

New fossil pushes back physical evidence of insect pollination to 99 million years ago

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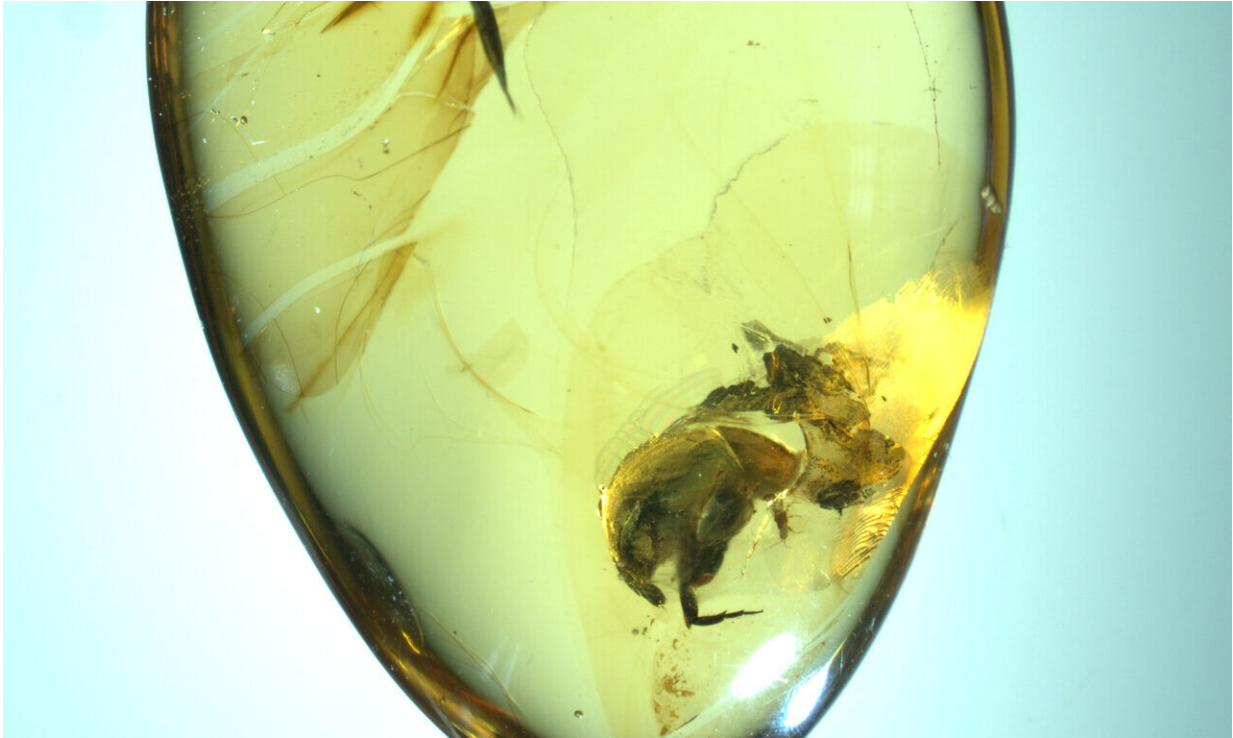
Artist's rendering of *A. burmitina* feeding on eudicot flowers. Credit: Ding-hau Yang

A new study co-led by researchers in the U.S. and China has pushed back the first-known physical evidence of insect flower pollination to 99 million years ago, during the mid-Cretaceous period.

The revelation is based upon a tumbling flower beetle with pollen on its legs discovered preserved in amber deep inside a mine in northern Myanmar. The fossil comes from the same amber deposit as the first ammonite discovered in amber, which was [reported](#) by the same research group earlier this year.

The report of the new fossil will publish Nov. 11 in the journal of the *Proceedings of the National Academy of Sciences*. The fossil, which contains both the beetle and pollen grains, pushes back the earliest documented instance of insect pollination to a time when pterodactyls still roamed the skies—or about 50 million years earlier than previously thought.

The study's U.S. co-author is David Dilcher, an emeritus professor in the IU Bloomington College of Arts and Sciences' Department of Earth and Atmospheric Science and a research affiliate of the Indiana Geological and Water Survey. As a paleobotanist studying the earliest flowering [plants](#) on Earth, Dilcher has conducted research on the process of amber fossilization.



A. burmitina in amber. The 99-million-year-old fossil, recovered from a mine in northern Myanmar, also contains 62 pollen grains from a eudicot flower. It is the earliest known physical evidence of insect pollination. Credit: the Nanjing Institute of Geology and Palaeontology.

The co-lead author on the study is Bo Wang, an amber fossil expert at the Nanjing Institute of Geology and Palaeontology, where the specimen was procured and analyzed.

According to Dilcher, who provided a morphological review of the 62 grains of pollen in the amber, the shape and structure of the pollen shows it evolved to spread through contact with insects. These features include the pollen's size, "ornamentation" and clumping ability.

The grains also likely originated from a flower species in the group

eudicots, one of the most common types of flowering [plant species](#), he said.

