



Living fossils, as an icon for understanding the past and current climate changes

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<https://www.kahaku.go.jp/english/>



Introduction

The climate has not been stable throughout the Earth's history. In discussing anthropogenic problems, it is important to show how current climate changes differ from historical changes. Living fossils have the potential to make people understand how environmental issues change over time. Here I introduce our new temporary exhibition in the National Museum of Nature and Science, Japan, focusing on a living fossil, Metasequoia.

Selecting icons is important

Icons of NMNS



Hachiko Momotarou2012 CC BY-SA 3.0
Futabasaurus Kabacchi CC BY 2.0
Myriad-Year-Clock
Blue whale

Which icons should be selected to let people understand the theme of the exhibition? This is one of the most important issues in our work. When we focus on anthropogenic problems, we tend to show something endangered. The story among those species often ring a bell of public. However, people may feel that the story is a bit far from their life, because those species are not common for them. If we can select something common to the public, that may have higher potential for our purpose.

Metasequoia is close to us

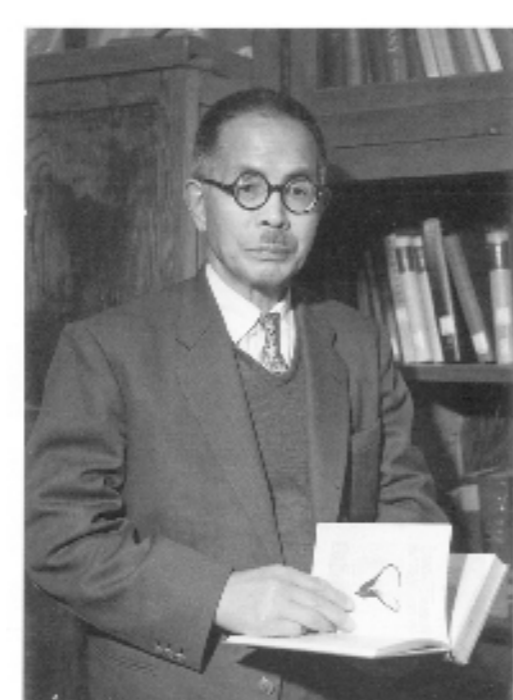


Cultivated Metasequoia trees in botanical garden

Metasequoia is cupressaceous conifer genus represented by a single species, *Metasequoia glyptostroboides* Hu et Cheng. This species is very common in Japan because they are often cultivated in school grounds and pavements, although we cannot see them in natural forest in Japan.

Stories behind Metasequoia

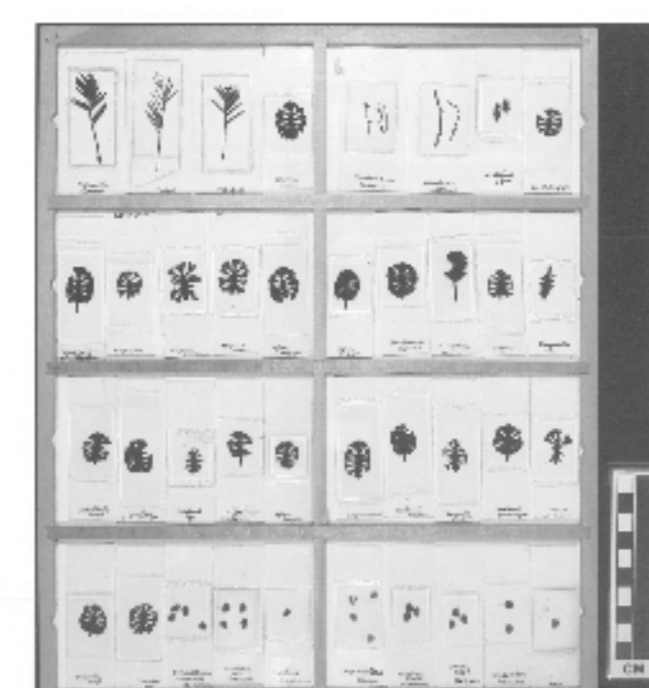
Metasequoia is a special plant for us Japanese. Because the genus was originally named by a Japanese botanist and paleobotanist, Dr. Shigeru Miki in 1941, based on fossil materials collected in Japan.



