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Metasequoia:
Back from the Brink?
An Update

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The Arnold Arboretum: A Botanical Bridge between the United States and China from 1915 through 1948

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Abstract

This paper examines the role played by the Arnold Arboretum of Harvard University in training the first generation of modern Chinese botanists and supporting them to do field work and develop herbarium collections in China. It highlights the scientific career of H. H. Hu, who received his doctorate from Harvard University in 1925 and was strongly influenced by Arnold Arboretum staff members, including C. S. Sargent, Alfred Rehder, J. G. Jack and E. D. Merrill. The paper discusses the role of the Arnold Arboretum in the initial, worldwide distribution of *Metasequoia glyptostroboides* seed in 1948, and features photographs and measurements of notable specimens growing at the Arboretum today.

Keywords

Metasequoia glyptostroboides, Bussey Institution, W.Y. Chun, H.H. Hu, W.C. Cheng, C.S. Sargent, J.G. Jack, E. D. Merrill.

Introduction

The Arnold Arboretum of Harvard University, established in 1872, is justifiably famous for its contributions to the scientific study of trees, including aspects of their taxonomy, ecology and biogeography. The Arboretum's first director, Professor Charles Sprague Sargent (1841–1927) initially established the institution's reputation through his work with the native trees of North America, and later expanded it with an extensive research program on the woody plants of temperate Asia. Building on the studies of Harvard botanist Asa Gray (1810–1888), Sargent was interested in the evolutionary relationship of the flora of eastern Asia to that of eastern North America, and the potential for the cultivation of Asian plants in Boston. Sargent himself traveled to Japan in 1892 to study the vegetation and to

collect seeds and cuttings of ornamental species for the Arboretum (Hay 1995).

The Arboretum's commitment to studying the flora of Asia advanced dramatically in 1905 when Sargent hired Ernest Henry Wilson (1876–1930) to explore central China on behalf of the Arboretum. Wilson went on two long expeditions for the Arboretum, between 1907 and 1910, and collected herbarium specimens as well as seeds from numerous plants, many new to science (Sargent 1913–1917). The work of identifying Wilson's collections generally fell to Alfred Rehder (1863–1949) who served as the Arboretum's taxonomist for 50 years, from 1899 through 1949 (Spongberg 1990).

These three men, Sargent, Wilson and Rehder, formed what has often been referred to as the three pillars of the Arboretum (Figure 1). By rights, however, they should be joined by a



Figure 1. Alfred Rehder, E. H. Wilson and C. S. Sargent in 1916 (*left to right*). Together they formed the three pillars of the Arnold Arboretum. From the Archives of the Arnold Arboretum, Harvard University.

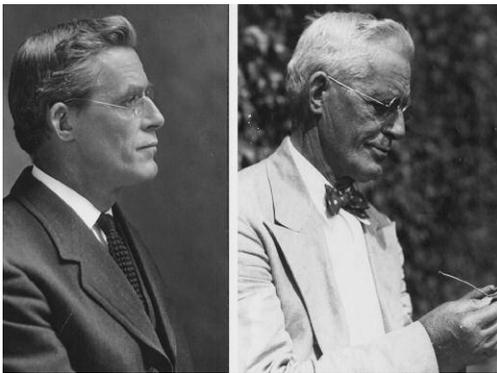


Figure 2. Professor John G. Jack in 1903 (*left*) and 1933 (*right*). He worked at the Arboretum for close to 50 years. From the Archives of the Arnold Arboretum, Harvard University.



Figure 3. Woon-Young Chun as a young man (age 22) in 1912. From the Archives of the Arnold Arboretum, Harvard University.

fourth pillar, Professor John George Jack (1861–1949), who worked at the Arboretum from 1886 through 1935. Jack performed a wide variety of tasks during his almost 50 years at the Arboretum, including checking the identification and supervising the health of its collections, leading walks of the grounds for the general public, and teaching classes to a wide variety of students from Harvard as well as other educational institutions (Figure 2). Jack was unusual in that he had a combined knowledge of the practical as well as the theoretical aspects of tree growth and cultivation. He was also interested in Asian plants and cultures and financed his own trip to Japan, China and Korea in 1905 to collect seeds of both wild and cultivated species for the Arboretum's collections (Sax 1949).

