

# True colors of some fossil feathers now in doubt (w/ Video)

March 28 2013

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(Phys.org) —Geological processes can affect evidence of the original colors of fossil feathers, according to new research by Yale University scientists, who said some previous reconstructions of fossil bird and dinosaur feather colors may now merit revision.

The discovery reveals how the evidence for the [colors](#) of feathers—especially melanin-based colors—can be altered during fossilization, and suggests that past reconstructions of the original colors of feathers in some [fossil](#) birds and dinosaurs may be flawed.

"Here we have concrete experimental evidence for how the colors of

feathers are affected by pressure and temperature during burial," said lead researcher Maria E. McNamara, a former Yale [postdoctoral researcher](#) now based at the University of Bristol in the United Kingdom. The study was published online in the journal *Biology Letters* on March 27.

Derek E. G. Briggs, the Yale University paleontologist whose lab hosted the research, is a co-author. Briggs also is director of the Yale Peabody Museum of Natural History.

In modern birds, black, brown, and some reddish-brown colors are produced by tiny granules of the [pigment melanin](#). These features—called melanosomes—are preserved in many fossil feathers, and their precise size and shape have been used to reconstruct the original colors of [fossil feathers](#).

"The problem was that we had no idea whether melanosomes could survive the fossilisation process intact," said McNamara. "Our experiments show that this is not the case. Our results cast a cautionary light on studies of fossil feather color and suggest that some previous reconstructions of the original plumage colors of fossils may not be accurate."

Using a novel experimental technique pioneered in the group's recent study on the colors of [fossil insects](#), McNamara's interdisciplinary team simulated high pressures and temperatures that are found deep under the Earth's surface. The team used feathers of different colors and from different species, but the geometry of the melanosomes in all feathers changed during the experiments.

"This study will lead to better interpretations of the original plumage colors of diverse feathered dinosaurs and fossil birds," said Briggs.

"Fossils that have experienced relatively mild burial conditions will yield

the most accurate reconstructions."

Co-author Zhengrong Wang, the Yale geochemist who designed the experimental apparatus, said that the experimental technique used by the team is going from strength to strength. "This approach can be used to investigate broad questions relating to the fossilization process and we have several new projects in the pipeline."

The [paper](#) is titled "Experimental maturation of feathers: implications for reconstructions of fossil feather colour."

**More information:** Experimental maturation of feathers: implications for reconstructions of fossil feather colour, *Biology Letters* Published 27 March 2013 [doi: 10.1098/rsbl.2013.0184](https://doi.org/10.1098/rsbl.2013.0184)

## **Abstract**

Fossil feathers often preserve evidence of melanosomes—micrometre-scale melanin-bearing organelles that have been used to infer original colours and patterns of the plumage of dinosaurs. Such reconstructions acknowledge that evidence from other colour-producing mechanisms is presently elusive and assume that melanosome geometry is not altered during fossilization. Here, we provide the first test of this assumption, using high pressure–high temperature autoclave experiments on modern feathers to simulate the effects of burial on feather colour. Our experiments show that melanosomes are retained despite loss of visual evidence of colour and complete degradation of other colour-producing structures (e.g. quasi-ordered arrays in barbs and the keratin cortex in barbules). Significantly, however, melanosome geometry and spatial distribution are altered by the effects of pressure and temperature. These results demonstrate that reconstructions of original plumage coloration in fossils where preserved features of melanosomes are affected by diagenesis should be treated with caution. Reconstructions of fossil feather colour require assessment of the extent of preservation of various

colour-producing mechanisms, and, critically, the extent of alteration of melanosome geometry.

Provided by Yale University

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