

Embargoed until: November 13, 2018: 7am EST /  
12pm UK time

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## PRESS RELEASE

*PeerJ – the Journal of Life  
& Environmental Sciences*

### **Most Complete Enantiornithine Bird Fossil from North America**

*Researchers describe one of the largest birds known from North America from the Age of Dinosaurs in PeerJ – the Journal of Life & Environmental Sciences. Detailed analysis of the well-preserved fossil suggests the new species was an advanced flyer.*

A 75-million-year-old bird skeleton from a threatened national monument in Utah represents the most complete skeleton ever found in North America for a long-extinct group of birds called enantiornithines. This large, fossilized bird provides important new insight into the evolution of flight. It has several advanced adaptations for flying, which show that the Enantiornithes evolved these features separately from living birds.

Enantiornithine birds (“opposite birds”) were a group that existed during the Cretaceous. They were super successful — so far scientists have found enantiornithine fossils from every continent except Antarctica, and they are known from rocks as old as 130 million years right up to the end of the Cretaceous 65 million years ago. In many ways, they looked quite similar to modern birds and are in fact closely related. They were fully-feathered and flew by flapping their wings like modern birds.

In North America, the enantiornithine fossil record is restricted to the Late Cretaceous – about 100-65 million years ago. Nearly all of these fossils are single bones from the feet, so we don’t know what most of these birds looked like. In our new paper published in peer-reviewed journal *PeerJ – the Journal of Life & Environmental Sciences*, we describe a very special enantiornithine fossil from the Kaiparowits Formation in Utah (~75 million years old), which we named *Mirarce eatoni* (Meer-ark-ee).

*Mirarce* pays homage to the incredible, detailed, three-dimensional preservation of the fossil (“*mirus*” = “wonderful” in Latin), and anatomical evidence that it was an advanced flyer (*Arce* was the winged messenger of the

Titans in Greek mythology). The species name honors Dr. Jeffrey Eaton for his decades of work as a paleontologist on fossils from the Kaiparowits Formation.

Mirarce is unique and important for several reasons. First, it is by far the most complete enantiornithine bird fossil ever discovered in North America. We have bones from almost all regions of the skeleton, except the skull. Additionally, it is also one of the largest birds known from North America from the entire Age of Dinosaurs.

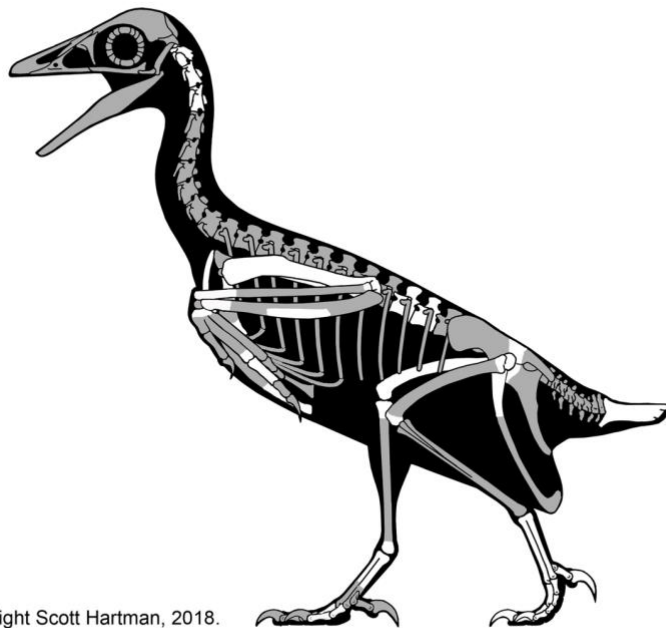
Most Cretaceous birds were the size of chickadees or crows, but Mirarce was significantly bigger, about the size of a turkey vulture or great-horned owl. This fossil also is critical to helping us understand trends in enantiornithine evolution, and bird evolution in general. Though they superficially look like modern birds, enantiornithines have many anatomical differences. Most enantiornithines had a sternum (breast-bone) with a low keel and a wide wishbone. Though they could fly, they weren't as well-adapted for flight as modern birds.

Mirarce, however, shows us that by the Late Cretaceous opposite birds had separately evolved adaptations for advanced flight, similar to what we see in modern birds. The wishbone is narrower, and the sternum has a deeper keel for bigger flight muscles. What is most exciting, however, are large patches on the forearm bones. These rough patches are quill knobs, and in modern birds they anchor the wing feathers to the skeleton to help strengthen them for active flight. This is the first discovery of quill knobs in any enantiornithine bird. Thus, we know that Mirarce was a very strong flier.

This important fossil was found in Grand Staircase Escalante National Monument in Utah, a monument currently under threat of severe size reduction by the national government. Originally discovered in the early 1990s, this find (among many others) contributed to the original establishment of the monument in 1996. Mirarce is one of thousands of fossils discovered from Grand Staircase, and the rocks of the Kaiparowits Formation contain one of the best Cretaceous fossil records in the entire world, underscoring the critical importance of protecting and preserving these parts of our natural heritage. Reducing the size of the protected area puts some of our nation's most valuable natural and scientific resources at risk.

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## Images:



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**Image caption:** Skeletal reconstruction of *Mirarce eatoni*, an extinct bird that lived in Utah about 75 million years ago. *Mirarce* was a very large, strong flier. Image credit: Illustration by paleoartist Scott Hartman (skeletaldrawing.com). Permission to share with publicity of [peerj.com/articles/5910](https://peerj.com/articles/5910). Please include link back to the full article.



**Image caption:** Reconstruction of a living *Mirarce eatoni* perched on the horns of the ceratopsian dinosaur *Utahceratops gettyi*, animals that

were alive in Utah during the Late Cretaceous (75 million years ago).  
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**EMBARGOED** until 13 Nov 2018: 7 am EST; 12 midday UK local time; 11 am GMT (i.e. the date of publication)

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**Citation to the article:** Atterholt et al. (2018), The most complete enantiornithine from North America and a phylogenetic analysis of the Avisauridae. PeerJ 6:e5910; DOI 10.7717/peerj.5910

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