Scientists find evidence of fossilized dinosaur brains

by Ryan Bebej

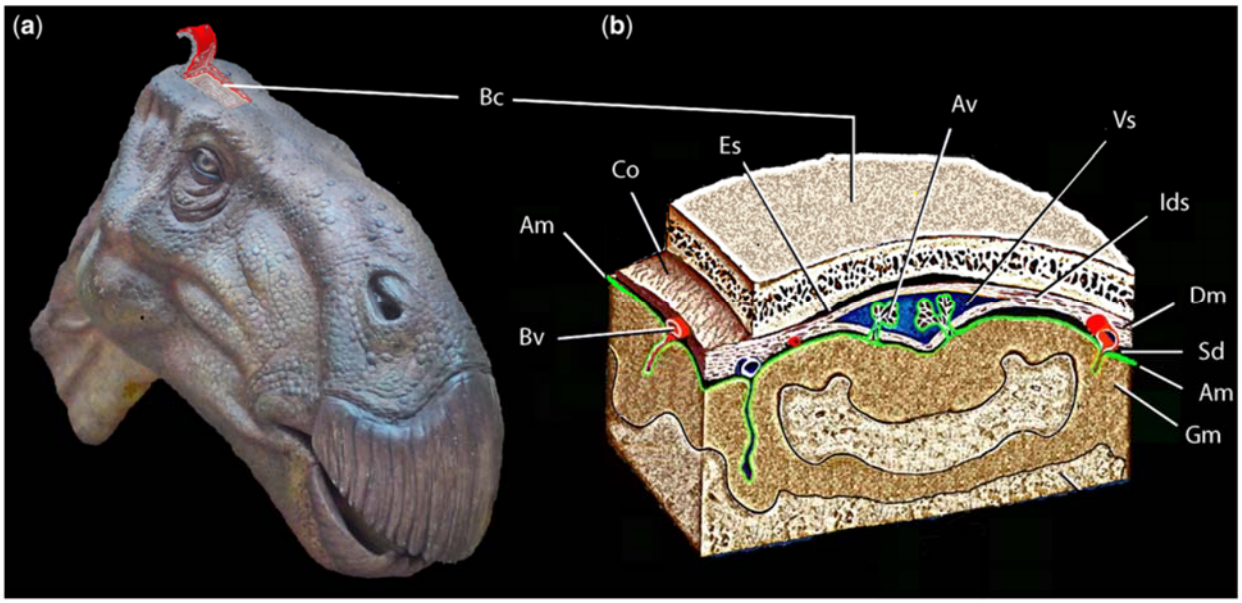

Image from MD Brasier, DB Norman, AG Liu, LJ Cotton, JEH Hiscocks, RJ Garwood, JB Antcliffe, and D Wacey. 2016. Remarkable preservation of brain tissues in an early Cretaceous iguanodontian dinosaur. Geological Society, London, Special Publications 448: 1-16.

At the 76th Annual Meeting of the Society of Vertebrate Paleontology in Salt Lake City on October 27, Dr. David B. Norman of the University of Cambridge described what he and his colleagues believe to be the first known preserved brain tissues from a dinosaur.

You read that right: fossilized dino brains.

Soft tissues like the brain are generally subject to fairly rapid decay and are only preserved in the fossil record under exceptional conditions. Studies of brain anatomy in fossil vertebrates are normally limited to the study of endocasts—structures that form when sediment fills in the spaces inside the skull that are left behind after the brain decays. Endocasts are fairly common in the fossil record and provide a rock-like approximation of the size and shape of a creature's brain.

The fossil under study was found twelve years ago in southern England by Jamie Hiscocks in sediments dated to about 133 million years old (early Cretaceous). The late Dr. Martin D. Brasier from the University of Oxford confirmed that the fossil was an endocast, which Norman determined belonged to a dinosaur similar to *Iguanodon* based on its size and shape. But the research team noticed some unusual details preserved on the surface of the specimen. Further examination using scanning electron microscopy (SEM) and micro-computed tomography (μCT) scans revealed mineralized structures that resemble meninges (the tough fibrous membranes which support the brain and spinal cord in life), strands of collagen, blood vessels, and some of the folds and grooves on the surface of the brain itself. These details confirm hypotheses about brain structure in dinosaurs that were based on comparisons of

modern bird and crocodile brains. However, the fossil does not provide any additional insights into dinosaur brain structure that were not already suspected.

Not everyone will be immediately convinced that the features on this endocast are the fossilized remains of soft tissue. North Carolina State University paleontologist Mary Schweitzer—one of the foremost experts on the preservation of soft tissues in vertebrate fossils—has faced an uphill battle since she first reported evidence of suspected blood vessels and blood cells in the femur of a *Tyrannosaurus rex* back in 2005 [Editor's note: See the further reading selections for more BioLogos material on this subject, including an interview with Schweitzer]. In the past decade, she and others have worked to eliminate other explanations for the possible soft tissue structures preserved in dinosaur bones. With each passing study that crosses different possible explanations off the list, more and more researchers are coming to agree that these types of tissues can be preserved in fossils when the conditions are right. The unique endocast described by Brasier and colleagues will need to stand up to the same type of scrutiny before it will be widely heralded in the paleontological community as the fossilized remains of actual neural tissue.

Regardless, this type of specimen should generate excitement. This fossil prompts questions about the exceptional conditions that are necessary to preserve tissues that are normally subject to rapid decay. It raises the possibility that soft tissues may be able to be preserved in parts of the body where we would never expect to see them. It will motivate others to dive deep into the drawers of museum collections and pull out long forgotten fossils to see if any possible traces of soft tissue are preserved. It offers the possibility that the behavior of long extinct creatures can be investigated using new lines of evidence. This case can be an example of science at its best—a provocative hypothesis that generates further study to test the veracity of its claims and provides excitement about new ways to investigate the history of life on earth.

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