

Reading

A fossil skeleton of a dinosaur called *Sinosauropteryx*, preserved in volcanic ash, was discovered in Liaoning, China, in 1996. Interestingly, the fossil included a pattern of fine lines surrounding the skeletal bones. Some paleontologists interpret the lines as evidence that *Sinosauropteryx* had feathers. However, critics have opposed the idea that *Sinosauropteryx* was a feathered dinosaur, citing several reasons.

First, the critics point out that the fine lines may not even represent functional structures of a living dinosaur, but rather structures that were formed after the animal's death. After the animal died and was buried in volcanic ash, its skin may have decomposed into fibers. The skin fibers then became preserved as lines in the fossil; the lines were misinterpreted as evidence of feathers.

Second, even if the fine lines are remains of real structures of a *Sinosauropteryx*, scientists cannot tell with certainty what part of the dinosaur's anatomy the structures were. Many dinosaurs had frills, ornamental fan-shaped structures growing out of some parts of their bodies. Some of the critics argue that the lines surrounding the skeleton are much more likely to be fossilized remains of frills than remains of feathers.

A third objection is based on the fact that the usual functions of feathers are to help animals fly or regulate their internal temperature. However, the structures represented by the lines in the *Sinosauropteryx* fossil were mostly located along the backbone and the tail of the animal. This would have made the structures quite useless for flight and of very limited use in thermoregulation. This suggests that the lines do not represent feathers.

Lecture

The evidence that the lines in the *Sinosauropteryx* fossil represent feathers is very strong; the arguments of the critics are unconvincing.

First, it's unlikely that the lines are a result of the decomposition of the dinosaur's skin. Because we don't see any such decomposition in the fossils of other animals buried at the same site. In fact, the fossils of many other animals buried at the site show evidence that the functional skin structures have been beautifully preserved in volcanic ash. The well-preserved condition of the other fossils makes it likely that the *Sinosauropteryx* lines are also well-preserved functional structures, possibly feathers, and that they are not fibers caused by decomposition.

Second, the idea that the lines represent frills. Well, there is an important chemical difference between feathers and frills. Feathers contain a great deal of protein called beta-keratin; frills, on

the other hand, do not contain beta-keratin. Our chemical analyses suggest that Sinosauropteryx structure did contain beta-keratin. So that indicates that the structures were feathers not frills.

Third, feathers can be used for other functions than flight and thermo regulation. Think of a bird like a peacock for example. The peacock has long colorful feathers in its tail and displays its tail in order to attract to mate. That's a distinct function of feather called display function. Recently, we've been able to do analysis on the Sinosauropteryx's structures that showed us that the structures were colorful. They were orange and white. The fact that they were color strongly supports the idea that they were feathers that these dinosaurs used for display.