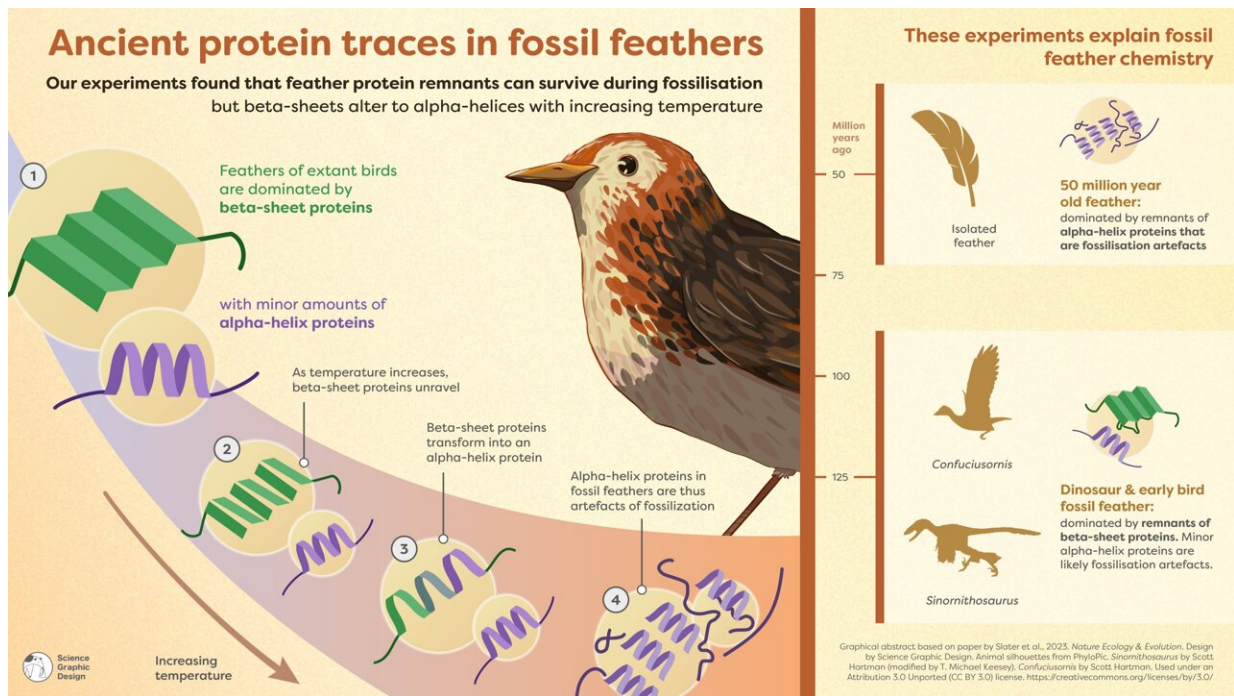


# Dinosaur feathers reveal traces of ancient proteins

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A graphical abstract based on paper by Slater et al., 2003. Credit: Science Graphic Design

Paleontologists at University College Cork (UCC) in Ireland have discovered X-ray evidence of proteins in fossil feathers that sheds new light on feather evolution.

Previous studies suggested that ancient feathers had a different

composition to the feathers of birds today. The new research, however, reveals that the protein composition of modern-day feathers was also present in the feathers of dinosaurs and early birds, confirming that the chemistry of feathers originated much earlier than previously thought.

The research, published today in *Nature Ecology and Evolution*, was led by paleontologists Dr. Tiffany Slater and Prof. Maria McNamara of UCC's School of Biological, Earth, and Environmental Science, who teamed with scientists based at Linyi University (China) and the Stanford Synchrotron Radiation Lightsource (U.S.).

The team analyzed 125-million-year-old feathers from the dinosaur *Sinornithosaurus* and the early bird *Confuciusornis* from China, plus a 50-million-year-old [feather](#) from the U.S..

"It's really exciting to discover new similarities between dinosaurs and birds," Dr. Slater says. "To do this, we developed a new method to detect traces of ancient feather proteins. Using X-rays and [infrared light](#) we found that feathers from the dinosaur *Sinornithosaurus* contained lots of beta-proteins, just like feathers of birds today."



Isolated fossil feather from the Green River Formation (ca. 50 million years old, USA). Specimen held in the Yale University Peabody Museum of Natural

History. Scale bar indicates 100 mm. Credit: Dr Tiffany Slater



Scanning electron microscopy image of zebra finch feather. Scale bar indicates 200  $\mu\text{m}$ . Credit: Dr Tiffany Slater

To help interpret the chemical signals preserved in the [fossil feathers](#), the team also ran experiments to help understand how feather proteins break down during the fossilization process.

"Modern bird feathers are rich in beta-proteins that help strengthen feathers for flight," Dr. Slater says.

"Previous tests on dinosaur feathers, though, found mostly alpha-proteins. Our experiments can now explain this weird chemistry as the

result of [protein](#) degradation during the fossilization process. So although some fossil feathers do preserve traces of the original beta-proteins, other fossil feathers are damaged and tell us a false narrative about feather evolution."

This research helps answer a long-standing debate about whether feather proteins, and proteins in general, can preserve in deep time.

Prof. Maria McNamara, senior author on the study, said, "Traces of ancient biomolecules can clearly survive for millions of years, but you can't read the [fossil record](#) literally because even seemingly well-preserved fossil tissues have been cooked and squashed during fossilization. We're developing new tools to understand what happens during fossilization and unlock the chemical secrets of fossils. This will give us exciting new insights into the evolution of important tissues and their biomolecules."

**More information:** Slater, T.S., et al, Preservation of corneous  $\beta$ -proteins in Mesozoic feathers, *Nature* (2023). [DOI: 10.1038/s41559-023-02177-8](#).  
[www.nature.com/articles/s41559-023-02177-8](https://www.nature.com/articles/s41559-023-02177-8)

Provided by University College Cork

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