublai Khan conquered the area—renamed it the kingdom of Dali. Diancang Shan, an uplifted mountain of granite and marble, rises 13,500 feet (4,100 m) just west of the city. Since most of the remainder of the province of

Yunnan is limestone, the flora of Diancang Shan is distinctive and interesting in and of itself. In 1984 Dave Boufford spent six weeks collecting herbarium specimens there; on this trip we could spend only a day on the mountain.

Heading north we saw fields of tobacco, corn, rape seed (used for cooking oil), cabbage, beans, and peas. Large *Populus yunnanensis* grew along the roadsides, but most of the land was stripped completely of woody vegetation. Joseph Rock, the Viennese-born botanist, ethnologist, and linguist, made his home in Lijiang for some thirty years. Between 1924 and 1927, he collected hundreds of herbarium specimens for the Arnold Arboretum and sent back seed of many new plants for its living collections.⁵

For more than an hour the road followed the Yangtze River (Jinsha Jiang), a broad, muddy expanse. The weather was warm, but clouds prevented us from seeing Yulongxue Shan (Snow Mountain), at 18,467 feet (5,596 m) the highest in Yunnan. Growing on the roadside were species of *Philadelphus* (mock orange), *Sambucus* (elderberry), *Pyracantha*, *Indigofera* (indigo), juniper, and an evergreen oak with a dense covering of yellow-brown hairs on the underside of the leaves. By the time we reached Zhongdian early in the evening, we had gone from an elevation of 7,000 feet (2,100 m) in Dali, to about 10,500 feet (3,200 m).

Zhongdian, close to the Tibetan border, was the first town in which we saw a sizable population of Tibetans. Some of the shops had Tibetan goods for sale, such as silver bracelets, coral and turquoise necklaces, daggers, and clothing. The architecture of the town, however, was typical Han Chinese white tile buildings. Alongside the modern food shops, banks, restaurants, hotels, and CD and DVD shops, pigs ran in the muddy streets and vendors in open-air markets offered housewares, horse blankets and saddles, fresh yak meat, live chickens and fish, vegetables, brooms, baskets, pots and pans. One vendor had



Rheum nobile, a type of rhubarb (also seen in closeup at right), and several species of *Primula* grow near Tiensi Lake in northern Yunnan.

