A mouth that only a dentist could love

In the world of fossils, teeth are often the most expressive part of the body. The serrated daggers of *Tyrannosaurus rex* recount a life spent ripping through flesh. The broad molars of an ice age mammoth describe a steady diet of plants. But no mouth speaks as clearly as the bizarre dental battery of *Pterodaustro*—a South American flying reptile from the Cretaceous period.

With 1,000 needle-thin bristles packed along its lower jaw, *Pterodaustro* had a sieve for a smile. Although the purpose of these bristles was evident—they were ideal for filtering tiny animals and plants from water—paleontologists had long wondered whether they were actually teeth or a hornlike material similar to the baleen of blue whales.

Now, detailed analysis of *Pterodaustro*'s mouth reveals it had the real thing.

"These are true teeth. They have enamel and dentine and the structure of teeth. To some extent, they were flexible, which is interesting because enamel is typically rigid," says Luis M. Chiappe, a paleontologist at the American Museum of Natural History in New York City. Chiappe and colleague Anusuya Chinsamy of the South African Museum in Cape Town describe their study in the Jan. 18 NATURE.

Specimens of *Pterodaustro* were first discovered during the late 1960s by paleontologist José F. Bonaparte, working in the province of San Luis, Argentina. The pelican-sized pterosaur has a long beak that curves upward at the tip. The upper jaw has small, rounded teeth that may have helped crush animals caught in the basket of teeth in the lower jaw.

Fossils show the long teeth of the lower jaw leaning in various directions, indicating that they were pliable. Paleontologists therefore wondered whether the teeth were made of keratin—the same protein found in fingernails and baleen, but nobody had sliced open a fossil to analyze it.

During excavations in 1994, Chiappe collected new specimens of *Pterodaustro* and sacrificed one for microscopic analysis. Thin sections of the teeth revealed a structure typical of vertebrate dentition.

Other pterosaurs also evolved comblike dental arrangements useful for straining water, but neither they nor any other vertebrate developed as many teeth as *Pterodaustro*. "This is certainly one of the most peculiar dental specializations that we know of," says Chiappe.

The *Pterodaustro* of San Luis lived along a large inland lake and may have flocked together like birds, judging from the number of individuals found in the same deposit. Chiappe suggests that the flying reptiles may have behaved somewhat like flamingos, whose mouths have a different type of filtering structure, not made of teeth.

Kevin Padian, a paleontologist at the University of California, Berkeley, agrees with the analogy to flocking birds. Last year, he and C. Michael Bell of Cheltenham and Gloucester College of Higher Education in England reported finding thousands of scattered pterosaur bones at a site in Chile. They suggested that the bone bed formed when flood waters swept over a pterosaur rookery.

— R. Monastersky

New pancreatic cancer gene identified

Investigators have discovered a gene whose inactivation appears to contribute to the deadly transformation of pancreatic cells into cancer cells.

Cancer of the pancreas ranks as the fifth deadliest cancer in the United States, killing more than 25,000 people a year. The newfound gene probably plays a role in about half of those deaths, says Scott E. Kern of Johns Hopkins University Medical Institutions in Baltimore.

Although genes on other chromosomes have been linked to pancreatic cancer, investigators suspected that a gene on chromosome 18 was also involved: In about 90 percent of cases, pancreatic tumor cells lack part of one of the cell's two copies of that chromosome. "Chromosome 18 stood out as an unexplained and important player," says Kern.

To narrow the region in which a cancer gene might exist, the investigators began to determine the parts of chromosome 18 missing from patients' cancer cells. Four of their patients lacked the same small region on both copies of their chromosome 18.

"If you get hit with lightning four times, you're probably standing near a tree or lightning pole. We quickly realized we were in the right area," says Kern.

Within that small region, the investigators unearthed a gene they call *DPC4*. The exact function of the protein encoded by *DPC4* remains a mystery, although it resembles proteins identified in fruit flies and earthworms, the researchers report in the Jan. 19 SCIENCE. Those proteins appear to belong to a family of molecules active in controlling the proliferation of cells, they say.

That possible function, and the observation that both copies of the gene are deleted in many patients' cancer cells, led the researchers to conclude that *DPC4* is a new member of a growing class of genes called tumor suppressors.

Researchers have learned that if chromosomal deletions or other genetic alterations rob a cell of the function of a tumor suppressor gene, that cell can ignore the strict regulations on cell growth and division that the body ordinarily imposes. This cancerous transformation can only occur if both copies of the tumor suppressor gene are silenced.

After determining the DNA sequence of *DPC4*, Kern and his colleagues discovered that some pancreatic cancer patients who were obviously missing one copy of the gene had small mutations in the other copy.

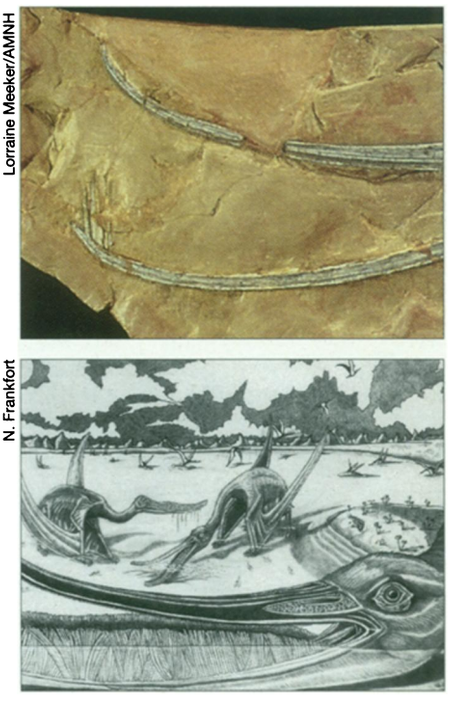
Yet not every person with cancer of the pancreas had *DPC4* problems. "There seem to be other pathways by which this cancer occurs," says Kern. He also suggests that other types of cancers, such as bladder and colorectal, may result from the loss of *DPC4*.

To determine whether *DPC4* is indeed a tumor suppressor, investigators need to add a functioning *DPC4* gene back into cancer cells that are missing both copies of the gene and see if the cells return to a noncancerous state, says Nick R. Lemoine of the Imperial Cancer Research Fund in London.

Both he and Kern suggest that the discovery of *DPC4* will someday help physicians battle what is one of the most aggressive and untreatable forms of cancer. By the time most patients have been diagnosed with pancreatic cancer, notes Lemoine, the disease has already spread to other parts of the body.

"The more [genes involved in pancreatic cancer] we identify, the better position we will be in for screening, diagnosis, and, ultimately, therapy," says Lemoine.

— J. Travis



Lorraine Meeker/AMNH

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Fossil (top) with few teeth remaining at far left. Pterodaustro *shown sieving for small crustaceans in a lake (bottom).*