Paleontologists find first molecular evidence of ginger pigment molecules in fossil frogs

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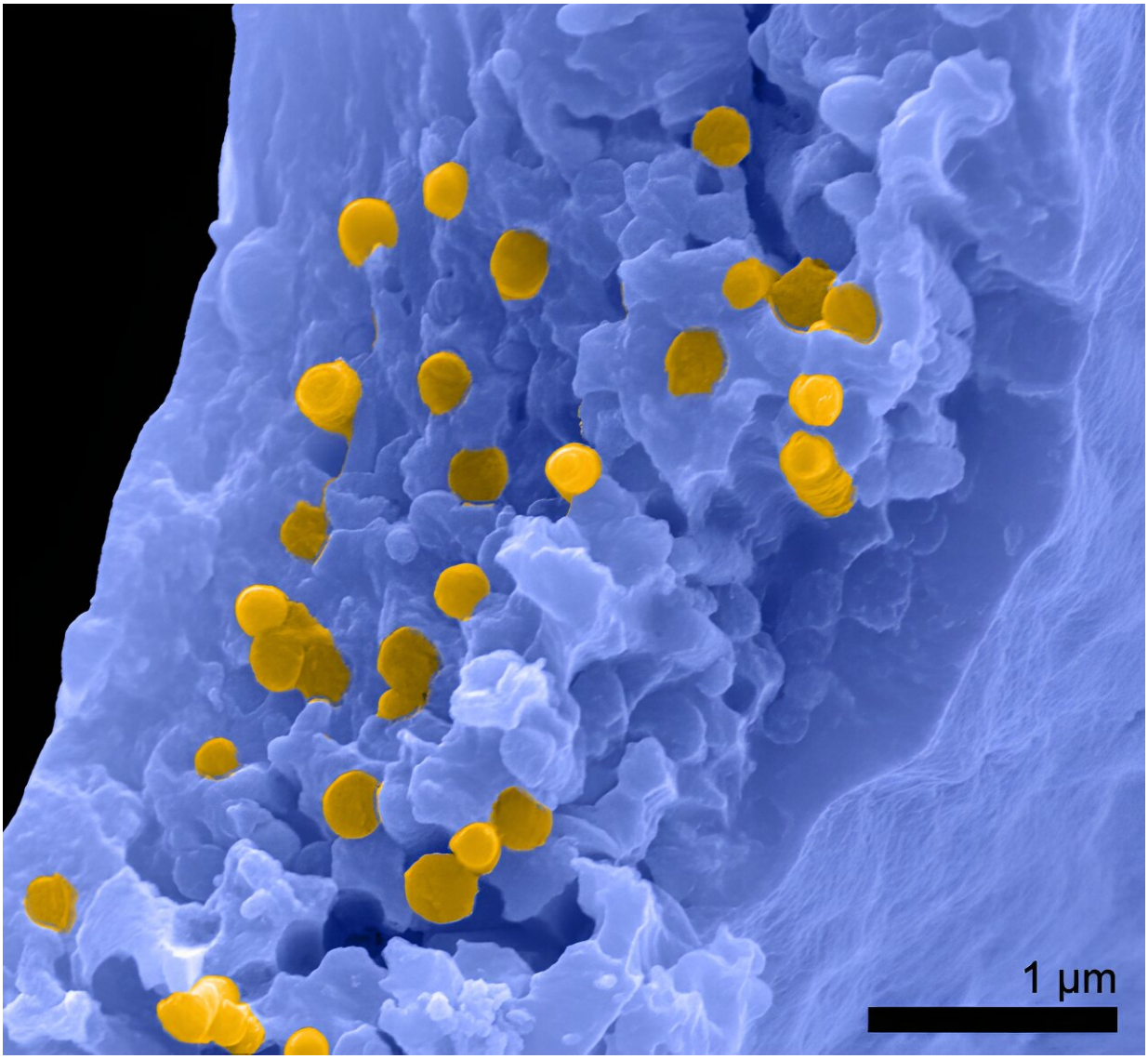


False color scanning electron microscopy image of zebrafinch feather showing the feather cortex (in blue) and melanosomes (melanin-rich granules, in orange).

Scale bar indicates 1 μm. Credit: Pic Dr Tiffany Slater.