The First Chinese Students

In addition to his primary job with the collections of the Arnold Arboretum, Jack also taught courses in forestry at the Bussey Institution for Research in Applied Biology, which was part of Harvard University's biology program and located adjacent to the Arboretum in Boston. This famous graduate school, which was in operation from 1908 through 1939, was best known for its research in the emerging fields of plant and animal genetics. Among the graduate students who attended the Bussey Institution between 1915 and 1925 were four of the five founders of modern botany in China (Li 1944; Hass 1988).

The first of these Bussey Institution students was Woon-Young Chun (Chen Huanyong, 1890–1971), who arrived in Boston in 1915 to study dendrology (Figure 3). During his four years at the Bussey, Chun took four courses from Jack, who became his friend, mentor and confidant (Figure 4). On his graduation in 1919, Chun was awarded a Sheldon Traveling Fellowship and Sargent encouraged him to collect plants on Hainan Island off the south coast of China. In 1920, Chun began his teaching career at National Southeastern University in Nanjing, and in 1922 he published *Chinese Economic Trees*, the first botanical book in English written by a Chinese botanist (Li 1944; Hass 1988).

The three other Chinese botanists who attended the Bussey Institution were Sung-Shu Chien (Qian Songshu, 1883–1965), who en-

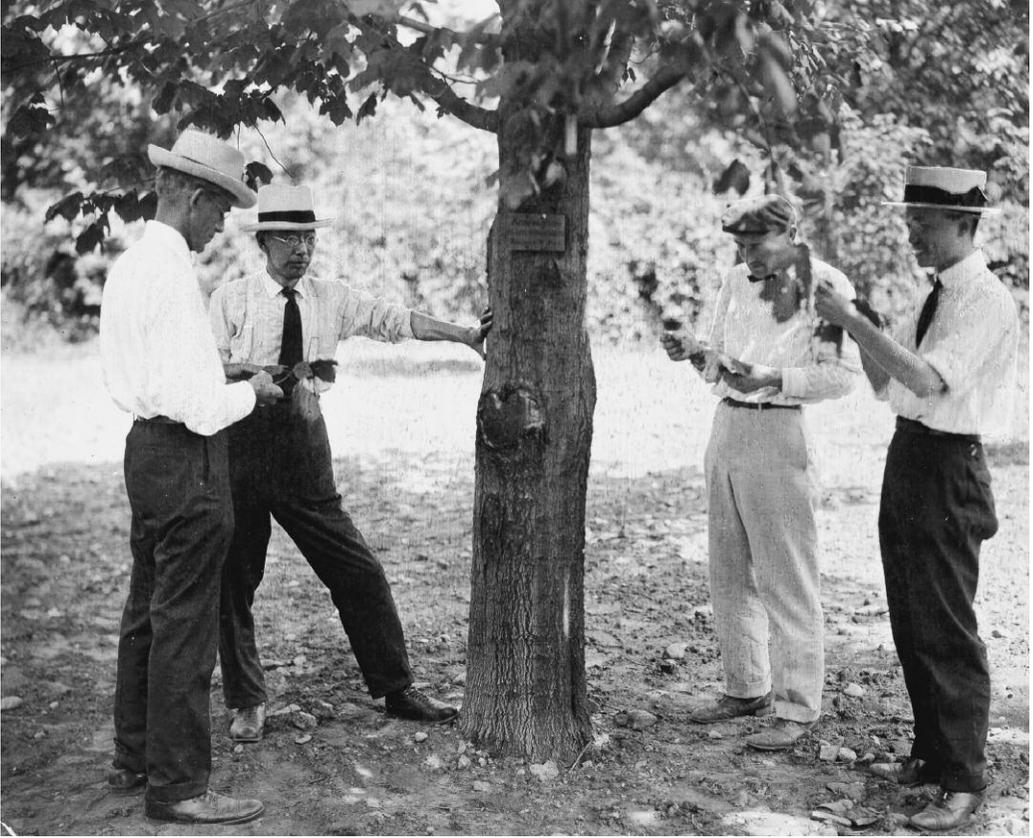


Figure 4. J. G. Jack (*at left*) with three of the Chinese students at the Arnold Arboretum in the summer of 1917. Woon-Young Chun is on the right. From the Archives of the Arnold Arboretum, Harvard University.

