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How Metasequoia, The "Living Fossil" Was Discovered In China

By H. H. Hu, Director
Fan Memorial Institute of Biology
Peiping, China

CHINA has the richest temperate flora in the world. Since the mesozoic age a large portion of China has never been submerged by the transgressing sea; and during the glacial period, glaciation has been little developed in China; again there have been in China no insurmountable barriers, such as a large body of water like the Mediterranean sea or a great desert like the Sahara, which prevent plant migration back and forth during the glacial and interglacial periods.

All these factors contribute to the origin and survival in China of numerous interesting flowering plants, both gymnosperms and angiosperms, especially in the southwestern and upper Yangtze provinces, such as western Hupeh, Szechuan, Yunnan, Kweichow, Kwangsi and Kwangtung provinces. Among the interesting Chinese genera of trees, *Ginkgo* was the most famous and was first rightly called the "living fossil." But there are many other "living fossils" among Chinese trees, such as *Pseudolarix, Keteleeria, Amentotaxus, Glyptostrobus, Cunninghamia, Cephalotaxus,* and *Libocedrus,* among the gymnosperms and *Cericidiphyllum, Liriodendron, Petrophiloides* (*Platycarya*), *Sassafras, Nyssa,* and many others among the angiosperms, which have been discovered in fossil conditions in Europe or North America from very ancient geological times. Other genera of Chinese trees, such as *Taiwania* and *Fokienia* among the gymnosperms and *Rhoiptelea, Eucommia, Tetracentron, Euptelea, Trochodendron,* etc., among the angiosperms, may be discovered some day in fossil conditions also. Only the most striking relics are called "living fossils." Among these the latest and the most interesting is the *Metasequoia* discovered in 1941 in Wan Hsien of Szechuan province.

In the winter of 1941 Professor T. Kan of the Department of Forestry of the National Central University journeyed from Hupeh to Szechuan, and saw on the roadside at Mou-tao-chi in Wan Hsien a large deciduous tree which was called by the natives SHUI-SA or water fir. This attracted the attention of Professor Kan. Unfortunately no specimens were collected at that time as all the leaves had fallen off. Next year Professor Kan requested Mr. Lung-hsin Yang, the principal of the Agricultural High School, to collect herbarium specimens for him. But these were not identified. In the summer of 1944 Mr. T. Wang, a staff member of the Central Bureau of Forest Research, went to western Hupeh to explore the forests at Shen-lung-chia, and was asked by Mr. Lung-hsin Yang to go to western Hupeh by way of Wan Hsien and Enshi in order to investigate the SHUI-SA at Mou-tao-chi.

At Mou-tao-chi Mr. Wang collected herbarium specimens of leafy branches and fruits of this tree and thought it to be *Glyptostrobus pensilis* Koch, or SHUI-SUNG, the water pine, which is a common deciduous coniferous tree in Kwangtung province found also in Kiangsi. Mr. Chung-lung Wu, an assistant in the department of forestry of the National Central University, met Mr. Wang, who gave him a branchlet of the water fir with two cones. Mr. Wu presented these to Professor W. C. Cheng of the same department, who considered this tree not a *Glyptostrobus* but a new genus, on account of the opposite character of the peltate fruiting scales, which differ from those of *Glyptostrobus,* although the deciduous linear leaves are somewhat similar.

Professor Cheng then sent his assistant, Mr. C. Y. Hsieh, to go twice to Mou-tao-chi in February and May 1946 and these trips resulted in the collection of specimens of flowers and young fruits of this water fir, from which Professor Cheng understood the morphology of this tree more clearly. In the autumn of the same year Professor Cheng sent to me fragments of herbarium specimens Mr. Hsieh collected and asked my opinion about this new genus, which he thought to be closely allied to the American genera *Sequoia* and *Sequoiadendron,* the California coastal redwood and the famous big tree.