Paleontologists at University College Cork (UCC) have found the first molecular evidence of pheomelanin, the pigment that produces ginger coloration, in the fossil record.

The new study reports the preservation of molecular fragments of the pigment pheomelanin in 10-million-year-old frogs, adding molecular analysis to the paleontologists' arsenal when reconstructing the original colors of extinct organisms.

The study, published today in *Nature Communications*, was led by paleontologists Dr. Tiffany Slater and Prof. Maria McNamara of UCC's School of Biological, Earth, and Environmental Sciences (BEES) and Environmental Research Institute (ERI). They worked with an international team of scientists at Fujita Health University (Japan), Linyi University (China) and Lund University (Sweden).

Dr. Slater said, "This finding is so exciting because it puts paleontologists in a better place to detect different melanin pigments in many more fossils. This will paint a more accurate picture of ancient animal color and will answer important questions about the evolution of colors in animals. Scientists still don't know how—or why—pheomelanin evolved, because it is toxic to animals, but the fossil record might just unlock the mystery."

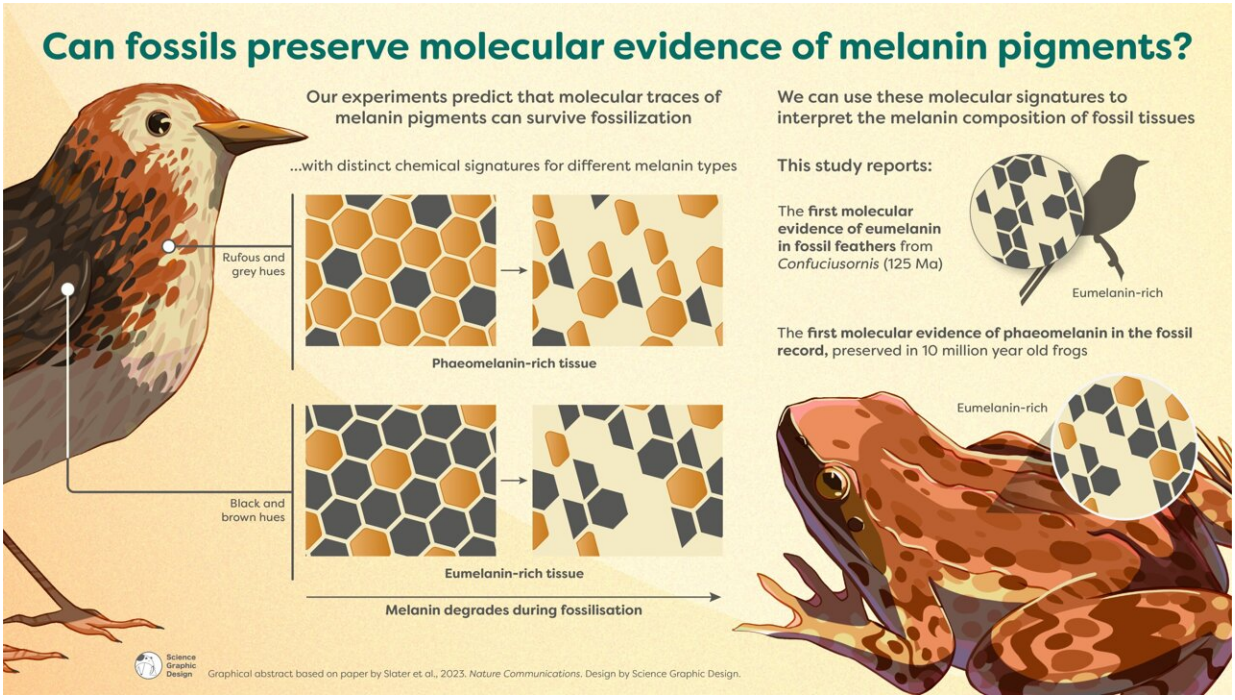
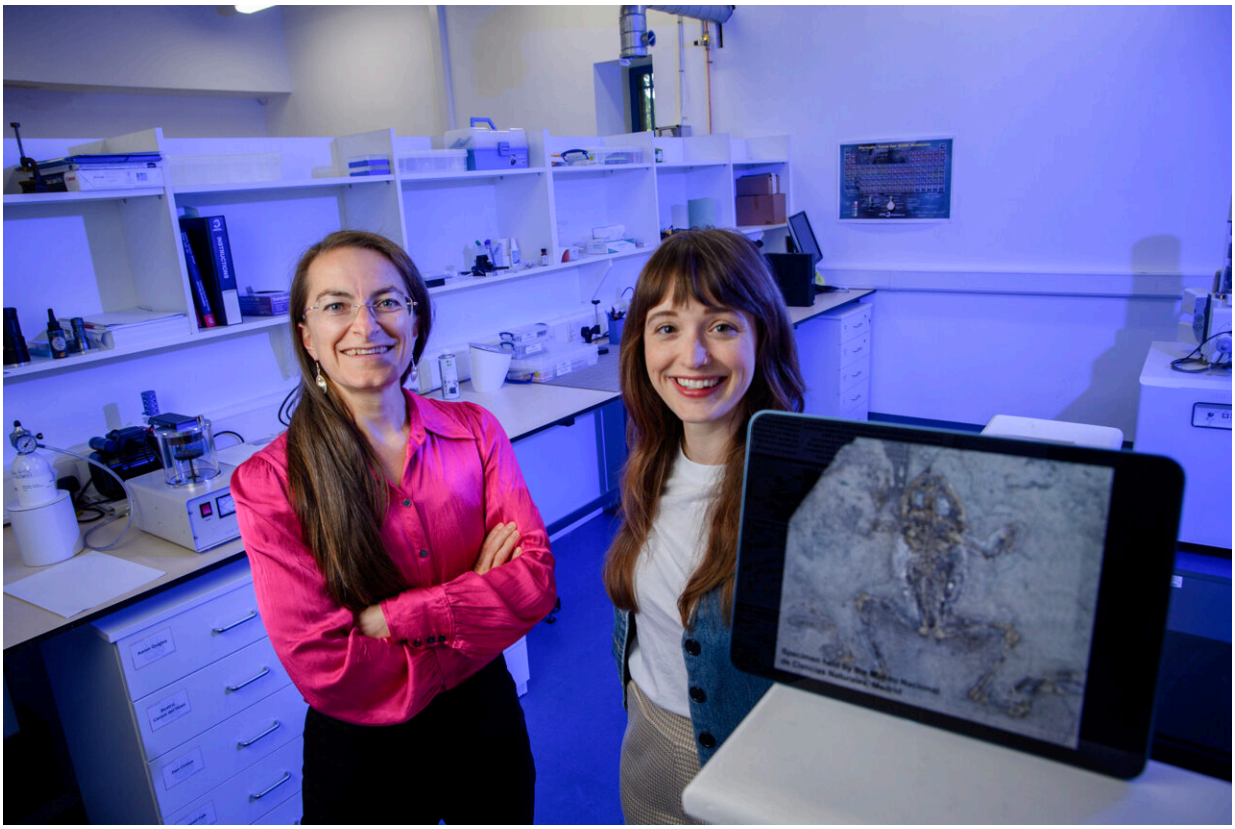


Illustration of the main findings reported in Slater et al., 2023 published in *Nature Communications.* . Credit: Science Graphic Design.



Prof. Maria McNamara (left) and Dr Tiffany Slater pictured at the School of Biological, Earth and Environmental Sciences at University College Cork. Credit: Pic Daragh Mc Sweeney/Provision

The team performed rigorous laboratory experiments on black, ginger, and white feathers to track how pheomelanin pigments degrade during the fossilization process, which backs up their interpretations of the fossil chemistry.

Prof. McNamara, senior author on the study, said, "Fossils are invariably altered by the ravages of heat and pressure during burial, but that doesn't mean that we lose all original biomolecular information. Our fossilization experiments were the key to understanding the chemistry of the fossils, and prove that traces of biomolecules can survive being

cooked during the fossilization process.

"There is huge potential to explore the biochemical evolution of animals using the fossil record, when we account for chemical changes during fossilization."

More information: Taphonomic experiments reveal authentic molecular signals for fossil melanins and verify preservation of phaeomelanin in fossils, *Nature Communications* (2023). DOI: 10.1038/s41467-023-40570-w

Provided by University College Cork