

Zhan Wang (1911– 2000)

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Fig. 1. Zhan Wang's portrait (1979)

Metasequoia glyptostroboides (Chinese redwood, dawn redwood) is one of the world's best-known living fossil trees, but the world and its scientific community know little about the scientist who discovered this tree. Prof. Zhan Wang (also known in the literature as Wang Than, Wang Chan, Wang Chang, Wang Tsang)⁷ collected and studied the first specimen of *Metasequoia glyptostroboides* in 1944. Because of his more than sixty years of research and teaching experience in dendrology, forestry and ecology, Zhan has been widely regarded in China as a mentor in scientific research and professional education.

His friendly manner and earnest character deeply influenced many Chinese students, scientists and administrators and impressed occasional visitors from all over the world. His remarkable contribution to science is a legacy that will certainly remain with us forever. As his

students, we share with our colleagues in the botanical world our personal knowledge of Zhan's professional life.

Education

Zhan was born 4 May 1911 in a remote, forested village in Donggou County, Liaotung Province (currently part of Liaoning Province) in northeast China (Fig. 2). His given name was Yishi. Born to be a naturalist, Zhan had developed by his teenage years much knowledge about plant identification, primarily for the purposes of learning Chinese medicine. Zhan went to middle- and high school at Dandong City, the former Liaotung Province capital, where he chose forestry as his major. Throughout his lifetime, Zhan's interests in botany and forestry would never diminish.

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7. Zhan is his given name and Wang is his family name throughout this paper. Another reference used Wang.

Zhan graduated from high school in 1931. By then, the Japanese army had invaded northeast China, also known as Manchuria. To move away from Japanese-occupied territory, Zhan wanted to continue his higher education in Beijing (Peking). Accordingly, In 1932, he ran away from home, headed toward Beijing, where he changed his name to Zhan. After he graduated in 1936 from the Forestry Department of the Agriculture College in Beijing University (Peking University), Zhan became a Assistant Professor at the university.

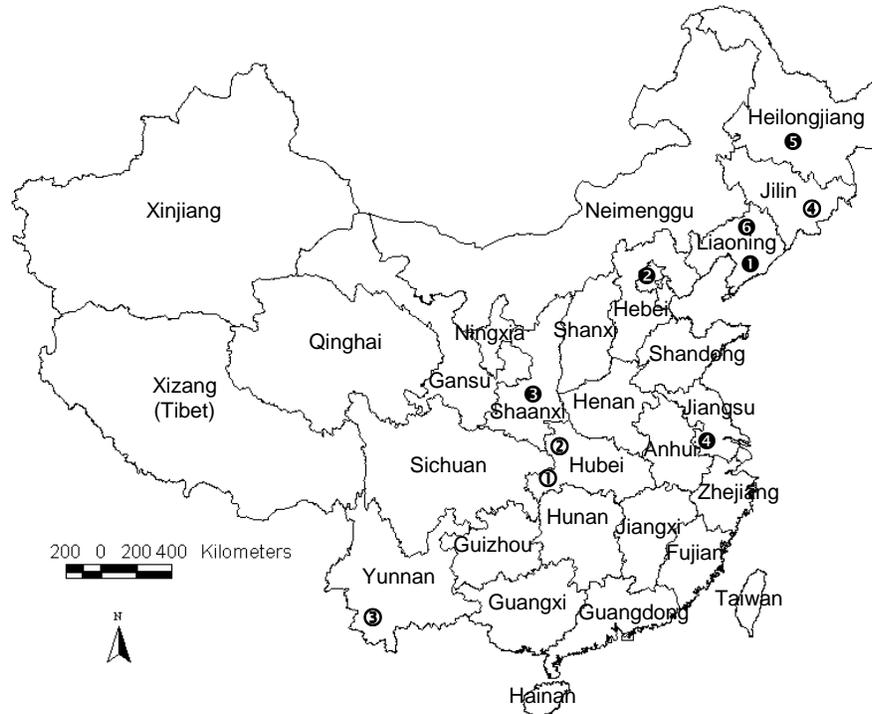


Fig. 2. Major locations where Zhan Wang resided or made significant expeditions.