Dr. S. Miki (from Tsukagoshi, 2011, J. Histor. Bot. 19 (1-2))

- 1941 • Establishment of new genus
- 1945 • Discovery of natural trees
- 1946 • Official report of modern new species
- 1947 • Conservation project started
- 1950 • 100 seedlings arrived in Japan
- Metasequoia conservation ass. began to distribute seedlings to schools in Japan

Miki was the first who recognized the differences among some fossil plants named as *Taxodium* or *Sequoia*, both are extant genera belonging to the family Cupressaceae. They have been recorded from many fossil localities in northern hemisphere. However, Miki recognized that some of them are distinct from *Taxodium* and/or *Sequoia* in phyllotaxis and other morphological details. Then he established a new genus *Metasequoia* as an extinct genus that is known only in fossil records. After that, Dr Hu, Hsen Hsu, a Chinese botanist, newly found extant population of the genus in Central China and named as *Metasequoia glyptostroboides* in 1946. Then, *Metasequoia* was finally regarded as a living fossil. Because of the importance of this discovery by Miki and Hu, the natural population was started to be protected and some young shoots were cultivated to distribute them to botanical gardens in all over the world.

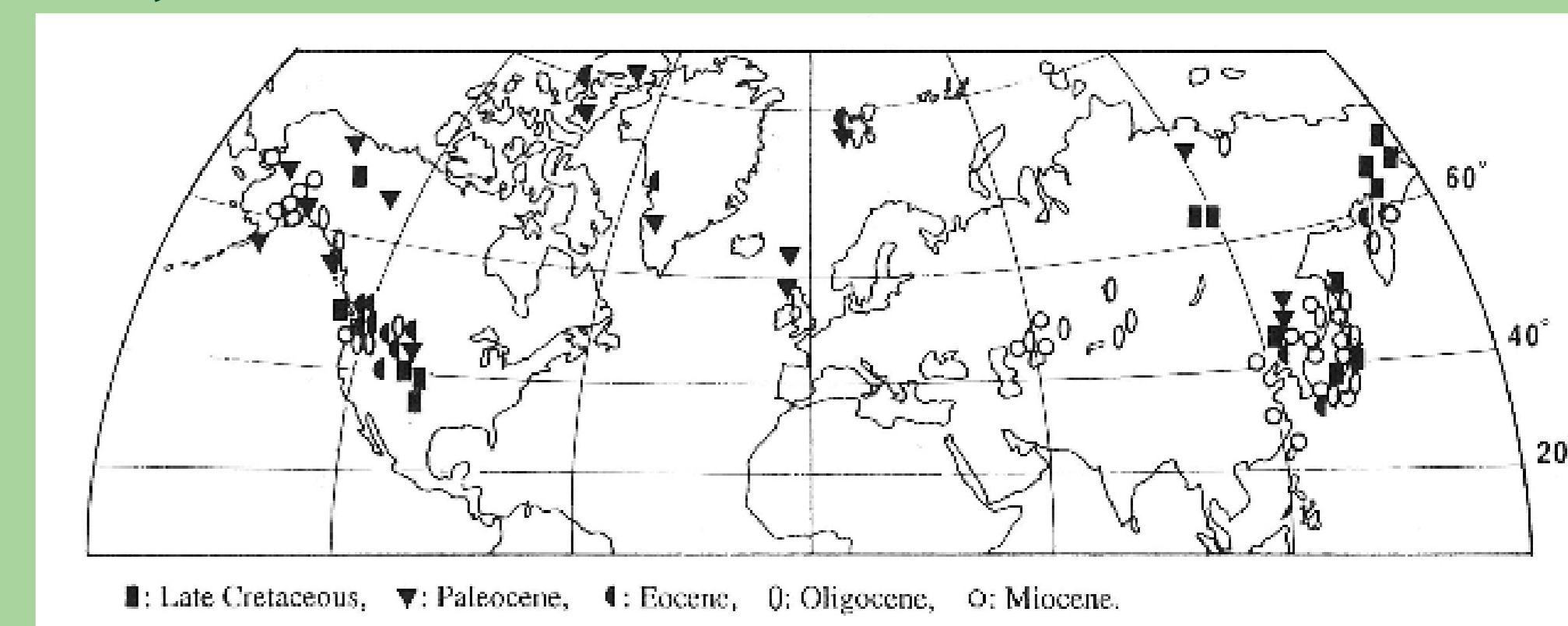


Original specimens studied by Miki (1942) (from Tsukagoshi, 2011, J. Histor. Bot. 19 (1-2))



Morphological comparison between Metasequoia and Sequoia.

Why it was extinct from Japan?

