How a huge forest of extinct trees sparked transformation of life on Earth

August 9 2019, by Jan Zalasiewicz

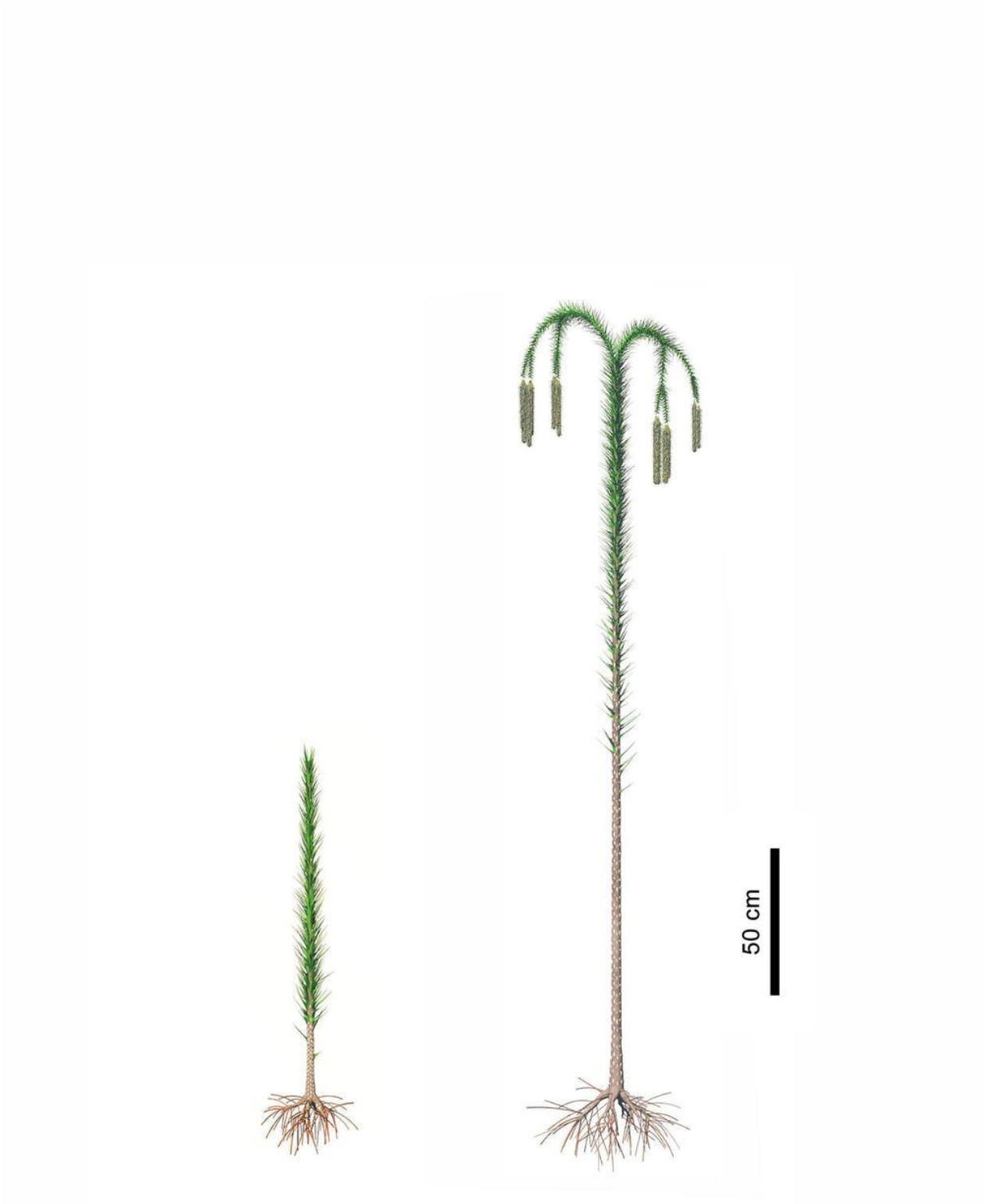
Credit: Zhenzhen Deng

If you were to step back in time some 365 million years, you might see a landscape more akin to the wilder shores of science fiction than earthly reality. Imagine a forest made up only of one kind of tree. A thin, straight, leaf-covered trunk just a few metres tall, dividing at the very top into four short hanging branches. A little like a green, living version of an art deco streetlamp.

