

Oviraptor philoceratops Dinosaurs

Oviraptor philoceratops was a small bird-like dinosaur that lived about seventy-five million years ago, during the late Cretaceous period. In 1923, George Olsen of the American Museum of Natural History (AMNH) in New York City, New York, discovered the first Oviraptor fossilized skeleton on top of a dinosaur egg nest in the Gobi Desert, Mongolia. Because of the close proximity of dinosaur and nest, when Henry Fairfield Osborn president of the AMNH published on the discovery, he assumed that the Oviraptor had died attempting to steal the eggs. However, since the initial discovery, more Oviraptor adults, eggs, and a well-preserved embryo fossil have confirmed that Oviraptors were parents who sat on their nests, a behavior called brooding common among birds. The fossils of Oviraptor philoceratops, from eggs and embryos to adults, provide evidence about dinosaur growth, development, and reproductive behaviors.

The discovery of the first Oviraptor philoceratops occurred during one of the Central Asiatic Expeditions, a series of fossil hunting expeditions organized by Roy Chapman Andrews from the AMNH in the 1920s and funded by the AMNH. Olsen, one of the team, discovered the adult Oviraptor in a bed of red sandstone in Shabarakh Usu, Mongolia. The Central Asiatic Expedition team then took the fossil back to the AMNH to have it cleaned and examined. Paleontologist and president of the museum, Osborn, published an article on the specimen in 1924.

In that article, Osborn argued that the specimen was unique and deserved a new species designation. Osborn named the new species Oviraptor philoceratops, meaning egg seizer with a fondness for a species of beaked dinosaur, Ceratopsian eggs. There were four inches of sandstone separating the adult skull from the eggs, so Osborn hypothesized that the Oviraptor died in a sandstorm while attempting to rob the nest for the nutritious eggs. Osborn, along with the other members of the Central Asiatic Expedition, said that the eggs likely belonged to a different dinosaur species, like a horn-faced herbivore called Proceratops andrewsi. Proceratops fossils and their eggs were common in the area, but there were no exposed embryos in these eggs with which researchers could confirm or deny their species. As such, the reputation of the Oviraptor as an egg thief persisted for decades.

Oviraptor philoceratops was a dinosaur that resembled birds in many ways. The small dinosaur had a beak and a crest on the top of its head. Oviraptors' rib cages were similar to modern birds because they were rigid, a feature that scientists infer in the fossil record through the presence of protruding processes on each rib. While scientists have yet to recover conclusive evidence of features for this particular species, many of its closest relatives have left imprints, or trace fossils, of feathers surrounding their skeletons. Therefore, scientists claimed that the Oviraptor had feathers as well. into at least the first few decades of the twenty-first century, scientists had found Oviraptor fossils only in Mongolia.

In contrast to most dinosaur groups, Oviraptor eggs are relatively common in the fossil record. Scientists have used the eggs to study Oviraptors, including their classification, behavior, and growth patterns. In 1991, Karol Sabath from the Institute of Paleobiology of the Polish Academy of Sciences in Warsaw, Poland, and Konstantine Mikhailov of the Paleontological Institute of the Russian Academy of Sciences in Moscow, Russia, began to question the association between Proceratops and these elongated eggs. In 1993, a team led by Mark Norell, from the AMNH, confirmed Sabath and Mikhailov's suspicions by recovering the skeleton of an embryo in one of these eggs. The team found the embryo fossil in the Gobi Desert, at a site called Ukhaa Tolgod. The largely complete embryo was one of a large nest that had approximately twenty eggs. The fossil embryo, was partially surrounded by red sandstone, heavily weathered eggshell, and rock matrix, much like the

surroundings of Olsen's fossils.

Norell and colleagues published a description of the find in 1994. The egg was one of many from a weathered nest largely destroyed by wind and rain. The eggs within this nest arranged in a semicircle pattern with numerous eggshell fragments in the nest area, which indicated that other eggs had been in the nest, but were destroyed by weather. Norell described one eggshell and its surrounding matrix, which had weathered away so that it exposed most of a fossilized embryo.

The egg with the incased embryo measured approximately twelve centimeters long by six centimeters wide. This measurement was an estimate, as the overlap of certain eggshell fragments indicated that the shell suffered some sort of pressure during fossilization and was slightly deformed. The fetal dinosaur was preserved with the limb bones articulated in the proper place rather than jumbled around in the egg. The skull was in view, including the braincase, as was much of the rest of the skeleton including an arm, the pelvis, a leg, and much of the spine and ribs. Additionally, Norell's team discovered part of an articulated foot, attached to a piece of eggshell, a few centimeters from the embryo, and inferred that it may be from the same individual.

The Oviraptor embryo lay in a curled position with its head tucked near its knees. Norell noted that the bones were well ossified, suggesting that the embryo was late in development and close to hatching. Based on several features present in the skulls and skeletons of adult Oviraptors, Norell confirmed that this embryo belonged to a young Oviraptor philoceratops. Features of the embryo that Norell relied on for the species designation were the shape of the skull, including the vertical nature of the premaxillae and the arch of the braincase as it descended in the back of the skull. The postcranial skeleton of the embryo also displayed features similar to adult Oviraptors, including the shape of the wishbone.

The Oviraptor embryo provided information about bone growth in young dinosaurs as well as evolutionary relationships of dinosaurs and birds. One example is the fusion of the jawbones. The jawbones in adult Oviraptors fuse at the midline, or the mandibular symphysis. The embryonic bones indicated that in young Oviraptors, these bones are not yet fused. Scientists argued that this trait of the timing of fusion indicated the evolutionary relationship between Oviraptors and modern birds, because for some modern birds the mandibular symphysis fuses before the bird hatches, while in others it remains unfused until after the bird hatches.

Scientists used the fossils to study the reproductive behavior of these avian dinosaurs. The egg containing the embryo was identical in shape, size, and texture to the eggs that Olsen had discovered underneath the original Oviraptor adult skeleton. Therefore, Norell concluded that the Oviraptor was not an egg thief as Osborn had presumed, but instead a parent, either incubating or protecting the clutch. This conclusion sparked scientists to discuss the evolutionary origin of bird-like reproductive behaviors in dinosaurs.

After the discovery of the Oviraptor embryo, scientists collected specimens for a joint Mongolian Academy of Sciences and American Museum of Natural History Paleontological Project. They recovered another fossil, an additional adult Oviraptor over a clutch. The find confirmed their hypotheses about the Oviraptor's brooding behavior. The new specimen was more complete than any other Oviraptor fossil, and it enabled scientists to determine the exact position of the adult's stance over the nest. Based on a lack of disturbance in the surrounding sediment, scientists said that this Oviraptor's position was such that the pelvis centered on the nest, the front shoulder made contact with the nest, and the arms wrapped around toward the back of the nest. Scientists argued that this position is further evidence for the Oviraptor having feathers, as do Oviraptor's closest described dinosaurian relatives, *Citipati osmolskae*. Scientists have found *Citipati osmolskae* fossils that indicated those dinosaurs used feathers to incubate their nests.

Sources

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