

Boat and beetle beside the pyramids

When a joint Egyptian and American team last October drilled into the ancient pit beside the Great Pyramid of Cheops in Egypt, one of their big hopes was to obtain samples of 4,600-year-old air, dating back to when the pit was sealed during the time of the pharaohs. (SN: 9/12/87, p.172; 11/7/87, p.295). That hope was dashed when a video camera lowered into the pit showed a live beetle crawling on the decaying timbers of a disassembled wooden boat.

After extensive testing of samples taken from the pit, researchers determined that desert air from outside is constantly mixing with air inside the pit. The age of the inside air is between two months and a year, says Pieter Tans from the National Oceanic and Atmospheric Administration, who was a member of the team. "From our standpoint, scientifically, it was a complete bust," says Tans.

From the archaeological perspective, however, the project was a success, says Farouk El-Baz, head of the remote-sensing department at Boston University. Funded by the National Geographic Society and the Egyptian Antiquities Organization, the project members probed the inside of the pit with \$300,000 worth of high-tech equipment that would not disturb its contents. The gadgets included ground-penetrating radar, special drills, miniature remote-controlled cameras and an air lock to keep outside air from contaminating the pit (in case the pit had been hermetically sealed.) El-Baz believes this type of equipment may be useful in future archaeological projects in Egypt, Mexico, Guatemala and elsewhere.

The project also confirmed that an ancient boat is resting in the pit. In 1954, the first such boat was found in almost perfect condition in a nearly identical neighboring pit. Egyptian archaeologists removed the wooden pieces and reassembled this 142-foot-long craft, which is now in a museum near the pyramid. At present the Egyptian government has no plans to remove the second boat, which appears to have decayed more than the first. After taking air samples, the team photographed the chamber, inserted temperature and humidity gauges and resealed the hole.

The air samples revealed that the pit contains almost double the amount of carbon dioxide present in the atmosphere. This gas is produced by organic decay, which has eaten away about 4 tons of wood, or 10 percent of the boat's weight.

Outside air, which feeds the decay, apparently enters the chamber through the porous limestone walls and ceiling. Because air can travel through the rock, Tans does not believe either pit was ever hermetically sealed, and he cannot explain why the wood of the first boat survived the centuries so well.

Dinosaur embryos: The story they tell

More than 60 years after scientists in the Gobi Desert made the first discovery of dinosaur eggs, paleontologists have completed the first study of dinosaur embryos preserved inside their eggs. These embryos, found in Montana four years ago, are revealing the diverse kinds of behavior that marked the early years of dinosaur life. While some dinosaurs appear to have been early developers that could walk about immediately after hatching, others remained in the nest and relied on doting parents for sustenance, report John R. Horner of the Museum of the Rockies in Bozeman, Mont., and David B. Weishampel of Johns Hopkins University in Baltimore.

The scientists, whose findings appear in the March 17 NATURE, studied 19 embryos of a previously undiscovered and unnamed type of hypsolophodontid dinosaur, along with seven hadrosaur embryos. The hypsolophodontids, *Orodromeus malerkai*, were herbivorous dinosaurs slightly larger than human beings, while the herbivorous hadrosaurs, *Maiasaura peeblesorum*, reached 8 meters in length.

According to Horner, the hypsolophodontid embryos, found together in a clutch of unhatched eggs, had bones and joints that were almost fully developed. In contrast, the long bones of the hadrosaur embryos were capped by incomplete joints, even though they were closer to hatching than the hypsolophodontid specimens.

These observations support earlier evidence that newly hatched hadrosaurs remained nest-bound until they grew to sufficient length and developed fully formed joints. Horner had previously proposed this kind of behavior because he had found the bones of baby hadrosaurs resting in a nest-like structure. In the hypsolophodontid nests, however, he had found the unbroken bottom halves of eggshells. With their fully developed joints, these animals probably left the nest right after hatching, Horner says. Otherwise, they would have crushed their shells.

Icy voyage into Antarctic past

Protected by a Danish support ship that nudged aside threatening icebergs, scientists on the most recent leg of the Ocean Drilling Project spent two months in the waters off Antarctica pulling up sediment cores from the ocean bottom. Their cores are leading researchers to revamp scientific theories about the Antarctic's prehistoric shift from a temperate region laced with rivers and forests to its present state as the icebox of the world.

Results from previous drilling projects have suggested that ice sheets started to spread over the eastern end of the Antarctic continent in the early part of the Oligocene period, 35 million years ago. But the sediments from Leg 119 indicate that extensive ice sheets were already covering East Antarctica by 37 million years ago and must have started growing before that time. Moreover, the scientists found evidence that tentatively suggests the ice may date back as far as 42 million years ago.

Part of the evidence comes in the form of glacial till, or sand and pebbles ground up by the action of glaciers. When this till appears in the sedimentary record, it alerts scientists to the presence of ice on the continent, says John Barron, of the U.S. Geological Survey in Menlo Park, Calif., who was co-chief scientist of Leg 119, which ended in February. As well, scientists are examining sections from more northern drill sites that document changes in currents at the ocean bottom. Caused by the cooling effect of the ice, these currents provide indirect information about Antarctic ice.

Barron and his colleagues also found signs that the edge of the ice shelf near Prydz Bay has advanced and retreated over the eons by as much as 140 kilometers. This frequent melting and refreezing supports a controversial theory that sea levels have often risen and dropped through time (SN: 3/7/87, p.154).

As an added bonus, the Leg 119 scientists pulled up a unique section of rock from the Cretaceous-Tertiary boundary, formed 65 million years ago, that will allow paleontologists to trace the history of marine life as it slowly rebounded from the mass extinctions for which that boundary is famous. What excites the researchers about this 15-centimeter-thick section is that the sedimentary rocks in it are well layered. In many marine sections of the boundary, ancient worms and other animals have made a mess of the stratigraphic record by rearranging the layers before the sediments could harden into rock.

Analysis of this newly found section aboard the drillship JOIDES Resolution indicates that tiny plants called calcareous nannoplankton recovered slowly from almost complete extinction at the boundary. Land-based studies of the section should tell more about the evolution of new life forms, as well as help explain what kinds of climatic stress were responsible for the mass extinctions (SN: 3/12/88, p.164).