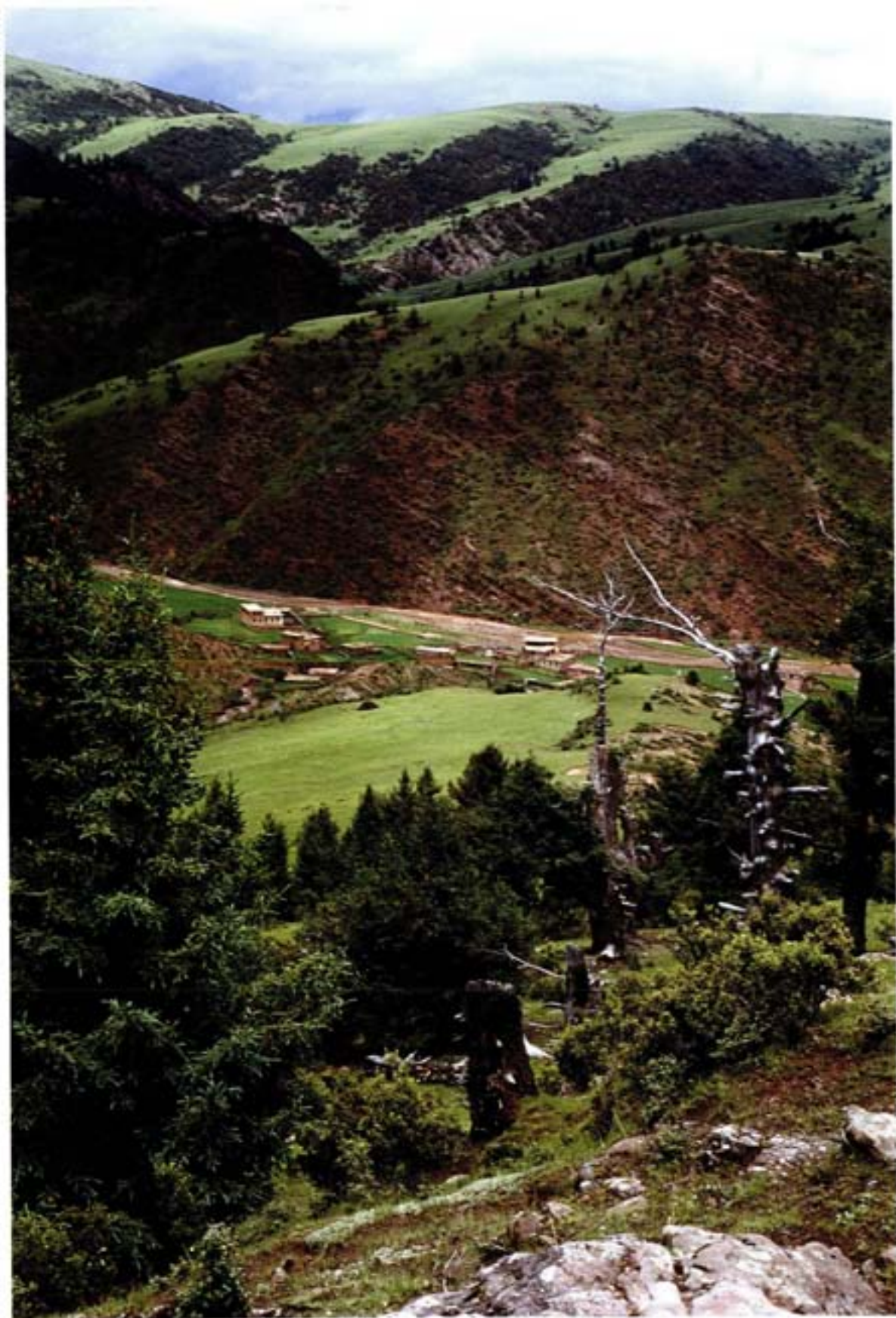
stacks of fresh yak butter, which I had tasted that morning in a bowl of tea. In the outlying areas, we saw the first signs of Tibetan architecture, square, two-story stucco structures, painted white but with colorful decorations around the doorways and windows. Buddhist prayer flags flew from the rooftops.

We spent two days in Zhongdian, waiting for Yang Zhen to arrive with our passports and the permits needed to cross the provincial border into Tibet. We spent the time exploring the vegetation in the mountains outside Zhongdian. Lake Tiensi, at 13,500 feet (4,100 m), is a beautiful alpine lake about two hours from Zhongdian. Growing there among grazing yaks, we found *Rhododendron wardii*, a tall rhododendron with pale yellow flowers named for British botanist Frank Kingdon-Ward. Between 1909 and 1957, Kingdon-Ward introduced hundreds of new species into cultivation (rhododendrons, primroses, gentians, the Himalayan blue poppy) from here and other parts of western China and from upper Burma and French Indochina. We also found the distinctive *Rheum nobile*, a rhubarb with large, pale yellow bracts; purple and yellow species of *Primula*; and a yellow *Mecanopsis*, the Himalayan poppy. Two curious Tibetan boys, perhaps nine or ten years old, appeared seemingly out of nowhere. Although initially quite shy, they followed us at a distance and eventually helped our mycologist find several interesting fungi.

Our second day in the Zhongdian area was spent in drizzling rain at Shudu Hu, another alpine lake, this one surrounded by heavily grazed meadows with patches of cut-over spruce forests. Scattered in the meadows were primroses, asters, gentians, and *Stellera chamaejasme*, a member of the thyme family whose corolla color varies from yellow to pink across its geographic range and even in single populations.

From Zhongdian we drove toward Deqen, closer to the Tibetan border. In the early afternoon we reached a 14,000-foot (4,250-m) pass where for the first time we saw Tibetan nomad tents woven of black yak hair, with large branches of juniper propped against the doors for insulation. A few specimens of *Pinus armandii*, almost 60 feet (18 m) high, with bright green, pendulous cones, were growing there along with a few specimens of *P. yunnanensis* and *P. densata*, but most of the woody vegetation had been cut for fuel or lumber. (There is a nice 65-foot [20-m] specimen of *P. armandii* on Peters Hill that was grown from seed collected in 1909 by William Purdom in Shaanxi Province, to the northeast of the Hengduan Mountains.)

