

Metasequoia, Another "Living Fossil"

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For a modern-day equivalent of the *Shortia* story, we have the case of the dawn redwood. The tale of its discovery is here told by Elmer D. Merrill, who was director of the Arnold Arboretum from 1935 to 1946. He will always be remembered for arranging the first introduction and distribution of dawn redwood seeds from the wilds of Hubei Province, China.

Ginkgo biloba, a monotypic genus of very ancient lineage, in fact from the standpoint of geologic history, outside of the Cycadaceae, the most ancient of living trees, is often spoken of as a "living fossil." The sole species, once of very wide geographic distribution in the North Temperate Zone, can scarcely be distinguished from fossil forms of ancient Mesozoic times. This is a beautiful example of the persistence of selected life forms, in highly organized groups, through many millions of years. *Ginkgo* has persisted in cultivation in China, but there are a few places in that country where it is spontaneous in limited forested areas. Whether or not it is truly native in such places, or merely occurs as a descendant from planted trees, is not definitely known. It was introduced into Japan about A D 700, into Europe about 1730, and into the United States in 1784. Now another striking case develops, not quite as old geologically as is the *Ginkgo*, through a remarkable discovery originally made by Mr. T. Wang in 1945. *Metasequoia*, previously known only from paleobotanical records, is now shown to exist in the form of a single living species in a very limited area, and it, or its immediate ancestry, goes back to Mesozoic times. . . .

Mr. Wang's fragmentary specimens of 1945 were supplemented by additional material collected in the following year, originally three large trees representing this strange conifer having been located in northeastern Szechuan, very close to the Hupeh border. With the additional collections made in 1946, the discovery then developed into one of extraordinary interest in that the tree proved to be a living species of a genus, *Metasequoia*, which, up to that time, had been known only from paleobotanical records. Various species of North America and Asia originally ascribed to the genus *Sequoia* as fossil forms, proved not to belong in that genus, and in 1941 the new genus *Metasequoia* was proposed to accommodate these; and only four years after that genus was described, a living species was actually found in China. This, because of the ancient lineage of *Metasequoia*, and its former wide geographic distribution (various parts of North America, Japan, Saghalien, Manchuria), is a most extraordinary circumstance. The proposed paleobotanical species are *Metasequoia heerii* from North America, *M. japonica* and *M. disticha* from Japan, and *M. chinensis* from Manchuria and Saghalien. Assuming that all of these extinct species are actually congeneric, then, in former geologic times, *Metasequoia* was a genus of very wide



One of the *Metasequoia* seedlings raised from the original batch of seeds collected by C. J. Hsueh in China in 1947 (AA #528-48). The young girl is pointing to where the growth of the tree started in spring 1951. The photograph was taken in September 1951. From the Archives of the Arnold Arboretum.

geographic distribution, as was *Ginkgo*. The latter is represented by only a single living species and this apparently now persisting only because it was preserved in cultivation in China. And now this striking *Metasequoia* is found, confined to a relatively few individual trees scattered along small streams and on the slopes of northeastern Szechuan and the adjacent parts of Hupeh.

It is sufficiently extraordinary, only four years after *Metasequoia* was actually described from the fossil records, that a living species of the genus should be found in China; but what is perhaps even more extraordinary is that when found, this living species,

the sole surviving representative of a former widely distributed genus, was apparently not far from the verge of extinction as a living entity in its native habitat.

As noted above, the first observer located only three trees. A second expedition was sent out by Professor Wan-Chun Cheng of the National Central University, Nanking, in 1946, and Mr. C. J. Hsueh, his assistant, who led this expedition, brought the census up to about 25 trees. When botanical specimens were received at the Arnold Arboretum in the latter part of 1946, I immediately became interested in the possibility of securing seeds of this extraordinary species, and accordingly communicated with Dr. H. H. Hu, Director of the Fan Memorial Institute of Biology in Peiping, one of the joint authors concerned with the actual description of the species. Incidentally, Dr. H. H. Hu was trained at the Arnold Arboretum, receiving his Sc.D. degree from Harvard University in 1925. Dr. Hu responded favorably and accordingly a modest grant was made from the Arnold Arboretum 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. On the basis of this grant Professor Cheng organized a third expedition to the type locality, this also led by his assistant Mr. Hsueh. He flew from Nanking to Chungking on September 3, 1947, and arrived at Mou-tao-chi, 110 kilometers east of Wan-hsien, Szechuan, on September 11, where the type of the species was originally discovered. This is very close to the Hupeh border. He spent approximately three months prosecuting field work in this part of Szechuan and in adjacent parts of Hupeh. He reports somewhat more than one hundred large trees representing the species, occurring on slopes, along small streams, and near rice paddies (some of the trees planted) between the altitudes of 900 and 1300 meters scattered over an area of about 800 square kilometers. This is a region of considerable rainfall, with some ice and snow in the winter months. The center of its greatest abundance is in the Shui-