rolled at the Bussey in 1915 but returned to China in 1916, Hsin-Hsuan Chung (Zhong Xinxuan, 1893–1961), who enrolled in 1916 and graduated in 1920, and Hsen-Hsu Hu (Hu Xian-shu, 1894–1968) who entered in the fall of 1923 and graduated in 1925 with a Doctor of Science degree (Figure 5) (Hass 1988; Ma and Barringer 2005). Hu had earned his undergraduate degree from the University of California, Berkeley, in 1916 and returned to China to teach at National Southeastern University in Nanjing. It was here that he met Chun, who encouraged him to attend Harvard for an advanced degree. Following in Chun's footsteps, Hu took four forestry courses from Jack and became his good friend and confidant. Indeed, the two men maintained their relationship throughout the 1930s through an exchange of letters that discussed a wide range of topics, from current events and politics to taxonomy and philosophy.

Students Return to China

On his graduation from the Bussey Institution, Hu returned to China in 1925 to teach at National Southeastern University in Nanjing and immediately began collaborating with Chun on an ambitious project to publish a multivolume work with illustrations and descriptions of Chinese plants. Between 1927 and 1937, the two men published five volumes of *Icones Plantarum Sinicarum*. In 1928, Hu co-founded the Fan Memorial Institute of Biology in Beijing with C. Ping (1886–1965), and served as the first head of the Botany Department. In 1932, Hu replaced Ping as director and held the position through 1949. Despite political upheavals and limited financial resources, Hu was able to build up the Institute's herbarium and library into the largest in China. After the Chinese Communist Revolution, the Botany Department of the Fan Memor-

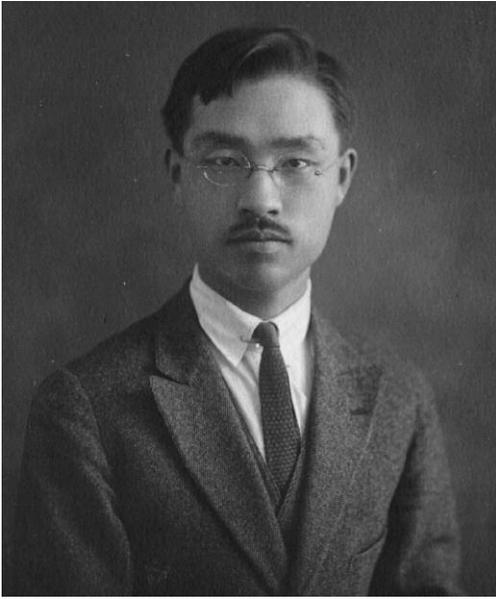


Figure 5. Hsen-Hsu Hu's Harvard University portrait, taken in 1925 at the age of 31. From the Archives of the Arnold Arboretum, Harvard University.



Figure 6. A rare photograph of the Lushan Botanical Garden (*top*), taken by Ren-Chang Ching in 1935. From the Archives of the Arnold Arboretum, Harvard University. Below, more or less the same view photographed in 2004 by Peter Del Tredici.

ial Institute was reorganized into what is today's Institute of Botany at the Chinese Academy of Sciences in Beijing (Li 1944; Ma and Barringer 2005).