These bizarre plants made up the oldest large forest yet found on Earth, which was recently unearthed in Xinhang, in the Anhui province of China. Researchers discovered 250,000 square metres of fossilised lycopsid trees in two clay quarries dating to the Devonian period, making it the oldest known fossil forest in Asia. It represents a pivotal step in the history of forest growth that marked a true transformation, and enormous expansion, of life on Earth.

The ancient forest-forming tree has been named Guangdedendron, a new genus of the extinct lycopsid plants. It had no flowers and no seeds (those were mainly later features of the plant world) but shed spores from bottle-like structures at the ends of its branches. Primitive by comparison with the trees of modern forests, it had nevertheless evolved enough to survive the harsh conditions of life on land, subject to sharp temperature swings and frequent dry spells.

This was a much more challenging environment than the more constant (and constantly hydrated) conditions of the sea, where complex multicellular life had already flourished for hundreds of millions of years. But life was slowly conquering the land as well. Ankle-high, simple land plants inhabited the preceding Silurian Period, some 430m years ago. The first known forest (more a copse, about the area of few tennis courts) grew around 385m years ago in what is now Gilboa in New York state in the US.



The extinct guangdedendron tree. Credit: Zhenzhen Deng

However, the often densely packed Xinhang trees form the earliest truly large forest that we know of. It marks a transition to the gigantic, worldwide swamp forests of the succeeding Carboniferous period that developed some 320m years ago. These pioneering land plants, and the food and shelter they provided, allowed animals ranging from millipedes to amphibians to invade the land as well.

Even rivers changed their form as the vegetation took hold and stabilised their banks. This made single, meandering channels more common than the multiple shifting arteries that had characterised the landscape for billions of years prior to its greening.

The sheer biological scale of this landscape invasion was shown in a recent study that calculated the mass of the modern biosphere, that is, the weight of all of life on Earth today. They arrived at a figure of 550 billion tons of carbon (which represents one fifth of all the mass in organic molecules). Over 80% of that biomass is land plants. This underlines just how significant the spread of forests was in the history of life on Earth.

Fossilised guangdedendrons. Credit: Deming Wang and Le Liu

Origins of climate change

The super-charged plant growth of the late Devonian and Carboniferous periods had another planet-wide consequence. It locked up huge amounts of carbon from the atmosphere, first in the living plants and then as the buried fossils that became deposits of coal and gas we still rely on for energy today.

The resulting fall in atmospheric carbon dioxide plunged the world into a glaciation that lasted some 50m years, causing fluctuations in climate and sea level that had worldwide effects and was a major event in paving the way for life as we know it today.

Now, we have dug up the compressed remains of those fossil forests, and in using them to power the industrial transformation of the last two centuries, have returned their carbon to the atmosphere in enormous amounts. This is what has precipitated the global warming—or more accurately global heating—climate crisis that we have today.

What can be done about humanity's ongoing massive ground-to-air carbon transfer? The global biomass study noted that the estimate of 550 billion tons of living carbon is likely about only half the size of the Earth's biomass that was present before humans began cutting down trees. So a rapid Xinhang-style re-expansion of the forests may be one way of taking some of the heat out of global warming.

This article is republished from The Conversation under a Creative Commons license. Read the original article.

Provided by The Conversation

Citation: How a huge forest of extinct trees sparked transformation of life on Earth (2019,

August 9) retrieved 25 April 2024 from https://phys.org/news/2019-08-huge-forest-extinct-trees-life.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.