On July 11 we finally crossed into the province of Xizang (Tibet), descending from almost 11,000 feet (3,265 m) in Deqen to 7,000 feet (2,100 m) on the banks of the upper Mekong River. The landscape here was dry and sparsely covered with scrubby vegetation, with a few



low, cut-over shrubs and many herbaceous plants growing along the road. Following the road up from the Mekong, we came to the village of Yenjung where we had lunch in a low, dark, wooden dwelling (complete with satellite dish on the roof), with almost unbearable smoke flowing from the cooking area.

Within fifteen minutes of leaving town, we climbed another 1,000 feet (300 m) and soon began seeing mixed broadleaf deciduous and conifer forests of *Salix*, *Abies*, *Populus*, *Cornus*, and *Quercus*, along with many herbaceous alpine plants growing by the roadside. After two hours we reached yet another 14,000-foot (4,250-m) pass, Hong La, and began the descent to the town of Markam. The fifty-four-mile journey from our lunch spot had taken more than three-and-a-half hours over rough, narrow roads that required our drivers to negotiate numerous hairpin turns and the remains of recent landslides overlooking precipitous drops of more than 1,000 feet (300 m).

Markam, lying in a long, wide valley created by a tributary of the Mekong, is truly a Tibetan outpost, a primitive, extremely poor town with red mud everywhere and a wild west look to it.

It seemed strange amidst the squalor to hear chants emanating from the walls of a Buddhist temple. While most Tibetan men wore traditional long, fur-lined coats with one sleeve hanging off the shoulder, a few wore Chicago Bulls jackets. The women, in traditional dresses called *chhubas*, stared at us as we walked down the street. A large group of local people followed us to our Chinese guesthouse. It was a bit unnerving to have five or six of them watching from the doorway, long silver daggers hanging from their belts, as we pressed plants and entered data into our laptop computer. Another guesthouse—a government-sponsored temple-restoration project—and the early-morning radio news that blared out from speakers on tall poles were the only signs of non-Tibetan



Dave Boufford bargaining with Tibetan men in Markam.

influence. In fact, this would be the only town in which we saw vestiges of the Tibetan culture, albeit in shambles.

The following day we retraced the road to Hong La (Pass), south of Markam, and made ninety-six collections of vascular plants and mosses in a mixed broadleaf deciduous and conifer forest. Two government officials accompanied us, but they seemed quite uninterested in our work. For two more days we collected in different habitats around Markam. Heavily grazed meadows of grass and *Kobresia*, a type of alpine carex, were dotted with scrubby rhododendrons and remnants of spruce and juniper forests. Many genera were very familiar to Western eyes: *Gentiana*, *Ligularia*, *Lonicera*, *Berberis*, *Carex*, *Clematis*, *Rubus*, *Anemone*,

A small Tibetan village in a valley near Markam.



Flowers of *Clematis* climbing on shrubs at a forest's edge near Nyingchi in southeastern Tibet.

Trollius, *Potentilla*, *Pedicularis*, *Picea*, *Campanula*, *Cerastium*, *Polygonum*.

Three days and fifty-some collections later, we headed northwest, climbing another pass above the Mekong River. Apricots were ripening above 12,000 feet (3,665 m), as well as dark blue *Delphinium*, tall *Thalictrum*, and several ferns. The landscape was vast, and although a few scattered pine, spruce, and juniper remained, there was much evidence of clear cutting. Our sense of the strangeness of this land was intensified by the sight of three monks on the road in long, heavy carmine robes, making their pilgrimage to Lhasa, some 400 miles (250 km) away.

It was at Dongda La, south of Zogong, that we hiked to 17,500 feet (5,300 m) to collect alpine perennials from the scree slopes. In the level areas of the glacial cirques, we collected two Himalayan poppies (one blue and one an intense yellow), a creeping willow, several species of rhododendron, and dozens of tiny herbaceous plants. The diversity in this barren landscape was amazing:



A species of *Meconopsis*, the Himalayan blue poppy, growing at 17,000 feet at Dongda La.

in the three days that we spent around the town of Zogong, we collected 57 flowering plants and over 140 mosses.

While we collected in the field, Wu Sugong drove to Changdu (Qamdo) to obtain permits for traveling west to Lhasa across the northern road of the Plateau. The local officials in Zogong had informed us that a major bridge had washed out west of the town of Bomi, so the southern route would be impossible to negotiate. On July 19 the entire team set out for Changdu, a 45-mile (75-km) trip that would take six hours because of the now familiar delays caused by road construction, landslides, and generally rough roads.