In 1934, Hu co-founded, together with R. C. Ching (Ching Ren-Chang, 1898–1986) and F. H. Chen (Chen Feng-Hwai, 1900–1993), China's first botanical garden, the Lushan Arboretum and Botanical Garden in Jiangxi Province (Figure 6). A letter that Hu wrote to Jack on 6 August 1935 (Arnold Arboretum Archives) makes it clear that he learned valuable lessons at the Arnold Arboretum that were useful to him in establishing China's first botanical garden:

Concerning my work I have some news to tell you. The Lushan Arboretum and Botanical Garden progresses admirably. Mr. R. C. Ching, the Keeper, has succeeded to send out the seed list last winter including quite a number of rare seeds, including seeds of a new species of *Rehderodendron* [Styracaceae], which I shall soon publish. This is surely a feat, since the garden was inaugurated last August. Now by collection and exchange we have already procured 3,800 kinds of seeds. The garden has been donated with two greenhouses, one by Gen. Chen Cheng, one of Gen. Chiang Kai-shek's right-hand men. One of our trustees promised to donate a library building costing at least \$10,000. I am now trying to start a foundation fund of \$500,000 for the garden, although I don't know whether my dream can materialize or not. But we are soliciting the help from the president down.

The *Metasequoia* Connection

As important as Hu was in establishing modern plant taxonomy in China, he is best known in the West for the role he played in identifying *Metasequoia glyptostroboides* Hu & Cheng, the dawn redwood, and facilitating its distribution throughout the world. In the latter endeavor, Hu collaborated closely with his friend and colleague Dr. Elmer Drew Merrill (1876–1956), who served as director of the Arnold Arboretum from 1935 through 1946 (Figure 7). Before coming to the Arnold, Merrill had worked as a botanist in the Philippines for the US Department of Agriculture from 1902 through 1924. Merrill was keenly interested in Asian plants and used his financial resources to establish cooperative agreements with many Chinese botanists—including both Hu and Chun—to support field work and to assist them in the establishment of herbaria, es-

Table 1. Dimensions of the surviving *Metasequoia glyptostroboides* raised from seed lot 524-48, measured in August 2005. *Abbreviations:* DBH, diameter at breast height; SD, standard deviation.

Accession number	Height (m)	DBH (cm)	Site conditions
524-48-DD	29.5	118	Wetland, full sun
524-48-P	28.5	75	Upland slope, part sun
524-48-D	28.2	46	Stream edge, part sun
524-48-AA	24.5	133	Wetland edge, full sun
524-48-A	24.2	39	Upland slope, part sun
524-48-Z	22.6	138	Stream edge, full sun
524-48-L	20.8	82	Upland slope, full sun
524-48-LL	20.7	66	Standing water, full sun
524-48-FF	19.2	86	Standing water, full sun
524-48-JJ	16.6	79	Standing water, full sun
524-48-HH	16.5	57	Standing water, full sun
Average \pm SD	22.8 \pm 4.5	83.5 \pm 33.3	

pecially those at National Southeastern University in Nanjing and Lingnan University in Guangdong (Li 1944; Hay 1995).

On 22 April 1946, Hu wrote to his old friend and colleague Merrill about the discovery of a new conifer from Sichuan Province (Arnold Arboretum Archives). Hu himself had just learned of the tree's existence from an herbarium specimen that had been sent to him by Professor Wan-Chun Cheng (Zheng Wan-Jun, 1904–1983) of National Central University, then temporarily located in Chongqing. The specimen had actually been collected (but misidentified) in July 1943 by Chen Wang (Wang Zhan, 1910–2000) of the National Bureau of Forest Research in Chongqing (Ma 2003). The fact that Hu told Merrill about this new conifer within a week of learning about it himself—and before he had identified it—is indicative of his internationalist approach to science and the strength of his relationship with Merrill.

Hu's first paper identifying the tree as a living member of the fossil genus *Metasequoia* was submitted for publication on 18 May 1946—about a month after he first saw Wang's specimen—but the article did not come out until December (Hu 1946). Around this same time period, in late 1946, Hu sent two small packets of *Metasequoia* foliage and cones to Merrill, the first herbarium specimen of the tree to leave China (Merrill 1948; Ma 2003).