It happened that I had a reprint of a paper by a Japanese paleobotanist, Mr. S. Miki, instructor in Kyoto University, entitled "On the Change of Flora in Eastern Asia since Tertiary Period," in which he proposed the new generic name *Metasequoia,* based on two fossil species which were formerly known as *Sequoia disticha* Heer and *Sequoia japonica* Endo, both found from the pliocene beds near Tokyo. He found his new genus *Metasequoia* differing from the true *Sequoia* in the long stalk and in the opposite scales of the fruits. I had on hand also a paper by another Japanese paleobotanist, Professor S. Endo, entitled "A New Palaeogene Species of *Sequoia,*" in which he published a new species, *Sequoia chinensis* Endo, from eocene beds in Fushun coal mines in southern Manchuria and

Kawakami coal mines in southern Saghalien. This I found to be also a species of *Metasequoia*. Thus I published a paper in the Bulletin of the Geological Society of China, Vol. 26, 1946, entitled "Notes on a Palaeogene Species of *Metasequoia* in China," in which I transferred *Sequoia chinensis* Endo to the genus *Metasequoia* and announced the discovery of a living species of this remarkable tree in Wan Hsien of Szechuan province.

I then communicated with Professor Ralph W. Chaney of the Department of Paleontology of the University of California, who had not seen either Miki's or Endo's paper. On the basis of the descriptions I supplied to him, Professor Chaney found that *Sequoia macrolepis* Heer, *S. fastigiata* Sternberg, *S. concinna* Heer, *S. Langsdorfii* Heer, *S. Nordenskioldi* Heer, *S. Reichenbachii* Heer, and *S. Heerii* Lesquereux all belonged to this new genus *Metasequoia*. He considered the discovery of this living *Metasequoia* the most interesting in botany in a century.

After Mr. Hsieh made the collection of herbarium specimens Professor Cheng sent a specimen to Dr. E. D. Merrill for examination. I wrote to Dr. Merrill telling him my identification of this new tree to the fossil genus *Metasequoia* and requested him to send $250 to enable Mr. Hsieh to go to Szechuan to collect seeds. Dr. Merrill sent the money and Mr. Hsieh flew to Chunking in the autumn of 1947 and then went to Mou-tao-

One of the Garden's seedlings of the recently discovered "living fossil" tree in China, *Metasequoia glyptostrobioides*, a deciduous conifer.

chi where he collected large quantities of seeds, which Professor Cheng sent to Dr. Merrill, who distributed them to 76 institutions and persons interested in trees for propagation purposes. I also distributed these seeds to a few institutions and persons abroad, and many important institutions of botany and forestry in China have been given seeds also for propagation purposes.

Last winter Professor Chaney wrote to me expressing his wish to visit the *Metasequoia* region to make personal investigations. Early in February this year Professor Chaney flew to Nanking and with Mr. Hsieh both flew to Chunking, from where they journeyed to Mou-tao-chi and Shui-sa-pa in Lichuan Hsien of Hupeh province. In these bandit-infested regions they explored for three weeks and took photographs and wood-borings and collected herbarium specimens of plants associated with this tree. I met Professor Chaney in Nanking in the latter part of March. We discussed the phylogeny of *Metasequoia* and *Sequoia,* and the relationship between the families Metasequoiaceae, Taxodiaceae and Cupressaceae. At the same time we started the movement to establish a committee in the Chinese government for the conservation of *Metasequoia,* which is on the verge of extinction as there are found no more than 1,000 large and small trees of this living fossil in existence, and the peasants are still cutting the trees for interior finishing purposes. Now such a committee has been established, the ministries of interior, education and agriculture, the Academia Sinica, the National Central Museum and the Fan Memorial Institute of Biology all have representatives to participate in this work, looking forward to the establishment of a Metasequoia National Park in the type region. Professor Chaney was appointed a foreign member of this committee. Professors Merrill and Chaney have jointly made an appeal to subscribe money for this purpose.

METASEQUOIA, THE WORLD'S NEWEST "LIVING FOSSIL", IN ITS NATIVE HABITAT

(*On the opposite page*)

Upper left, one of the first of the trees to be discovered in China, near Mou-tao-chi, Szechuan, in February, when it was leafless. The two smaller trees on the bank in the foreground are also specimens of *Metasequoia. At the right,* the large Metasequoia of the accompanying picture in its summer dress. *Lower left,* three specimens of the newly discovered deciduous conifer at Shui-sa-pa, Hupeh. These are the three straight trees of varying height at the left of center, with figures standing at their left. Farther to the left are trees of *Cunninghamia.* At the right are chestnuts and bamboos. *Lower right,* the landlord of the property where the second lot of *Metasequoia* trees was discovered, stands beside the trunk of the largest tree in the picture at the left, with his children. The three larger photographs opposite are from Dr. Ralph W. Chaney, who visited the site of these famous trees last year. The small picture showing the *Metasequoia* in full leaf comes from the author, Dr. H. H. Hu.