- ① Dandong: Zhan Wang's early home (1911–1932);
- ② Beijing: higher education and Zhan's first job as Assistant Professor at Beijing University (1932–1938);
- ③ Xi'an: Lecturer at the Northwest Agriculture College (1938–1943);
- ④ Nanjing: Forestry Institute of the Agro-Forestry Ministry (1943–1946 and 1947–1949);
- ⑤ Harbin: Associate Professor at the Agriculture College, Northeast University (1946–1947), and an Associate Professor at the Northeast Forestry College (1949–1953);
- ⑥ Shenyang: Professor, Department Director, Vice Director, Institute of Forestry and Pedology (renamed the Institute of Applied Ecology in 1987);
- ⑦ Modaoxi, Zhan collected the first specimen of *Metasequoia* (1944);
- ⑧ Shennongjia, 1944;
- ⑨ Xishuangbanna, 1945;
- ⑩ Changbai Mountain (Changbaishan in Chinese), 1953–2000.

Early Career

In 1937, government agencies and educational institutions in Beijing and Nanjing started to evacuate to escape air bombing. Late in 1938, Zhan moved with the university's Agriculture College, then called the Northwest Agricultural College, to Shaanxi Province. During this period, Zhan began his long educational development as a professor of

dendrology and forestry. He preferred teaching dendrology outdoors—"the real classroom", in his words. He emphasised hands-on experiences in observing "looks" (morphological characters) and "behaviour" (ecological characters) of plant species. To promote learning in students, he nicknamed some species "mountain climbers" (cool-temperature-resistant), "greedy boys" (nutrient-loving), "thirsty guys" (water-demanding) and "desert fighters" (drought-adapted). He told stories about the species. Looking, touching, smelling and chewing were frequent practices in his dendrology classes. At the end of the course, students realized that their professor had integrated botany and ecology, with a spirit of intellectual challenge and joy. Through his dendrology courses, he influenced many to pursue a professional career in botany and ecology (Wang, 1981).

The Central Forestry Experiment Institute of the Ministry of Agriculture and Forestry appointed Zhan as the Forest Administrator of the newly founded Forestry Survey Department in 1943; he worked in that position until 1945. In this post, he led the first field expedition team to explore the forest resources of Shennongjia, Hubei (Hupei) Province in southwest China—known to the scientific community as a remote, dangerous and mysterious area (Liu, 1993). The trip was triggered by stories that the Shennongjia landscape may have hosted the "Wild Man," a legendary humanoid primate. Zhan's report clearly rejected this hypothesis, but, meanwhile, concluded that the area is very rich in species and more complex than any other part of China. Today, this region is viewed as a "hot spot" of plant diversity.

Discoverer of the Chinese Redwood

In 1941, Japanese paleobotanist Shigeru Miki found exceptionally well-preserved Pliocene fossils of cones and foliage similar to *Sequoia*. Careful examination of these fossils convinced him that the fossil species was not a *Sequoia* but belonged to a new genus. He named it *Metasequoia* (Miki, 1941; Fulling, 1976).

On his way to Shennongjia, Zhan was infected with malaria and had to stop in Wanxian County. Longxing Yang (Yang Lung Tsing), the principal of the local agricultural school, and an undergraduate classmate of Zhan, knew Zhan was a plant taxonomist and wondered if he could help identify a large, unusual tree called *Shui Sha* by local residents in Modaoxi (Medaoxi, Motaochi). The story caught Zhan's attention, and he detoured his field route to Modaoxi, arriving in Modaoxi in the late evening on 20 Jul 1944.

During the next morning, Zhan collected some leafy branches and climbed to the temple roof under the tree to gather cones so he could prepare a typical specimen (No. 118, currently located at the Forestry Institute of Jiangsu Province, Nanjing, China).

Zhan and his assistants carefully examined the tree, later credited as the type tree. Zhan found that the tree was similar to Chinese swamp cypress or *Shui Song* (*Glyptostrobus pensilis*), a species widely distributed throughout southern China, but its leaves, twigs and scales of the cones were all opposite and the cones were larger and had long stipules. Undoubtedly, the tree was not *Glyptostrobus pensilis* but a new species (Yi, 1948). With much excitement, Zhan made a note "*Glyptostrobus pensilis?*" on the specimen in the field to remind his assistants that the tree was not *Glyptostrobus pensilis*. This was the first time that the living *Metasequoia* was scientifically examined.

The details above were included in Zhan's field journal. After his return from the expedition, Zhan attempted to characterise and identify the species, but the unavailability of references in his institute prevented Zhan from further investigation.

In 1945, Zhan and the Central Forestry Experiment Institute's director presented the specimen to Wanjun Zheng (Cheng Wan Chun), a dendrology professor from the National Central University (also in Chongqing), during an occasional visit to the institute (Yi, 1948; Lu, 1986). As a specialist on conifers, Prof. Zheng agreed that the specimen was different from *Glyptostrobus pensilis*. Zheng requested Zhan's permission to take the specimen with him to the university.