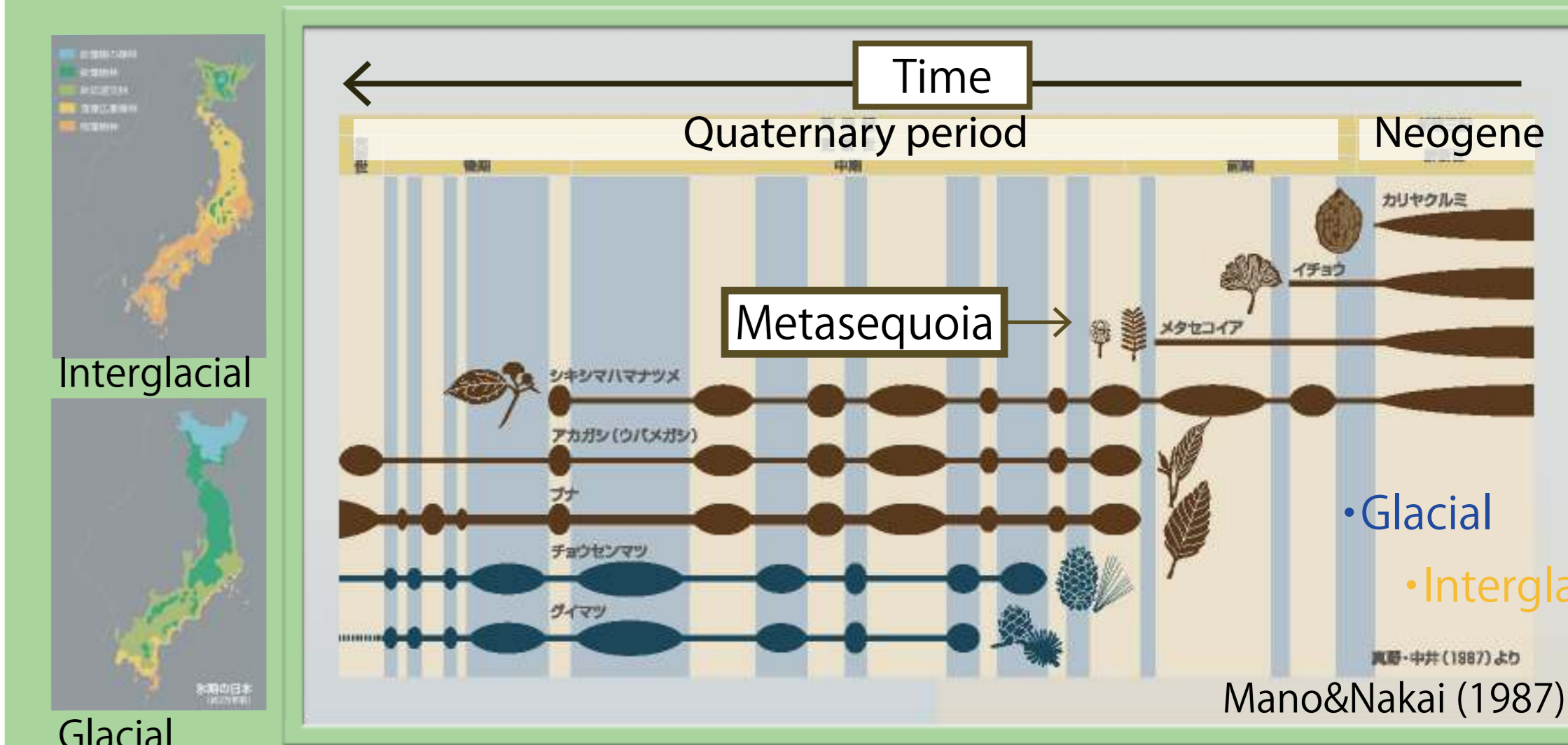


Distribution changes of Metasequoia over the Cenozoic.

Global climate pattern and geographic changes are considered as two main causes of distribution changes and local extinction of *Metasequoia*. It was extinct from Japan before the middle Pleistocene (ca. 500ky).