Changdu, the second largest town in Tibet, lies on the banks of the muddy Mekong and was once a thriving population center. Its large monastery complex, dating to 1444, formerly housed more than 5,000 monks. Only a few hundred monks remain today, but the Chinese government is providing funds to restore their living quarters and the many temples of the lamasery. Elsewhere in the town, however, all traces of Tibetan culture are being destroyed to make room for more modern Chinese architecture and goods. Although Changdu lies on the main road from Sichuan and attracts many tourists from that province, its best hotel can offer hot running water for only one-and-one-half hours each night, and even that isn't guaranteed. Massive construction projects throughout the city often disrupt the basic services that Westerners take for granted.

Our group was able to spend only one day collecting along the Mekong River south of Changdu. The dry slopes and ravines harbor a xeric shrub vegetation dominated by herbs and grasses. Among the thirty-four species we collected were *Salweenia wardii*, an endemic member of the pea family, and *Tribulus terrestris* (devil's thorn), which grew for many years in California as a noxious weed that has only recently been eradicated.

Most of the expedition's fieldwork had been scheduled to take place around the southern townships of Bomi, Yigong, and Nyingchi. The news about bad road conditions west of Bomi now made a long stay there unfeasible if we were to arrive in Lhasa on schedule, but we were determined to spend at least a few days in the area.

The trip to Bomi from Changdu took ten days, but along the way we collected in a number of interesting habitats. On the outskirts of Banda, a tiny outpost consisting of two restaurants, a few shops, a primitive guesthouse, and a Chinese army base, we collected for two days. We spent the first day along a steep, gravelly mountain slope (15,700 feet; 4,760 m) and at the crest of a limestone ridge in a *Kobresia* meadow with *Potentilla*, *Sibiraea*, *Rhododendron*, and *Salix* shrubs interspersed with species of *Corydalis*, *Lonicera*, *Caragana*, *Spiraea*, *Paraquilegia*, *Lepisorus*, *Cryptogramma*, *Pedicularis*, and *Draba*. On the second day we ventured east of Banda to a dry ravine and slope just above the Mekong River. There we encountered a family of Tibetan children collecting firewood, and throughout the day we could hear them laughing, talking, and singing. The woody plants had all been cut by the local people, but a rich flora remained. Among the fifty taxa we collected that day were *Gentiana*, *Geranium*, ten species of *Pedicularis*, *Ranunculus*, *Stipa*, *Rheum*, *Allium*, *Artemisia*, *Silene*, and *Astragalus*.

On July 24 we began our serious push west to Bomi. Our caravan and the other vehicles traveling along this road were forced to negotiate around numerous landslides and road construction projects. Indeed, the sixty-mile journey to the town of Baxio took almost ten hours. Having crossed several more mountain passes, we were now in the Salween River valley. The Salween is as muddy a river as the Yangtze or

the Mekong, but the land around it is as dry as any desert, and the vegetation is sparse.

In the small village of Rawu we saw evidence that deforestation was occurring to the west. Large trucks were unloading logs up to three feet (one m) in diameter in the local lumberyard. Our accommodations in Rawu were in the military compound, where we took our meals with members of the Chinese army and watched them perform their early morning drills. We spent four and a half days in and around this beautiful valley: on the moist, open slopes along Rawu Lake; in alpine meadows; on grazed slopes dotted with *Juniperus*, *Rhododendron*, *Salix*, *Sorbus*, and *Potentilla glabra*; on a boulder-strewn mountain slope along the Palongzang River; and in a broad, gravelly floodplain dominated by small specimens of *Hippophæe*. (This genus, a member of *Elaeagnaceae*, contains three species. The Arboretum has made several attempts to grow *H. rhamnoides* (sea buckthorn) and *H. salicifolia*, but conditions in the Boston area do not appear to be ideal for these taxa.) One particularly cold, miserable day, we were invited into the tent of a Tibetan family to sit by an open fire and drink fresh, hot yak milk and eat tsampa, a mixture of ground, roasted barley and warm yak milk. We watched with fascination as the family made fresh yak cheese and accepted their gracious offer to share it with us.

