

Modern technology restores ancient dinosaur fossil

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Reconstruction of the Cretaceous therizinosaur *Erlikosaurus andrewsi*: original fossil (back), reconstructed digital skull model (middle), and life-reconstruction (front). Credit: Dr Stephan Lautenschlager

A rare dinosaur fossil has been restored by an international team of scientists, led by Dr Stephan Lautenschlager from the University of Bristol, using high-resolution X-ray computed tomography (CT scanning) and digital visualisation techniques. The work is described this week in the *Journal of Vertebrate Paleontology*.

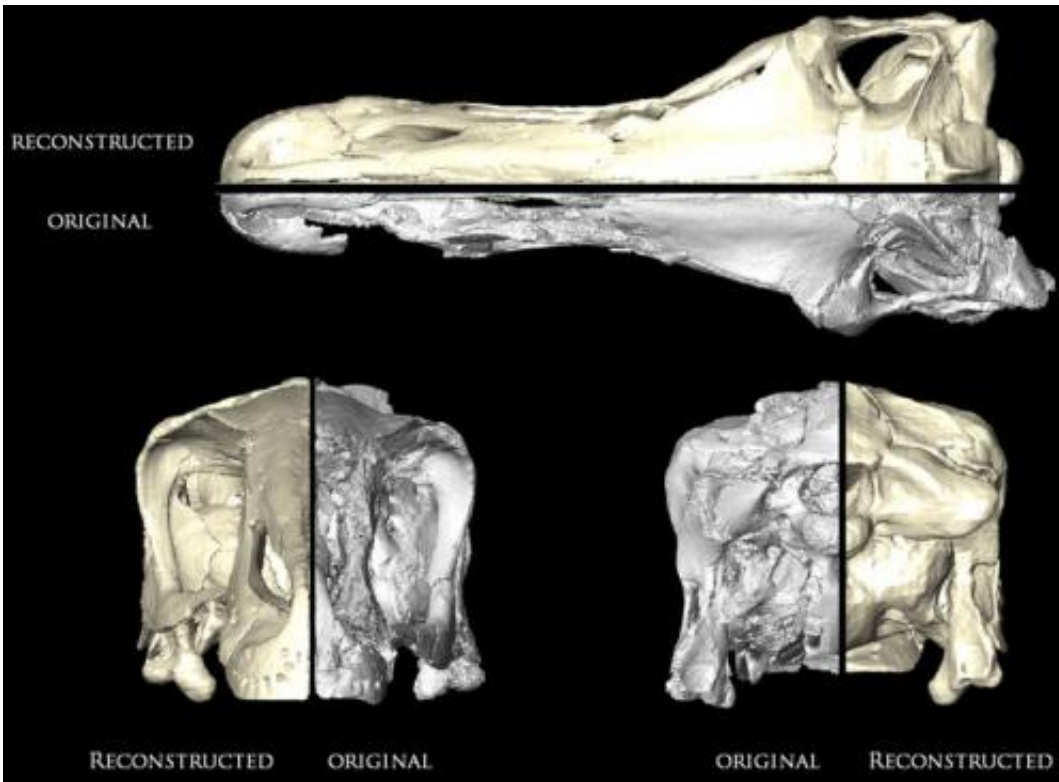
Fossils are usually deformed or incompletely preserved when they are found, after what can be millions of years of fossilization processes, and thus have to be studied very carefully to avoid damage. In addition, they are sometimes difficult to access as they might be located in remote museum collections.

Dr Lautenschlager of Bristol's School of Earth Sciences said: "With modern computer technology, such as CT scanning and digital visualisation, we now have powerful tools at our disposal, with which we can get a step closer to restore fossil animals to their life-like condition."

The focus of the study was the skull of *Erlikosaurus andrewsi*, a 3-4m (10-13ft) large herbivorous dinosaur called a therizinosaur, which lived more than 90 million years ago during the Cretaceous Period in what is now Mongolia.

Co-author Professor Emily Rayfield said: "The [fossil skull](#) of *Erlikosaurus andrewsi* is one-of-a-kind and the most complete and best preserved example known for this group of dinosaurs. As such it is of high scientific value."

Using a digital model of the fossil, the team virtually disassembled the skull of *Erlikosaurus* into its individual elements. Then they digitally filled in any breaks and cracks in the bones, duplicated missing elements and removed deformation by applying retro-deformation techniques, digitally reversing the steps of deformation. In a final step, the reconstructed elements were re-assembled. This approach not only allowed the restoration of the complete skull of *Erlikosaurus*, but also the study of its individual elements.



Comparison between originally preserved and digitally restored skull of the Cretaceous dinosaur *Erlikosaurus andrewsi*. Credit: *Journal of Vertebrate Paleontology*

However, using digital models has further advantages. Co-author Dr Lawrence Witmer said: "Digital models allow the study of the external and internal features of a fossil. Furthermore, they can be shared quickly amongst researchers – without any risk to the actual [fossil](#) and without having to travel hundreds or even thousands of miles to see the original."

Co-author, Dr Lindsay Zanno added: "Therizinosaurs, with their pot bellies and comically enlarged claws, are arguably the most bizarre theropod dinosaurs. We know a lot about their oddball skeletons from the neck down, but this is the first time we've been able to digitally dissect an entire skull."

The team consisted of Dr Stephan Lautenschlager and Professor Emily Rayfield from the University of Bristol, Professor Lindsay Zanno from the North Carolina Museum of Natural Sciences and North Carolina State University, Dr Perle Altangerel from the National University of Ulaanbaatar and Professor Lawrence Witmer from Ohio University.

The research was funded by a research fellowship to Dr Lautenschlager from the German Volkswagen Foundation, hosted by Professor Rayfield, and grants from the National Science Foundation to Professor Witmer.

More information: 'Cranial anatomy of *Erlikosaurus andrewsi* (Dinosauria, Therizinosauria): new insights based on digital reconstruction' by Lautenschlager, S., L.M. Witmer, P. Altangerel, L.E. Zanno and E.J. Rayfield in the *Journal of Vertebrate Paleontology*.

Provided by University of Bristol

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