

# NEWS RELEASE

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## Dinosaur Fossil Bone Leads to Sex, Age Determinations

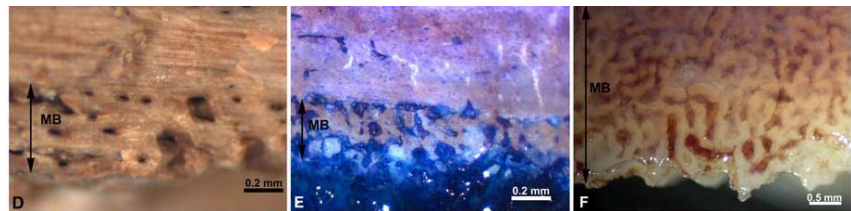
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It's a girl ... and she's pregnant!

Paleontologists at North Carolina State University have determined that a 68 million year-old *Tyrannosaurus Rex* fossil from Montana is that of a young female, and that she was producing eggs when she died.

The proof, they say, is in the bones.

In a case of a literal "lucky break," the scientists discovered unusual bone tissue lining the hollow cavity of the *T. rex*'s broken leg bone. In a paper published in the June 3 issue of the journal



Samples of medullary bone from *T. Rex* (D), emu (E) and ostrich (F).

*Science*, Dr. Mary Schweitzer, assistant professor of paleontology with a joint appointment at the N.C. Museum of Natural Sciences, and her technician, Jennifer Wittmeyer, along with colleagues at Montana State University, share their findings and say that the presence of this particular tissue provides evidence of the dinosaur's gender and a connection between the extinct giants and living birds, specifically ostriches and emus.

Schweitzer believes that the unusual tissue inside the *T. rex* bone is actually medullary bone: a thin layer of highly vascular bone that is found in present-day female birds only during ovulation. This estrogen-linked reproductive bone tissue is laid down inside the hollow leg bones of the birds and persists until the last egg is laid, at which time it is completely resorbed into the bird's body. Its formation is triggered by an increase in estrogen levels, and the temporary tissue provides the calcium necessary to form eggshells. Medullary bone is only found in present-day female birds; no other egg-laying species – including crocodiles, the other living dinosaur relative – produces this tissue naturally.

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Because the dinosaur tissues didn't look exactly like pictures published of medullary bone in living birds like chicken and quail, Schweitzer's team compared the tissue from the femur of the *T. rex* to that taken from leg bones of more primitive ratites, or flightless birds, such as ostriches and emus. These birds share more features with dinosaurs than other present-day birds. They selected an ostrich and an emu in different stages of their laying cycles, when medullary bone is present.

Schweitzer viewed the tissues under both a light and an electron microscope, and found that the dinosaur tissues were virtually identical to those of the modern birds in form, location and distribution. Demineralization – the chemical removal of a bone's minerals in order to obtain organic material that is much easier to work with in a lab environment – of the samples revealed that the medullary bone from the ostrich and emu was virtually identical in structure, orientation and even color, with that seen in the *T. rex*.

Since only females produce medullary bone, its presence in the *T. rex* femur indicates that this fossil was a female, and probably one who died toward the end of her laying cycle. From a biological perspective, the tissue is another link between dinosaurs and living birds.

“The discovery of medullary bone in the *T. rex* is important because it allows us to objectively sex a dinosaur,” says Schweitzer. “It also adds to the robust support linking birds and dinosaurs and shows that their reproductive physiologies may have been similar. Hopefully we'll be able to identify features within dinosaurs that will help us determine the gender of our other fossils, and lead to more information about their herd structure or family groups.”

The N.C. Museum of Natural Sciences will soon become the new home of the cast of the thigh bone. “We're pleased to be able to provide a way for the public to see for themselves evidence that after millions of years, soft tissue can actually be preserved in dinosaur bone,” said Dr. Betsy M. Bennett, museum director. The cast will be placed in the museum's Paleo Lab along with the complete story of where it was found, how it was excavated and how Schweitzer discovered the unique tissue cells in the hollow.

The research was funded by NC State, the N.C. Museum of Natural Sciences and the National Science Foundation.

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**Note to editors:** An abstract of the paper follows.

## “Gender-specific Reproductive Tissue in Ratites and *Tyrannosaurus Rex*”

*Authors:* Mary H. Schweitzer and Jennifer L. Wittmeyer, North Carolina State University; John R. Horner, Montana State University

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**Abstract:** Unambiguous indicators of gender in dinosaurs are usually lost during fossilization along with other aspects of soft tissue anatomy. We report the presence of endosteally derived bone tissues lining the interior marrow cavities of portions of *Tyrannosaurus rex* (MOR 1125)

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hindlimb elements, and hypothesize that these tissues are homologous to specialized avian tissues known as medullary bone. Because medullary bone is unique to female birds, its discovery in extinct dinosaurs solidifies the link between dinosaurs and birds, suggests similar reproductive strategies, and provides an objective means of gender differentiation in dinosaurs. |