To make a convincing case, Prof. Zheng sent his graduate student, Jiru Xue (Hsueh Chi-ju), to collect additional specimens in 1946. With Zhan's directions to Modaoxi, Jiru Xue made two trips in February and May (Hsueh, 1985). With the new specimens, Prof. Zheng tentatively named the tree *Chieniodendron sinense* (Lu, 1986). Later in fall 1946, Zheng sent the new specimen to Xiansu Hu (Hu Hsen Hsu), the director of the Fan Memorial Institute of Biology in Beijing and a recent Harvard graduate, to double-check the new genus. Hu immediately realized that the living tree was identical to Miki's fossil *Metasequoia* (Miki, 1941). The discovery of the living fossil, *Metasequoia glyptostroboides*, was then published (Hu & Cheng, 1948).

Discovery of *Metasequoia glyptostroboides* was perhaps one of the most significant events in natural history, evolution and paleontology in the twentieth century. News about the specimen caused a tremendous sensation within the botanical community and the general public. No other plant species has held such attention among scientists and the public since the 1940s. At present, more than three hundred research papers related to this species have been published (Ma & al., 2000; www.metasequoia.org). Yet, Zhan's contribution in discovering the tree was completely ignored in the very first publication about the species (Hu & Cheng, 1948), even though it was recognised in later publications (e.g., Miki, 1948, 1949; Just, 1949; Dieterich, 1952; Totten, 1952; Edwards, 1954; Chaney, 1957; Stabler, 1959; Forham, 1960; Hsueh, 1985). Additionally, some specialists in China who were familiar with the story also noted that Zhan was the true discoverer, including Wang (1981), Zheng (1984), Lu (1986), Hu (1990), and Qiu (1993). Be aware that almost all the *Metasequoia*-related publications outside China (e.g., Spongberg, 1990) did not know Yi (1948) but only referred to the story by Hu (1948), which diminished the role of Zhan by involving T. Kan and Chung-lung Wu.

Although his role in the history of *Metasequoia glyptostroboides* was distorted in many ways, Zhan never complained. He did not even tell us that there was an original publication by Yi (1948) regarding the discovery of *Metasequoia*. Zhan believed that discussing the past discovery of a new species is not as important as investigating how a living fossil species will survive in the future. He encouraged his students to focus on the species' protection and its habitat.

Among China's Most Respected Botanists

During the past half century, Zhan became one of the most respected botanists in China. He wrote a vast number of published scientific articles and books. However, his contribution to botany went far beyond what is available in print. His footprints from exploring plants in China can be found in almost every province. He not only could

identify several thousand vascular plants in the field but also knew their habitats. Whether on foot or riding with graduate students, he could point to tiny plants at a distance and emphasise their importance within the ecosystem. Frequently, his students suspected that Zhan had special eyesight capabilities. They realised soon enough that their professor was an excellent field-ecologist. Further, Zhan's kind, gentle character and contagious enthusiasm for nature and science influenced many students in establishing and developing their professions.

Although Zhan studied forestry as his major in high school and college, his primary interest was botany, which he taught in his first professional position at Beijing University. He offered dendrology classes in several universities in subsequent years, including National Northeast Agricultural College, Shenyang Agricultural College (currently Shenyang Agricultural University), and Northeast Forestry College (currently Northeast Forestry University).

Since the 1950s, Zhan spent most of his time on the challenging task of taxonomy of *Salicaceae*. Taxonomic identification within the family is difficult because most species vary greatly in their morphological characters (leaf features are especially problematic). Along with his graduate students and assistants, Zhan spent years collecting specimens throughout the country, including multiple site visits to capture phenological changes, and he described more than 90 new taxa. In 1984, the Science Press of China published the text, "Flora Reipublicae Popularis Sinicae, Vol. 20 (2)–*Salicaceae* of China," based on his long-term undertaking (Wang & al., 1984). The text gained recognition from the Chinese Academy of Sciences. Under his leadership, his students and assistants took part in further taxonomic work for the multivolume *Flora of China* (Fang & al., 1999).

Conservation interests

Because of his extensive experience in dendrology, Zhan raised concern for deforestation in the 1950s. Believing that China's deforestation would not slow down as population pressures and the nation's economy continued to grow, Zhan focused his attention on devising scientifically sound harvesting methods and successful regeneration processes. In contradiction to the traditional German-Russian silvicultural methods widely applied in China, Zhan preferred small and aggregated harvesting regimes and promoted various selective cutting choices, followed by natural regeneration. In 1956, he proposed a natural regeneration framework: (1) leave seed trees during harvesting; (2) protect forest floor for advanced regeneration and promotion of germination; and (3) control early successional species for survival of target seedlings.