One of the original *Metasequoia* seedlings in all its glory at the Arnold Arboretum. Photographed in 1990 by Rącz and Debreczy

sa-pa valley in Hupeh Province, where there are at least 1000 of the trees, including the small ones; but there are no groves or forests made up of the species. In other places, such as Houng-pin-ying and Mou-tao-chi, there are only a very few trees. It is of interest to note that the valley where most of the trees are now found takes its name from that of the tree, the tree itself known as *shui-sa* (*shui* = water, *sa* = fir or spruce), the place of its greatest occurrence being Shui-sa-pa.

The largest tree which was measured was 35 meters high, its trunk 2.3 meters in diameter. While 1947 was reported as not being a good seed year, an ample supply of seeds was secured during the time that Mr. Hsueh was in the field. These were delivered in Nanking early in December; the first small sending reached Boston January 5, 1948, and

a second and larger shipment is now in transit. Seeds were planted in our propagating house early in January, and many of these germinated before the end of the month. Thus it is that in due time the Arnold Arboretum will have a certain number of living plants for distribution.

Following long established Arnold Arboretum practice, packets of seeds have been widely distributed to institutions in the United States and Europe. It is, of course, not known whether this remarkable species will prove to be hardy under the rather difficult climatic conditions characteristic of the Boston area. With excellent germination records it is now certain that we shall be able to establish this ancient but now nearly extinct type in various parts of the United States and elsewhere, for somewhere, with us, favorable climatic conditions will be found—if not in the northeast, then in the south or on the west coast. The point is emphasized that in spite of the present unfavorable economic conditions, in spite of adversities in China rendering travel difficult, and in spite of unfavorable exchange conditions, this cooperative project did succeed; that as a result an ample supply of seeds is available; that the seeds are viable; and, this being the case, the Arnold Arboretum has made an important contribution, working through its Chinese associates, in thus being involved in an attempt to preserve a remarkable conifer, and a species that in its native habitat is apparently not far from the verge of extinction. Incidentally, Professor Cheng who, with Dr. Hu, cooperated with us, writes that without the modest grant made by the Arnold Arboretum, it would have been impossible for his representative to make the trip to Szechuan and Hupeh in 1947, and comments on the fact that trees are being rapidly destroyed by cutting in this region as well as in various other parts of China. He specifically mentioned *Picea heterolepis* Rehder & Wilson, which was described in 1914 from collections made by E. H. Wilson for the Arnold Arboretum in western Szechuan in 1910, and a species now growing in our grounds. Not a

single tree can now be found in the type locality, nor have the Chinese botanists been able to locate the species anywhere since 1932. The actual grant made by the Arnold Arboretum to finance this trip to Szechuan in 1947 was only \$250 which, because of the extreme inflation, actually yielded \$9,750,000 in Chinese currency. This will give some idea of the current financial difficulties under which the Chinese botanists are carrying on their work.

This new "living fossil" is a large tree, attaining a height of at least 115 feet, with a trunk diameter of at least 7.5 feet. One of its striking characteristics is that, like the various species of *Larix* (larch) and *Pseudolarix* (golden larch), and our *Taxodium* (swamp cypress), its leaves are deciduous, the trees being leafless in the winter months. In general appearance the leafy branchlets suggest those of the genus *Glyptostrobus*. It is needless to repeat here the technical characters of this remarkable species, as these will be available when the formal description is published. All I have attempted to do has been to give the

highlights regarding this remarkable discovery, and to call attention to the fact that viable seeds of the species have been received, from which young plants are now being grown.

It has been argued in some quarters that we approach the condition of diminishing returns in the botanical exploration of China, a field that has long been one in which the Arnold Arboretum has specialized. This statement is doubtless true to a certain degree, but from what has appeared in extensive collections made within the past three decades, I am still of the opinion that a vast amount of field work is still called for and is still justified. This remarkable *Metasequoia* find bears out this belief. In spite of all that has been published on the enormously rich flora of China in the past century, and particularly within the past four or five decades, there are vast areas still remaining to be explored, and the already known flora will be very greatly increased, as to the number of actually known species, when the more recently assembled collections are studied in detail.