

Fossils Reveal Flowers Originated 50 Million Years Earlier than Thought

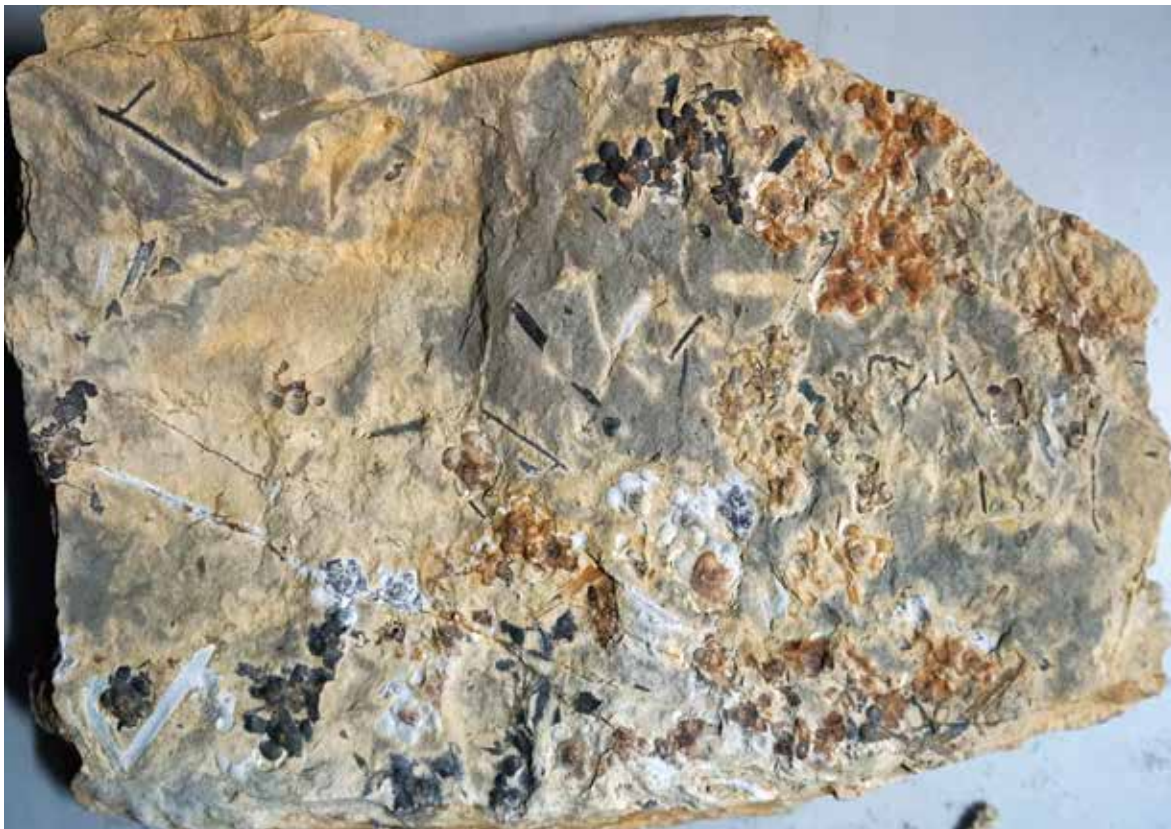
The discovery in China of fossil specimens of a flower called *Nanjinganthus* from the Early Jurassic suggests that flowers originated 50 million years earlier than previously thought.

Scientists have discovered the earliest flower specimens dating back to the Early Jurassic, more than 174 million years ago, a study in the open-access journal *eLife* reports.

Before now, angiosperms (flowering plants) were thought to have a history of no more than 130 million years. The discovery of the novel flower species,

which the authors named *Nanjinganthus dendrostyla*, throws widely accepted theories of plant evolution into question, by suggesting that flowering plants existed around 50 million years earlier. Also, *Nanjinganthus* morphologically surprised all botanists, showing a variety of “unexpected” characteristics that challenge almost all evolutionary theories.

Angiosperms are an important member of the plant kingdom, and their origin has been the topic of long-standing debate among evolutionary biologists. Many previously thought angiosperms could be no more than



Fossilized blossoms of *Nanjinganthus* on the same rock slab. (Photo by courtesy of WANG Xin's group, NIGPAS)

130 million years old. However, molecular clocks have indicated that they must be older than this. Until now, there has been no convincing fossil-based evidence to prove that they existed further back in time.

“Researchers were not certain where and how flowers came into existence because it seems that many flowers just popped up in the Cretaceous from nowhere,” explains lead author FU Qiang, associate research professor at the Nanjing Institute of Geology and Palaeontology (NIGPAS), Chinese Academy of Sciences (CAS). “Studying fossil flowers, especially those from earlier geologic periods, is the only reliable way to get an answer to these questions.”

The team studied 264 specimens of 198 individual flowers preserved on 34 rock slabs from the South Xiangshan Formation – an outcrop of rocks in the Nanjing region of China renowned for bearing fossils from the Early Jurassic. The abundance of fossil samples used in the study allowed the researchers to dissect some of them and study them with sophisticated microscopy, providing high-resolution pictures of the flowers from different angles and magnifications. They then used this detailed information about the shape and structure of the different fossil flowers to reconstruct the features of *Nanjinganthus dendrostyla*.

The feature unique of an angiosperm is “angio-ovuly” – the presence of ovules (precursors of seeds) fully enclosed before pollination. In the current study, the reconstructed flower was found to have a cup-form receptacle and ovarian roof thought to enclose the ovules / seeds. This was a crucial discovery, because the presence of these features confirmed the flower’s affinity of an angiosperm. Although there have been reports of angiosperms from the Middle-Late Jurassic in northeastern China, there are characters of *Nanjinganthus* that distinguish it from these previously known specimens and suggest that it is a new genus of angiosperm.

Having made this discovery, the team now wants to understand the relationship between *Nanjinganthus* and other angiosperms, namely, whether angiosperms are either monophyletic – which would mean *Nanjinganthus* represents a stem group giving rise to all later species – or polyphyletic, whereby *Nanjinganthus* represents one of many lineages of angiosperms and has little to do with many later species.

“The origin of angiosperms has long been an academic ‘headache’ for many botanists,” says senior



A lateral view of the earliest flower known to humans, *Nanjinganthus*, manifests in the fossil. (Photo by courtesy of WANG Xin’s group, NIGPAS)



An idealized reconstruction of *Nanjinganthus* (Photo by courtesy of WANG Xin’s group, NIGPAS)

author WANG Xin, research professor at NIGPAS. “Our discovery has moved the botany field forward and will allow a better understanding of angiosperms, which in turn will enhance our ability to efficiently use and look after our planet’s plant-based resources.”

Reference: The paper “*An unexpected noncarpellate epigynous flower from the Jurassic of China*” can be freely accessed online at <https://doi.org/10.7554/eLife.38827>. The contents, including text, figures and data, are free to reuse under a CC BY 4.0 license.