METASEQUOIA, THE WORLD'S NEWEST "LIVING FOSSIL",
IN ITS NATIVE HABITAT

(*For explanation, see the opposite page*)

Mr. Hwa has journeyed extensively in Szechuan and Hupeh to search for all the trees of *Metasequoia* growing in these regions. *Metasequoia* was first discovered at Mou-tao-chi of Wan Hsien in Szechuan province. There are found three trees, the largest of which is 33 meters in height and 3.3 meters in diameter at the swelling buttress and 2 meters in diameter at breast height; the other two are small trees. These are all the *Metasequoia* trees found within the boundary of Szechuan province. In Chien-nan county of Lichuan Hsien of Hupeh province Mr. Hwa discovered another tree measuring 30 meters in height, 1 meter in diameter at breast height; another in Wang-cha-ying measuring 35 meters in height and 2.1 meters in diameter breast high. From Ta-pan-ying through Shui-sa-pa to Shio-ho, along valleys about 40 LI long, there are large and small trees, altogether about 1,000 individuals, among which the large ones there number about 100, the tallest measuring 30 meters in height. The natives frequently dig the wild young trees or make cuttings and plant them along the rice fields or streams or before their doors. North from Wan Hsien and south down to Shui-sa-pa, the *Metasequoia* region extends to an area about 800 square kilometers, with Shui-sa-pa as the distribution center. Altitudinally *Metasequoia* is distributed from 800 to 1,350 meters. Within this region there is plenty of rainfall and a large amount of humidity, cool in summer and with heavy snow in winter. Its ideal site for propagation is the highlands in central and eastern and southwestern China at an altitude of about 1,000 meters.

As Professor Chaney returned to Nanking, Mr. Hwa was left behind to make further exploration. He traveled extensively in western Hupeh. Though no further discovery of *Metasequoia* trees has been made, he discovered several large tracts of forests which have not been discovered before. He made extensive collections of herbarium specimens. Surely there will be new species of plants discovered. Latest interesting news from him is that at the border region between Lichuan and Enshi Hsiens he discovered about a dozen large trees of *Taiwania,* all about 40 meters high, a genus of coniferous trees consisting of two species, one discovered in Formosa, and the other in western Yunnan and Upper Burma. This one found in western Hupeh may present a new species or may be either of the two existing species, or may be an intermediate form which will unite these two into one species.

The discovery of a *Taiwania* in western Hupeh is interesting enough, as it represents an endemic genus of conifer in China which is at the same time the tallest and longest living conifer tree in China. *Metasequoia* is no more than 35 meters in height and about 600 years or a little more in age, while *Taiwania* attains a height of 60 meters. Mr. C. W. Wang of the Fan Memorial Institute of Biology has felled a large tree found beside the upper Salween in western Yunnan, and found it to be 1,700 years old. As *Metasequoia* has been now widely introduced in America and

Europe, this new *Taiwania* should be introduced also, as it will thrive in the same territory as the *Metasequoia,* and is an almost as interesting but more majestic and more beautiful tree. Its discovery and the discovery of *Metasequoia* prove that there are still botanical treasures to be found in China, even in quite extensively covered regions such as western Hupeh, an area long explored by Professor Augustine Henry, and Wan Hsien, a region repeatedly traversed by Dr. E. H. Wilson and many other European and American botanists.

Since Chinese botanists have taken active part in the botanical exploration and systematic studies of Chinese flora, numerous new discoveries have been made, such as the genera *Pseudotaxus, Nothotsuga, Smithiodendron, Sinojackia, Rehderodendron, Huodendron,* and *Zenia,* all interesting trees, both botanically and horticulturally. Crowning all is the *Metasequoia,* the probable ancestor of the American redwood and the big tree, the "living fossil" discovered in Central China, the most remarkable botanical discovery in the century.