Museum of Nature and Science

TEAM OF PALEOBOTANISTS DISCOVER TWO NEW GENERA AND SPECIES OF CONIFERS FROM THE UPPER CRETACEOUS OF HOKKAIDO, JAPAN

Research published in prestigious scientific journal, Botany, *describes two new genera of ancient Cupressaceae conifers based on two beautifully preserved 3-D fossil seed cones*

DALLAS (Aug. 3, 2021) – Illustrations depicting the dinosaur era – whether in books or movies – are often accompanied by lush greenery. And during the Cretaceous period, the trees commonly dominating a wide range of Earth's terrestrial environments were conifers – similar to the pines, spruces cypresses and cedars that populate the earth today. These conifers played a key role in ecosystems, providing nourishment, nutrients, and habitat for a range of prehistoric creatures.

In a recently published paper, a team of American paleobotanists describe two new genera of ancient conifers based on two beautifully preserved 3-D fossil seed cones. The scientific paper describing the find – titled **"**Ancient diversity and turnover of cunninghamioid conifers (Cupressaceae): two new genera from the Upper Cretaceous of Hokkaido, Japan**"** – has been published online in the prestigious, peer-reviewed scientific journal, *Botany*. Co-authors of the report are **Brian A. Atkinson**, Ph.D., assistant professor at University of Kansas and curator of paleobotany at the Biodiversity Institute, Lawrence, Kan.; **Dori L. Contreras**, Ph.D., curator of paleobotany, Perot Museum of Nature and Science, Dallas, Texas**; Ruth A. Stockey**, Ph.D., professor, Oregon State University, Corvallis, Ore.; and **Gar W. Rothwell**, Ph.D., distinguished professor emeritus, Ohio University, Athens, Ohio. Read their manuscript and view renderings, here.

The fossils are named ***Ohanastrobus hokkaidoensis*** and ***Nishidastrobus japonicum*** in honor of Tamiko Ohana (National Museum of Nature and Science, Tsukuba, Japan) and Professor Harufumi Nishida (Chuo University, Hachioji, Japan) for their contributions to paleobotany.

These cones belong to the Cupressaceae (cypress) family, which was widespread and important in many ecosystems during the age of dinosaurs. This is especially true for one of the oldest lineages of family – the cunninghamioids. The two new genera show that cunninghamioids had very diverse forms and were particularly important components of Cretaceous ecosystems of eastern Asia.

"What's interesting about these two new genera, specifically, is that they represent part of the last heyday of cunninghamioids before the group's diversity declined toward the end of the Cretaceous," said Contreras. "Today we are left with only one living genus, *Cunninghamia*, which are large evergreen trees that grow in the forests of China, Taiwan, Vietnam, and Laos."

The two new cones showed combinations of unique features that indicated they were different from each other and all previously known species, therefore they have been named as two new genera. Differences include their more cylindrical shape compared to the modern *Cunninghamia* and most other extinct genera, the number and form of their cone scales, and many aspects of their internal anatomy.

How the discoveries were unearthed and analyzed

The cones come from the Cretaceous of Japan and are permineralizations, a type of fossil which preserves all the details of the cells that make up the cones. To study them, the team of paleobotanists used a method called the cellulose acetate peel technique. The fossils are originally cut with a rock saw in two halves vertically to get a "longitudinal section" and then cut perpendicular to that to get a "cross section" (see image).

The cut surfaces are polished and then etched with an acid. A sheet of acetate film is placed on the surface with acetone, which adheres to the fossil surface. The film is then removed, leaving a microscopically thin peel of the fossil specimen attached to the film. The process is repeated so that the successive peel slices can be studied under microscopes to understand the three-dimensional anatomy of the specimens and describe them in detail.

As part of their findings, the research team analyzed and compiled the records of all cunninghamioid and similar conifers to understand how their diversity has changed through time. They show that during the Jurassic to Cretaceous there was a much greater diversity of this important group of conifers, both by the number of different genera (at least 12 fossil genera compared to only one living genus!) and species, and by the variation in the form of their cones. The living genus *Cunninghamia* appears during the Campanian and maintains a nearly continuous fossil record through to today, while nearly all other extinct genera of cunninghamioid Cupressaceae disappear by the close of the Campanian (~72 million years ago).

The two new species expand the known diversity of the cunninghamioids before their decline toward the end of the Cretaceous and further demonstrate the importance of these conifers in Cretaceous ecosystems, particularly in eastern Asia.

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About the University of Kansas Biodiversity Institute & Natural History Museum. *The KU Biodiversity Institute studies the life of the planet for the benefit of the Earth and its inhabitants. The institute, including the KU Natural History Museum, accomplishes this mission through the acquisition, curation and study of collections of plants, animals, fossil material and cultural artifacts for undergraduate, graduate and public education, as well as research and public and professional service. The Biodiversity Institute's worldwide collection of over 10 million specimens and 1.5 million archaeological artifacts encompass the study of archaeology, birds, reptiles, amphibians, fishes, mammals, plants, parasites, insects, and fossil plants and animals. The KU Natural History Museum is home to four floors of public exhibits including the historic Panorama; live snakes and insects; vertebrate and invertebrate fossils; parasites and microbes; and the flora and fauna of the Great Plains. The museum provides content-rich, hands-on informal science learning for school groups in grades K–12. These programs have reached more than 40,000 participants over the past decade. The museum also offers a wide range of public programs and events. To learn more, please visit https://biodiversity.ku.edu.*

About the Perot Museum of Nature and Science. *A top cultural attraction in Dallas/Fort Worth and a Michelin Green Guide three-star destination, the Perot Museum of Nature and Science is a nonprofit educational organization located in the heart of Dallas, Texas. With a mission to inspire minds through nature and science, the Perot Museum delivers exciting, engaging and innovative visitor and outreach experiences through its education, exhibition, and research and collections programming for children, students, teachers, families and life-long learners. A trusted science resource for all of North Texas, the Museum is committed to preparing the next generation of STEM workers by supporting K-12 schools and educators through highly accessible programs. The 180,000-square-foot facility in Victory Park opened in December 2012 and is now recognized as the symbolic gateway to the Dallas Arts District. Future scientists, mathematicians and engineers will find inspiration and enlightenment through 11 permanent exhibit halls on five floors of public space; a children's museum; a flexible-space, traveling exhibition hall; and a theater. Designed by 2005 Pritzker Architecture Prize Laureate Thom Mayne and his firm Morphosis Architects, the Victory Park museum has been lauded for its artistry and sustainability. To learn more, please visit perotmuseum.org.*

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