Metasequoia stamp in Tokyo

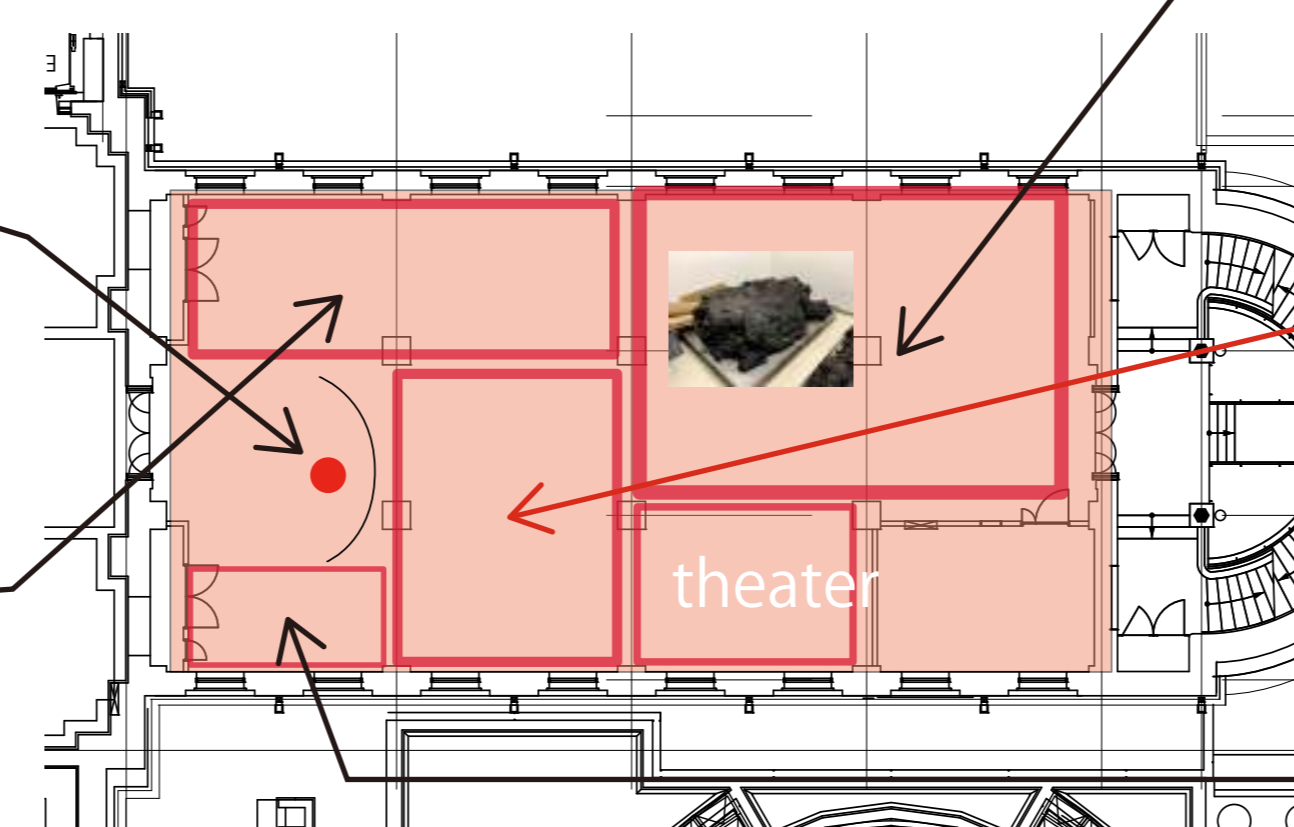


Fossil occurrence of selected plants (right) and vegetation changes (left) during the Quaternary in Japan.

Exhibition plan

(1) What is Metasequoia?

(2) Discovery of Metasequoia



(3) Metasequoia forest in deep time

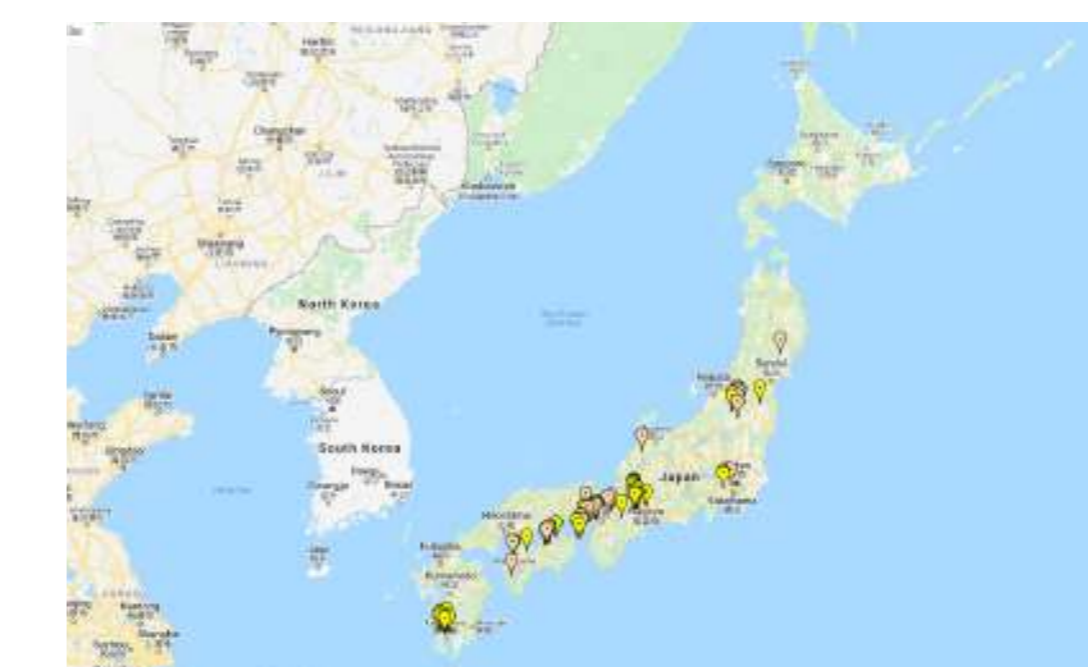
(4) Why did Metasequoia extinct from Japan?

(5) Current activities concerning Metasequoia

Potential activities: Feel ancient Metasequoia



Metasequoia is common not only as cultivated trees but also as fossil remains in Japan. We can even find fossil remains in Tokyo and other places throughout the country. We can thus feel/recheck stories behind it through our own experiences by digging fossils.



Quaternary distribution of Metasequoia in Japan. https://www.kahaku.go.jp/research/activities/project/hotspot_japan/Q-pmf/

Protecting natural populations —thinking modern problems beside

Currently, *Metasequoia* is endangered again due to the pressures of rapid population growth and climate changes, both are problems effecting other endangered species. We will consider and show current activities ongoing in China.

LePage et al. (2005) *The Geobiology and Ecology of Metasequoia*. Springer Verlag