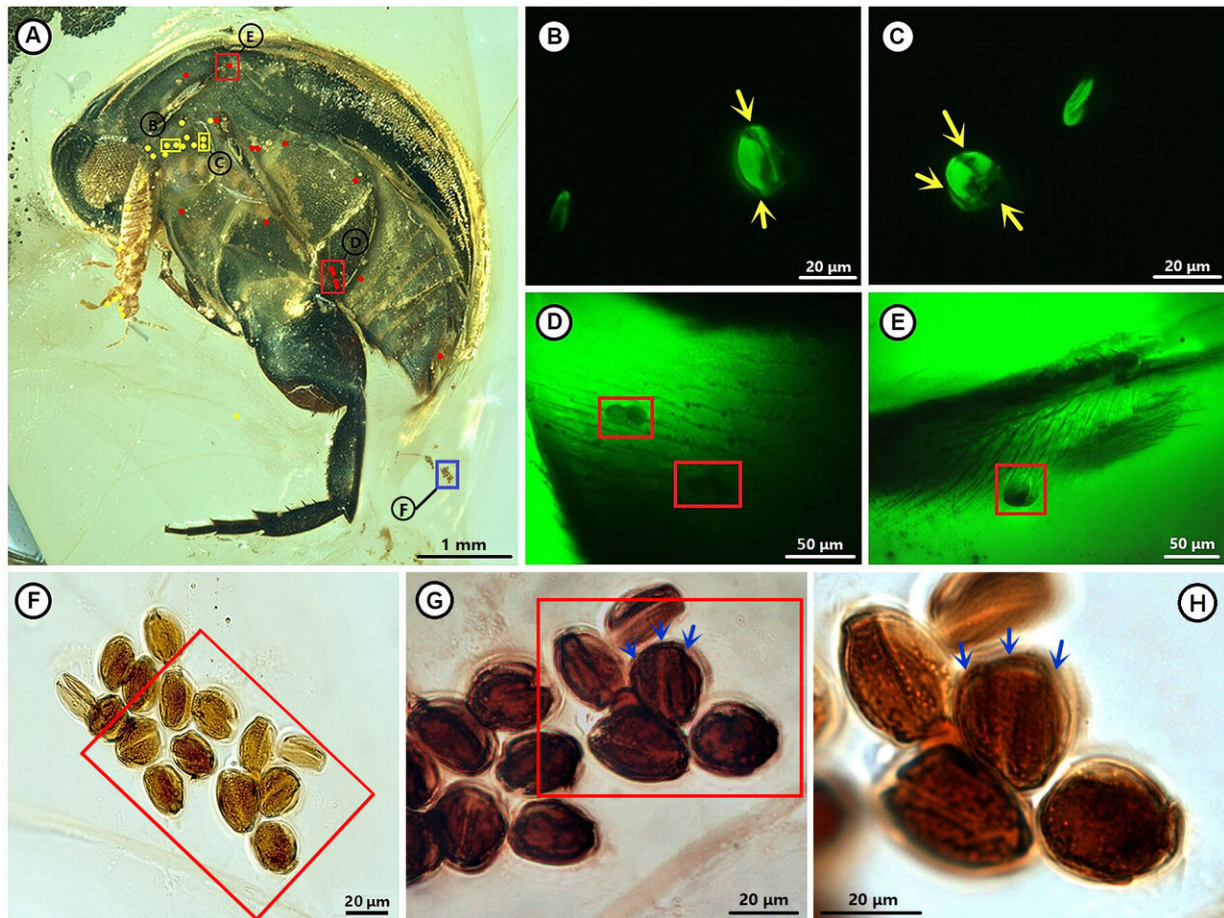
The pollen was not easy to find. The powdery substance was revealed hidden in the insect's body hairs under a confocal laser microscopy. The analysis took advantage of the fact that pollen grains glow under fluorescence light, contrasting strongly with the darkness of the insect's shell.



A close up of *A. burmitina* in amber. The fossil also contains 62 pollen grains from a eudicot flower, which indicates the insect's role as a pollinator. Credit: the Nanjing Institute of Geology and Palaeontology

The insect in the amber is a newly discovered species of beetle, which the study's authors named *Angimordella burmitina*. Its role as a pollinator was determined based upon several specialized physical structures, including body shape and pollen-feeding mouthparts. These structures were revealed through an imaging method called X-ray microcomputed tomography, or micro-CT.

"It's exceedingly rare to find a specimen where both the insect and the [pollen](#) are preserved in a single fossil," said Dilcher. "Aside from the significance as earliest known direct evidence of insect pollination of flowering plants, this specimen perfectly illustrates the cooperative evolution of plants and animals during this time period, during which a true exposition of flowering plants occurred."



Ecological reconstruction of the Cretaceous tumbling flower beetle. Credit: NIGPAS

Prior to this study, the earliest physical evidence of insect pollination of flowering plants came from Middle Eocene. The age of the new fossil was determined based upon the age of other known fossils in the same location as the fossilized beetle's discovery.

More information: Tong Bao et al., "Pollination of Cretaceous flowers," *PNAS* (2019).

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