In May 1947, Cheng, who had moved back to Nanjing with the National Central University at the end of World War II, sent Merrill a complete herbarium specimen of *Metasequoia* that had been collected in early 1946 by his graduate student, Chi-Ju Hsueh (Xue Ji-Ru, 1921–1999) (Ma 2003). On receiving this second specimen, Mer-

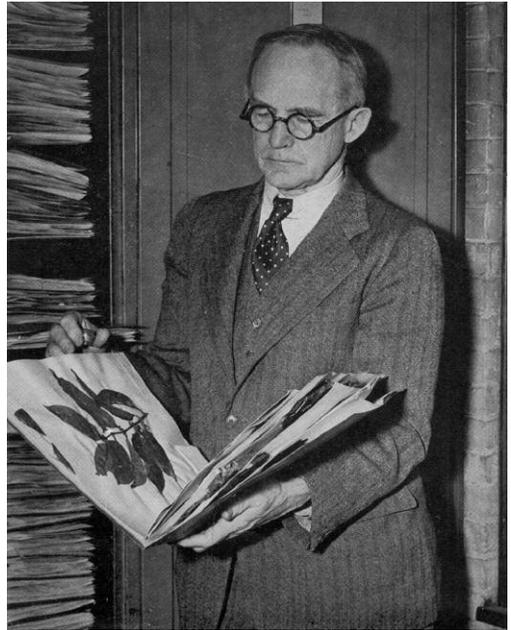


Figure 7. Elmer Drew Merrill working in the herbarium, circa 1940. From the Archives of the Arnold Arboretum, Harvard University.

