Hollow fossil melanosomes suggest earliest appearance of brilliant iridescent color in bird feathers

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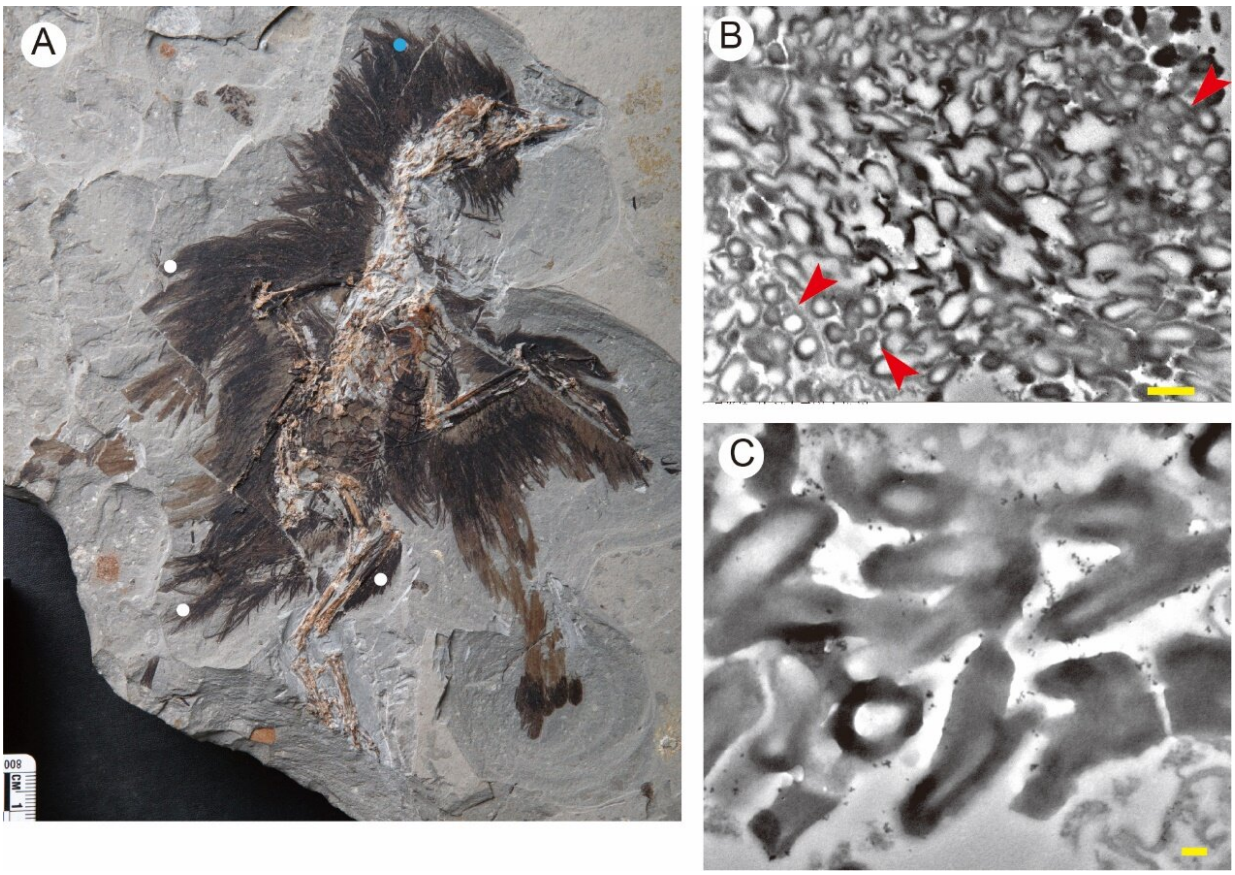

A is the photo of the specimen STM7-144, the blue dot on the head of the specimen shows where the hollow melanosomes collected; B and C are TEM images of the sample from the head of the specimen, with scale bar in B is 1000nm, C is 200 nm. Credit: Science China Press

SEM and TEM observations of the feathers on an Early Cretaceous basal bird Eoconfuciusornis, from 130-million-year old lake deposits in Fengning, Hebei Province in northern China, present the earliest record of hollow melansomes from feathers. They are preserved as rods with air holes and roughly circular in cross section. "I am very surprised by this observation, if proven true, it would be a really exciting discovery," says Dr. Pan Yanhong, who led this study.

Why are hollow melanosomes important? The color of feathers in extant birds are generally produced by pigments or structures, and brilliant iridescent colors, i.e., color changes depending on the reflectance spectra of sunlight at different viewing angles, are most unique, and are seen in some extant birds such as African starlings and birds of paradise. "Melanosomes creating iridescent plumage colors in extant birds are various in morphology, including solid cyclindrical, solid flattened, hollow cyclindrical and hollow flattened; however, hollow melanosomes have not yet been reported in fossil birds although flatted melanosome have been reported from a feathered dinosaur," Pan says.

Pan and her colleagues also noted that the hollow melansomes are only observed from feathers on the top of the head, but not from feathers from other regions of the same specimen. They relate this to the possible sexual display as coloration can be additional ornamentation.

Some of the hollow melanosomes seem to be more or less fused and the air holes are merged, which can be well explained by the taphomonic alternation. "Previous taphonomic work by our team has confirmed that melanosome could be fused during taphonomic process," Pan says.

The researchers are optimistic that future work will likely produce more observation of hollow melanosomes in early birds.

More information: Yanhong Pan et al, Unambiguous evidence of

brilliant iridescent feather color from hollow melanosomes in an Early Cretaceous bird, *National Science Review* (2021). DOI: 10.1093/nsr/nwab227

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