Zhan also developed a "cut-for-regeneration selective cutting method." Its underlying philosophy was to maintain simultaneously forest structure and preserve quality trees during forest harvest while promoting regeneration, increasing habitat diversity for a suite of species, and sustaining productivity. In 1973, after evaluating the Chinese Ministry of Forestry's forest harvesting regulations, Zhan proposed replacing the "Forest Harvesting Regulations" policy with "Forest Harvesting and Regeneration Regulations." Since this new policy was enacted, forestry practices in China have reflected Zhan's regeneration influence. While Zhan's work was mostly published in China—receiving little credit elsewhere—such harvest and regeneration approaches are widely recommended and accepted today in western forestry practices for ecosystem management.

In 1979, Zhan participated in a field investigation sponsored by the Chinese Society of Forestry. Its mission was to develop strategic management plans for natural resources in southwest China. The region is the nation's second largest timber production area, and hosts the origins of several major rivers, including the Yangtze. Zhan's field report predicted that the Yangtze River would become the second Yellow River, which was known for hundreds of years for its extremely high sedimentation and pollution due to deforestation in upper streams. Zhan and his colleagues wrote articles, published in *People's Daily*, *Guangming Daily*, and *China's Forestry Newspaper*, that greatly increased awareness of such risks to both the general public and national administrators. The central government, however, did not develop the Natural Forest Conservation Program (Zhang & al., 2000) for another twenty years—in 1998. In addition, Zhan's reports on the Yangtze River also produced many prolonged effects on management issues related to the river, including decades of ecological debates involving the Three-Gorge Dam Project.

Changbai Mountain

Changbai Mountain, the summit of the northeastern Eurasian continent, lies along the border of China and North Korea (128° E, 42° N). At such high elevations, unique natural ecosystems exist that humans have never disturbed. The 200,000-ha Changbai Mountain Nature Reserve was established in 1958. The extensive and contiguous old-growth forests, rarely found in temperate zones, provide us with the only remnant ecosystems with reference to prehistoric Europe and northeastern North America (Wang & al., 1980; Shao & al., 1996).

Zhan visited Changbai Mountain many times during the 1950s and 1960s and initiated some small research projects there (e.g., flora database). He viewed Changbai as an ideal natural setting for both research and education. However, the Cultural Revolution (1966–1976) completely interrupted his research and his ambitious goal. Immediately after the Cultural Revolution, Zhan and his colleagues attended the Chinese Academy of Sciences' terrestrial ecology meeting in Xining City, Qinghai Province, to propose the establishment of a Changbai Mountain Forest Ecosystem Research Station. The station researchers would investigate and document the structure, function and productivity of the area's major forest ecosystems. The academy subsequently funded the station in 1979, and Zhan became the station's first director. With his very broad view of



Fig. 3. Zhan Wang, in a birch forest on Changbai Mountain (19 May 1987).

ecological research and a strong commitment to team effort, he solicited and united heterogeneous experts from dozens of institutions into a formidable research team.

By 1980, with additional effort and support from Zhan's team, Changbai Mountain Nature Reserve was successfully included as one of the three Biosphere Reserves of the Man and Biosphere (MAB) programs in China.

For the station's first three years, the research team emphasized establishing baseline information on the area's flora, fauna, vegetation and soils, resulting in more than one hundred published papers. *The Enumeration of Plants for Changbai Mountain*, published in 1982, for example, became an irreplaceable handbook for researchers interested in Changbai ecosystems. The series, *Research of Forest Ecosystem*, has become a leading research journal for showcasing site-based ecosystem research and adaptive understanding of various aspects of ecosystem management.

In 1986, Zhan (Wang) and his colleagues organized the first International Symposium on Temperate Forest Management and Protection at Changbai Mountain Biosphere Reserve, which resulted in proceedings that were highly influential in the scientific community (Yang & al., 1987). At present, Changbai Mountain Forest Ecosystem Research Station remains one of China's leading research stations, and it is open to the international community.

Viewing Chanbai Mountain station as his home, Zhan spent as much time there each year as he could until 1998, when his physical condition prohibited him from further travel. He believed that his life belonged to this mountain region. Before Zhan passed away on 30 Jan. 2000, he requested that his ashes be spread throughout the wilderness of Changbai Mountain. Undoubtedly, he will forever be with his beloved plants and forests in this important site of plant diversity, and now, place of rest. Among his popular phrases are two that emphasize the relationship between nature and humankind:

All things on earth grow on soil, but are bred by forests.

Humans dominate all things on earth, but also rely on all things on earth.

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