Fossil skeleton sets seabird size record

Extensive fossil remains of the largest known seabird, weighing close to 90 pounds with a wingspan of between 18 and 19 feet, have been chipped out of a 30-million-year-old block of hardened sand and mud and identified by scientists at the Charleston (S.C.) Museum and the Smithsonian Institution in Washington, D.C.

The bird represents a new species of an extinct family known as "bony-toothed birds," or pseudodontorns, that lived from 50 million to 5 million years ago, says Smithsonian paleontologist Storrs L. Olson. Pseudodontorns are thought to be related to modern pelicans and cormorants. They appear to have glided over the ocean with little or no flapping of the wings, much as albatrosses – the largest living seabirds, weighing 22 pounds with a wingspan of up to 11 feet – now do.

Remains of the bony-toothed birds have been found throughout the world, but their fragile bones do not preserve well. "Usually just the ends of bones have been found," says Olson. "A few fairly complete skulls have turned up as well as a two-dimensional impression in rock." The new fossil find includes virtually the entire skull, a complete lower jaw, most of one wing, all of one leg with one toe bone and fragments of the clavicle, or wishbone. It is a much larger creature than any previously known pseudodontorn.

"This specimen will permit a reevaluation of all other species of pseudodontorns described from single or isolated remains," says Olson. In most places where these fossils are found, there appears to be a bigger and a smaller pseudodontorn species, he adds, "but up to now we haven't had any way to know which feet go with what skull."

The structure of the large bird's wing and shoulder bones indicates that it could raise and lower its wings, but the rotational movement necessary to flap the wings was restricted. Pseudodontorns appear to have glided long distances using oceanic winds. The wing construction of the pseudodontorns was similar to that of albatrosses, notes Olson, but the pseudodontorns probably possessed longer necks.

The bony "pseudo-teeth" of the specimen were intact and, in some cases, were as long as three-quarters of an inch. Although lacking the dentin and enamel of real teeth, the tooth-like bones may have enabled pseudodontorns to feed on soft marine life, such as squids, and possibly fish, says Olson. No other known group of birds, alive or extinct, has bony teeth.

Several anatomical features, however, link pseudodontorns to modern pelicans. For example, says Olson, the two groups of birds have salt glands located between the eyes and the skull, whereas the salt glands on most other seabirds – including albatrosses – are found in deep grooves on top of the skull.

"We simply don't know why these birds became extinct," says Olson. Their demise, he suggests, may have been related to changes in ocean currents and wind patterns that curtailed their movement. Another possibility is that their nesting areas along coastlines and island shores were overrun by competing animals, such as seals. "But this is pure speculation," adds Olson.

The new specimen was recovered in a block of hardened sand and mud excavated in 1984 during construction of an airport in Charleston. Fragments of another, smaller pseudodontorn were visible on the surface of the block, but the extensive skeleton it encased was not revealed until Smithsonian scientists began to chip away the hardened material early this year. Olson and his colleagues plan to return to the South Carolina site, which they believe may once have been a large nesting ground for pseudodontorns. *– B. Bower*

Pieces of a polyomino puzzle

Polyominoes, which are the basis for thousands of mathematical puzzles, are shapes that cover connected squares on a checkerboard. One of the most intriguing of such puzzles involves proving that polyominoes of a certain shape can be laid down to form a complete rectangle. Recently, software engineer Karl A. Dahlke of AT&T Bell Laboratories in Naperville, Ill., combining perseverance with clever computer programming, managed to solve two particularly perplexing versions of this problem – ones that for nearly 20 years had defeated the best efforts of scores of amateur and professional mathematicians (SN: 9/20/86, p.186).

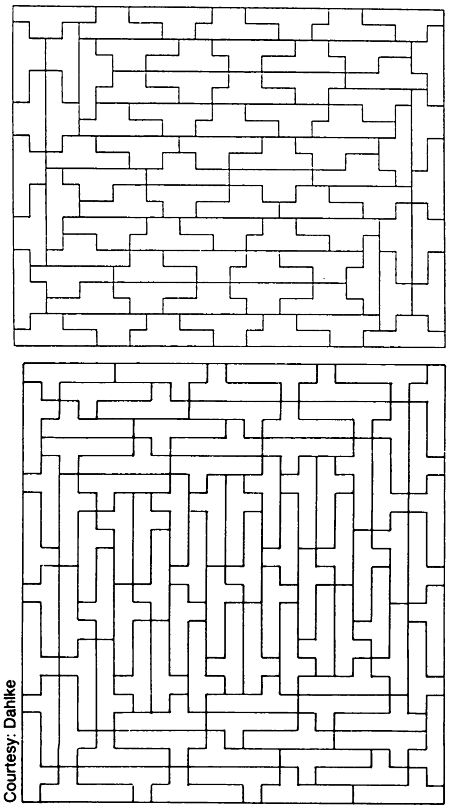
Vince Streff/AT&T Bell Labs

Karl Dahlke

"I was amazed," says mathematician Solomon W. Golomb of the University of Southern California in Los Angeles, who in 1954 introduced the term "polyomino." Golomb has been exploring polyomino properties and proposing polyomino puzzles ever since. "A lot of very bright people have worked on [the problem]," he says. "This is a noteworthy accomplishment."

Dahlke, who is blind, first learned of the puzzles earlier this year in an audio edition of Science News. Dahlke spent several months working on the puzzles in his spare time. First, he tried proving that the problem has no solution. Because that approach didn't seem to lead anywhere, he started looking for an answer but kept running into dead ends. "I took so many different avenues," he says.

Finally, Dahlke decided to program his personal computer to search for an answer systematically. Dahlke's computer is equipped with a speech synthesizer that converts the computer's output into sound. It took the addition of several programming tricks designed to circumvent time-consuming situations, in which the computer was trapped in endlessly repeating patterns, before Dahlke found his two minimum-area rectangles (see illustrations).



Courtesy: Dahlke

Solving a tiling problem.

"It turns out that the size of the solutions is clearly a little bit beyond what people could easily do by hand," says Golomb, "but fortunately, it's within the range of what you can find on a personal computer."

"I'm no Einstein," says Dahlke. "Maybe anyone with a micro, some perseverance and a little bit of geometric knowledge could have done it. But I did it, and it's a pretty thing." Dahlke is ready to try more polyomino puzzles. He also dreams of the day when he'll get a chance to go back to college to study mathematics at the graduate level. *– I. Peterson*