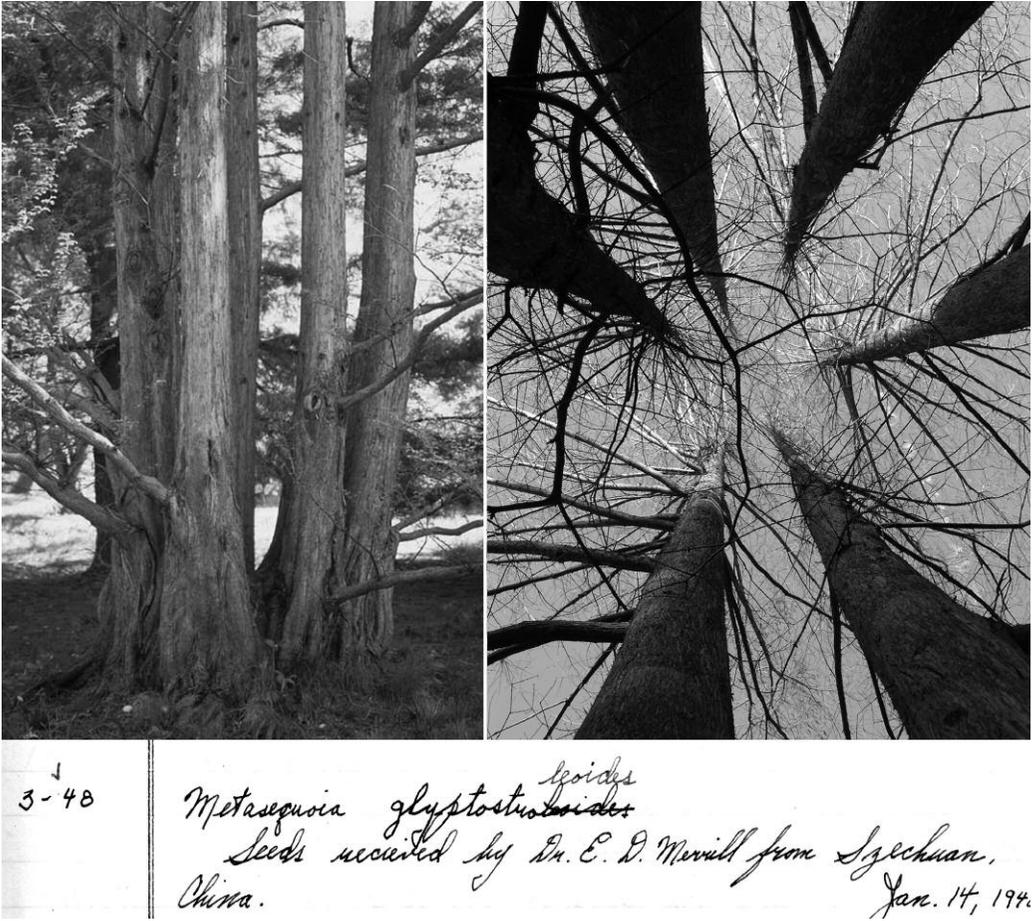


Figure 8. The Arnold Arboretum's unusual, multi-stemmed specimen of *Metasequoia* (3-48-A) is 27.6 m tall. Six co-dominant stems arising from a single root stock with diameters at breast height of 59, 55, 50, 44, 41 and 32 cm. No one knows for sure why this plant has developed its unusual growth form. Below is the original entry for this specimen from the Arboretum's accession book. Photographs by Peter Del Tredici.

rill "immediately became interested in the possibility of securing seeds of this extraordinary species and accordingly communicated with Dr. H. H. Hu" (Merrill 1948). Hu responded that he could supply Merrill with seeds and specimens of *Metasequoia* if the Arboretum could provide financial support for an expedition to the area where the tree was growing (Hu 1948).

Accordingly, in July 1947 Merrill, who was had resigned as director of the Arboretum a year earlier, arranged to have \$250 sent to Hu from "the Arnold Arboretum's restricted Chinese exploration fund provided by the late Harrison W. Smith of Tahiti, himself a graduate of Harvard in 1895 and long interested in matters Chinese" (Arnold Arboretum Archives). Because of the

extreme inflation in China at the time, Merrill estimated that 250 American dollars yielded the staggering equivalent of 9,750,000 Chinese yuan (Merrill 1948). The money was sufficient to send Cheng's assistant, Ching-Tsan Hwa (Hua Jing-Can, born 1921), to Sichuan Province and to support his field work from August through November 1947, which included collecting roughly 2 kg of *Metasequoia* seed and several herbarium specimens (Ma 2003).

On 24 December 1947, Cheng sent Merrill a small packet of the *Metasequoia* seed that Hwa had collected, which arrived in Boston on 5 January 1948. Merrill delivered the seed to the Arboretum on 14 January, where it was accessioned as number 3-48. Some of the seed was distrib-

