PALEONTOLOGY

Dinosaur Embryos Spark Excitement, Concern

CAMBRIDGE, U.K.—A stunning exhibition of more than 20 fossilized dinosaur and tortoise eggs, which opened here this week at the University Museum of Zoology, is leaving many paleontologists breathless with excitement. Many of the eggs, from an exceptionally rich fossil source in China discovered 3 years ago, have been painstakingly etched away to reveal the bones of the embryos they contain. "I never was so amazed in all my professional life. ... I think they are the most exciting fragment of the dinosaur world that humankind has seen," enthuses Dale Russell, dinosaur specialist at the Canadian Museum of Nature in Ottawa. "They are very, very spectacular," agrees vertebrate paleontologist Philip Currie of the Tyrrell Museum of Paleontology in Drumheller, Alberta.

But for many, the academic excitement is tempered with concern that these unusually well-preserved embryos are being exhibited in order to attract a purchaser. With the sanction of Beijing academics, the specimens were exported from China through agents 2 years ago by a consortium of fossil traders, one of whom—paleontology technician Terry Manning of Leicester, U.K.—has since been laboriously preparing the intricate embryo bones. Having revealed the potential scientific value of its treasure, the consortium is now seeking a private sponsor who will buy the eggs and donate them to an academic institution, along with funds providing for several years of formal research on the specimens.

That prospect presents many scientists with a dilemma: While they want to study the find, they are concerned that such a deal might "lend scientific credibility to what is essentially a commercial exercise," says geologist David Unwin of the University of Bristol, U.K. Fellow Bristol geologist Mike Benton says that although "there's no question of the fantastic scientific importance of these embryos ... my personal attitude is don't touch them with a bargepole."

Eggs containing embryo remains have so far proved extremely rare, so until now, scientists have opted to examine them using noninvasive techniques such as x-rays and CT scans—with mixed results. Manning uses a more direct method: He chips away some of the fossil eggshell and makes a tiny bore hole inside the egg to find out whether it contains bony material before beginning the etching process. "Our screening process has proved very successful," he says.

T. W. MANNING

Baring all.
Segnosaur egg, 7.5 cm long, etched by acetic acid to reveal jumble of bones. Skull is visible at center-right.

The fossilized eggs, ranging in size from 4 to 50 centimeters and dating from the mid to Late Cretaceous period—from 65 to over 100 million years ago—represent at least three different dinosaur species, as well as a tortoise previously unknown so early in the fossil record. To expose the embryos, Manning laboriously etched away the mineral rock from around the bones with weak acetic acid. "During one 10-hour day of working [on two eggs], at best I'll remove 4 grams of silt," says Manning. Then he rinsed the specimen thoroughly for many hours and painted the newly exposed embryonic tissue with liquid epoxy resin, which dries on and protects the tissue from the acid in the next round of etching.

In early 1993, when Manning realized his painstaking work was revealing exciting results, he contacted Arthur Cruickshank, vertebrate paleontologist at Leicester University and the Leicestershire Museum. Cruickshank decided to help exhibit the specimens because, he says, "the material is so important."

The most visually exciting embryo is that of a segnosaur (also called a therizinosaur), where a skull is clearly identifiable among a jumble of bones in an egg about 7.5 centimeters long. This egg contains the most complete set of bones representing this species. Unwin, who was involved in making the segnosaur identification, says, "I saw these [eggs] a year ago. ... There was obviously something spectacular." Manning has more than 100 such eggs in his collection, which have yet to be studied.

Another 4-centimeter spherical egg was recently identified at a seminar at the Museum of Zoology as an emyid pond-tortoise embryo. Fine details in the skeleton are well preserved, including claws, a bone in the middle ear, and a skull the size of a fingernail. The most interesting aspect of this egg is that, if the Cretaceous dating of the fossil is correct, at over 65 million years it represents the earliest known specimen of this modern type of tortoise, which was previously thought to have appeared only 40 million years ago. Yet more of the fossils have been tentatively identified as ankylosaur embryos, in cylindrical eggs each about 20 centimeters long.

Paleontologists are also curious to visit the source of Manning's specimens because of the high proportion of detectable embryos they contain. Fossil experts think that normally egg contents leak, or decompose until the bones dissolve, or are eaten by predator dinosaurs before fossils are formed. But because these eggs were bought rather than discovered by a scientific expedition, the exact site remains to be scientifically documented. "The vital ingredient, ... the provenance, ... is lacking," says David Norman, curator of the Sedgwick Museum of Geology in Cambridge.

In spite of the controversy surrounding the eggs, most scientists do not want to see them lost to science. "If you work on these eggs and describe them, they should be deposited in a museum," says Karl Hirsch, vertebrate paleontologist at the Museum of Colorado in Boulder. The consortium, however, is looking for a backer to provide funds in the region of $6 million for Manning to spend a further 6 years preparing the eggs, which would be donated to, and studied by, an academic institution. Most material in academic collections is bought from traders, as Unwin admits: "The commercial side ... provides the specimens we work on," but the consortium's asking price raises the stakes above most public pockets.

Fossil trader Simon Cohen, a member of the consortium that owns the eggs, believes that commercial traders and academics "serve useful and symbiotic functions to each other," because traders have more time and money than the academics have to go on fossil-collecting expeditions. Cohen stresses that traders, on the whole, "are a respectable lot. ... We are motivated by the same fascination with the subject." Cruickshank is pragmatic about the situation: "If we hadn't had the trade, we wouldn't have had the material, and we wouldn't have had the knowledge."

–Claire O'Brien

Claire O'Brien is a science writer in Cambridge, U.K.