The region around Bomi, which we finally reached on July 30, supports mixed semi-humid broadleaf forests of deciduous species such as



Two species of gentian, both growing in thin mountain soils. The blue flowers, in photo at right, are scarcely larger than one centimeter across.



A hospitable Tibetan family boiling fresh yak milk inside their tent.

Betula, *Alnus*, and *Sorbus*. Conifer forests at higher elevations are dominated by *Abies*, *Tsuga*, and *Pinus densata*. Other familiar taxa we saw included *Rosa*, *Populus*, *Lonicera*, *Ribes*, *Rubus*, *Primula*, *Gentiana*, *Rhododendron*, *Cornus*, *Potentilla*, *Sambucus*, *Viburnum*, *Berberis*, *Rhus*, *Elaeagnus*, *Quercus*, *Philadelphus*, *Clematis*, *Prunus*, and *Daphne*. One nice surprise was finding *Lindera obtusiloba* growing wild. (A 100-year-old specimen of this species, grown from seed collected in 1892 in Japan by Charles Sargent, stands across from the lilacs in the Arboretum.) Unfortunately, an unwelcoming attitude on the part of local officials forced us to cut short our time in Bomi; nevertheless, we collected about 125 taxa in the course of our three days there.



Fruit of a *Viburnum* growing at the edge of a forest near Bomi.

On August 4, we retraced our steps toward Banda and then headed north again to Changdu, where we remained for two days while Wu Sugong again met with local officials and made plans for the difficult road ahead. The five-day, 750-mile (465-km) journey from Changdu to Lhasa featured several of the by-now-all-too-familiar hazards of bad roads and washed-out bridges. Twice (once in the dark) we were forced to ford rivers so deep that the water poured over the hood of the vehicles and then rose up through the floorboards. After one night in Lhasa we headed southeast, back toward the Bomi region, to spend four final days in the field.

The more than 6,700 specimens (18,883 sheets) collected over the course of this three-year NSF project will no doubt help to define more precisely this critical biodiversity hotspot. All of the collection and locality data, as well as the images from these trips and others in the region, are linked to a geographic information system (GIS) and are available over the worldwide web (<http://maen.huh.harvard.edu:8080/china>). Specimens collected earlier in the region and now housed in the Harvard University Herbaria will be entered into a database and linked to the website in the near future. By providing training and computer equipment for American and Chinese students and professionals, the project laid the foundation for future long-term research projects on China's biodiversity. In addition, the research may have paved the way for conservation efforts and for detailed analyses of biogeographic patterns and processes of diversifica-



Fruit on stump sprouts of a *Sorbus* species growing on grazed slopes near Rawan



The author collecting in a meadow outside Markam.

tion in the region. Conservation International (<http://www.conservation.org/xp/CIWEB/home>), an organization that is currently working closely with Chinese botanists and government officials in western Sichuan to prioritize areas for conservation, has sought the expertise of Dr. Boufford, who has over twenty years of field experience in China.

Now, after a year's work, we have finished sorting these specimens and dividing them into sets for distribution to over a dozen other botanical institutions. The hardships of the trip are long forgotten, and the magic and richness of this remote, exotic land once known as Shangri-La beckons again. Who knows what other botanical treasures are still to be discovered on the rooftop of the world?

Notes

¹ N. Meyers, 1988, Threatened biotas: 'Hot spots' in tropical forests, *Environmentalist* 8: 187-208;

E. O. Wilson, 1992, *The Diversity of Life*, Harvard University Press (Cambridge).

² From D. J. Mabberley, 1987, *The Plant Book*, Cambridge University Press.

³ P. H. Raven and D. I. Axelrod, 1978, Origin and relationships of the California flora, *University of California Publications in Botany* 72.

⁴ W. T. Wang, S. G. Wu, K. Y. Lang, P. Q. Li, F. T. Pu, and S. K. Chen, eds., *Vascular Plants of the Hengduan Mountains*, 1993, Vol. 1, Pteridophyta, Gymnospermae, Dicotyledoneae (Saururaceae to Cornaceae); 1994, Vol. 2, Dicotyledoneae (Diapensiaceae to Asteraceae) to Monocotyledoneae (Typhaceae to Orchidaceae).

⁵ S. B. Sutton, 1974, *In China's Border Provinces the Turbulent Career of Joseph Rock*, Hastings House, (New York).

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