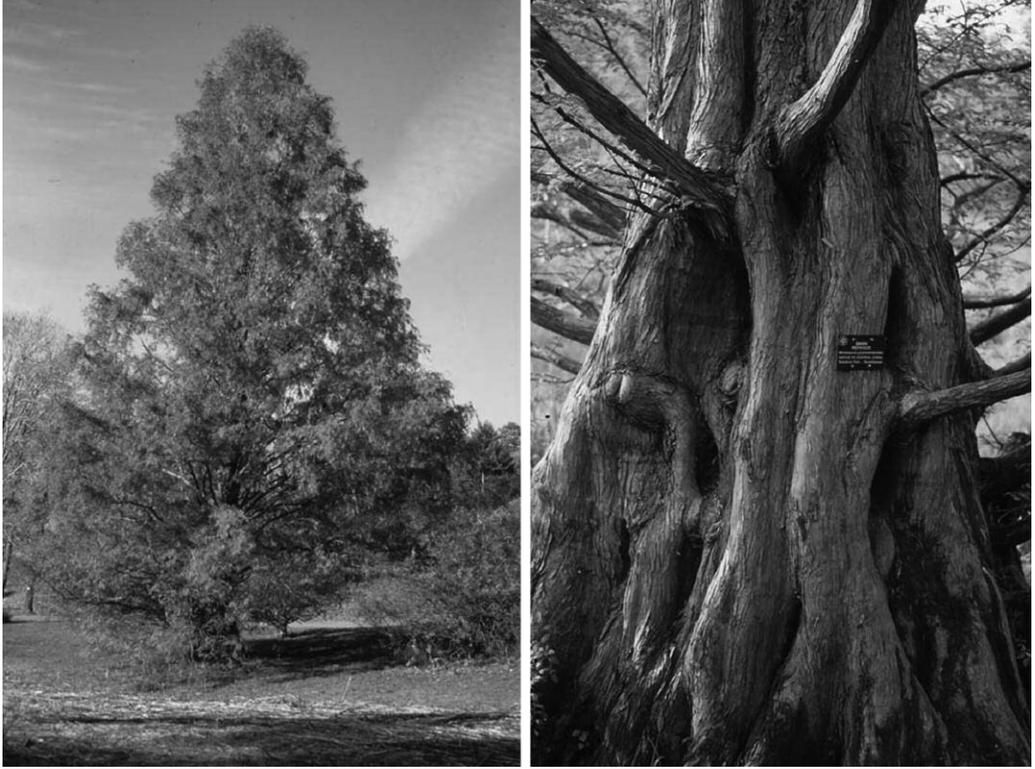


Figure 9. The specimen of *Metasequoia* (524-48-AA) growing near the main entrance of the Arnold Arboretum is 24.5 m tall with a diameter of 133 cm. Photographs by Peter Del Tredici.

uted to other institutions and some was sown in the “propagating house,” where it began to germinate “before the end of the month” (Merrill 1948). During March 1948, Merrill received four more shipments of *Metasequoia* seed, one from Hu and three from Cheng (seed lots 523-48, 524-48 and 525-48), totaling about a kilogram in weight (Ma 2003). In a letter to Cheng, written on 26 March 1948 (Arnold Arboretum Archives), Merrill gratefully acknowledged the receipt of the largest of the three packets: “I now have, thanks to you, all of the *Metasequoia* seeds that we need. You sent a package, I believe, through diplomatic agencies; a few days ago this large package was delivered to me here and contains some scores of thousands of seeds.”

Some of the *Metasequoia* seed was sown in the Arboretum greenhouses for propagation and research purposes, and some were repackaged and distributed to over 600 different individuals and institutions across the world (Spongberg 1990; Satoh 1999; Ma 2003). Dr. Shiu-Ying Hu (Hu Xiu-Ying, born 1910), a long-time Arbore-

tum staff member who had arrived in Boston from China in 1948 to become one of Merrill’s graduate students, was lucky enough to participate in this distribution. As she tells the story, during their first meeting Merrill told her that she should head over to the Arboretum in Jamaica Plain as soon as possible to lend a hand in sorting some seed that had recently arrived from China. He was referring, of course, to Cheng’s *Metasequoia* seed, which she, along with other Arboretum staff members, dutifully helped clean and put into small coin envelopes (Spongberg 1990).

***Metasequoia* Today**

In 1950, some 40 seedlings from seed lot 524-48 were planted on the grounds of the Arboretum in a variety of habitats with differing amounts of available moisture and sunlight. In 1953, one plant from seed lot 3-48 was also planted. As of January 2007, the one plant from seed lot 3-48 is still alive and has developed an unusual multi-

stemmed growth form (Figure 8). Of the 40 plants from seed lot 524-48, 11 (27.5%) are still alive 57 years after being planted on the grounds (Table 1). Arboretum records indicate that the mortality rate of the original 40 trees was rapid at first, but slowed with age: 2 trees were dead by 1951, 12 by 1954, 20 by 1962, 23 by 1981, 25 by 1986 and 29 of 40 were dead by 1994 (Figure 9).

The Arboretum's *Metasequoia* produced their first female (ovulate) cones in 1965, but because of the lack of production of male (microsporangiate) cones these did not contain viable seed (Wyman 1968). Indeed, it was not until 1980 that the Arboretum's dawn redwoods began producing male cones, with the production of viable seed a year later (Del Tredici, pers. obs.).

Conclusions

The *Metasequoia* story teaches two lessons: first is the important role that personal relationships play in building successful, long-term collaborations; second is the importance of teamwork in making scientific breakthroughs. The discovery and distribution of *Metasequoia* were the result of a group effort by Chinese botanists that took nearly five years to complete and required overcoming all manner of physical, cultural and political barriers. The tree we celebrate today is a living testament to their dedication.

Acknowledgments

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