Bird fossil reveals history of flight

Photos: G.F. Kurtz/NATURE.

In Las Hoyas fossil (left), coracoid (c) is bird-like shoulder bone. Pygostyle (py), part of the tail, is at end of vertebrate column. Feather fossil (below) may have belonged to the Las Hoyas bird.

Spanish and Argentine paleontologists have discovered a fossil bird that represents an important link between the oldest known bird and all modern birds. The bones of this creature, which would have been no bigger than a robin, are filling in evolutionary details about the early avian journey from ground to sky.

Found in the Las Hoyas limestone outcrop in Cuenca, Spain, the fossil dates back to the early Cretaceous period, approximately 120 million to 130 million years ago. The oldest bird known from the fossil record is Archaeopteryx, which has been found in 150-million-year-old formations.

"The new fossil, reported here, represents a previously unknown level in the organization of birds, intermediate between Archaeopteryx and later birds," according to the discoverers of the Las Hoyas bird, J.L. Sanz of the Autonomous University in Madrid, J.F. Bonaparte of the Argentine Museum of Natural Science in Buenos Aires and A. Lacasa of the Institut d'Estudis Ilerdencs in Lleida. The researchers report their find in the Feb. 4 NATURE.

Although the fossil lacks a skull, the rest of the specimen is relatively complete. The bird had primitive pelvic bones and hind limbs, but displays some more modern adaptations that are particularly important in flight. Most notable of these characteristics is a bird-like coracoid – a bone in the shoulder that helps translate muscular force into the power stroke of a wing. And at the end of the vertebrate column, the fossil has a bone called a pygostyle, which is the skeletal basis of an avian tail.

Because it combines primitive and modern characteristics, say the researchers, "the new fossil suggests that the early evolution of birds was firmly and rapidly influenced by the requirements of flight."

According to vertebrate paleontologist Joel Cracraft, who comments in the same issue of NATURE, the find "clarifies our knowledge of character evolution and provides important new interpretations regarding the early diversification of birds."

Cracraft, from the University of Illinois in Chicago, told SCIENCE NEWS that the Las Hoyas limestone formation is the type that often yields many fossils. "There's a good possibility of finding more of these," he says. – *R. Monastersky*

Prenatal toxoplasmosis tests: Medical advances, backward policy?

Toxoplasma gondii is a widespread parasite infecting, among others, about 35 percent of the U.S. population and up to 80 percent of Parisians. Most of these people are unaware of their infection because they have healthy immune systems to keep the parasite at bay. But fetuses, with their underdeveloped immune systems, are not so lucky. Of women who first become infected with the parasite during pregnancy, 50 percent pass it on to the fetus. And depending on the time of infection, congenital toxoplasmosis can cause death, mental retardation, epilepsy or blindness. In most cases the infected child appears healthy at birth; the first symptoms may arise anytime from a few months to nine years later.

In light of these serious repercussions, France and Austria have mandated prenatal testing for *T. gondii*. And as evidenced by a recent study of 746 infected pregnant women, French researchers in particular have come far in developing accurate prenatal toxoplasmosis tests – including blood and amniotic fluid tests and ultrasound examination of the fetal brain – for both mother and fetus. Such tests enable patients to make more informed decisions about whether or not to terminate a pregnancy, Fernard Daffos of the Hôpital Notre Dame de Bon Secours in Paris and his colleagues write in the Feb. 4 NEW ENGLAND JOURNAL OF MEDICINE.

Prenatal tests also give physicians a chance not only to minimize the parasite's effects but also to protect the fetus from infection in the first place. Daffos's group reports some success in treating infected fetuses with antibiotics while in the womb and concludes that "prenatal therapy in women who wish to continue their pregnancies reduces the severity of the manifestations of the disease."

In addition, Daffos's group discovered that the percentage of fetuses that became infected with the parasite was considerably lower than what was found in their previous studies. The researchers attribute this difference to immediately treating the infected women in the recent study with the antibiotic spiramycin. This finding, they say, is indirect evidence that spiramycin can limit placental infection by the parasite (which can take weeks to move from mother to fetus) and can reduce the chances of congenital transmission. (In the United States, physicians treating infected pregnant women must get permission from the Food and Drug Administration to use spiramycin, which is also used in other countries to treat strep throat and the like.)

Uninfected French women are tested monthly for *T. gondii* once they become pregnant, but in the United States, physicians rarely perform either pre- or postnatal tests for the infection, according to Jack S. Remington, a infectious disease specialist at the Stanford University Medical Center. While data for U.S. births are scarce, it's been estimated that as many as 1 in 1,000 U.S. children are born with congenital toxoplasmosis, which is more common than congenital German measles, syphilis, phenylketonuria (a disease that causes brain damage) and other maladies for which physicians routinely test.

With its lack of commitment toward *T. gondii* testing, says Remington, "the medical community in the United States is either oblivious to the problem or they have simply turned their back on it."

Moreover, he adds, U.S. physicians do little to educate pregnant women on how to prevent infection, which usually comes from eating undercooked meats or from touching cat feces when gardening or disposing of cat litter. Healthy women who have been exposed before becoming pregnant needn't worry about infecting the fetus, because their antibodies can control the parasite. In France, where more people eat undercooked meats,

most pregnant women nave been previously exposed to the parasite, whereas in the United States, most pregnant women have not and so are at risk.

In an editorial accompanying the French results, Remington and Robert McCabe at the University of California Medical School at Davis urge U.S. health officials to begin prospective trials of the benefits and costs of *T. gondii* screening programs. In Massachusetts, officials have already decided that, at a cost of $5 million per year, they couldn't afford a prenatal screening program. Instead, they have started a pilot program to add *T. gondii* tests to the battery normally given to newborns. New Hampshire and Illinois are the only other states considering such newborn testing.

Remington says he hopes that U.S. health officials will pay more attention to toxoplasmosis, especially now that toxoplasmosis encephalitis (brain inflammation) has become the most common opportunistic infection among AIDS patients, whose immune systems can no longer keep the parasite in line. The disease is predicted to affect up to 30,000 U.S. AIDS patients by 1991. Remington, who is involved in an international study of toxoplasmosis encephalitis, says he has great hopes "not only that we will be able to define better therapies for these patients, but also that there will be some fallout to the woman and the newborn."

— S. Weisburd

Tracking a molecule's progress

Imagine a diver, immersed in a stormy, syrupy liquid, pulling himself along a rope with one hand while hanging on to a load many times his size with his other hand. The enzyme kinesin, found in virtually every plant and animal cell, seems to perform a similar balancing act when it carries material along a microtubule from a cell's interior to its rim. Now researchers have a new tool for unraveling the details of how kinesin and similar enzymes accomplish their prodigious feats. By using an enhanced version of a technique called differential interference contrast microscopy, they can observe molecular-scale movements to a precision of a few nanometers.

"The overall goal is to try to apply this technology to understanding motions in biological systems," says Michael P. Sheetz of the Washington University School of Medicine in St. Louis. Scientists want to know how protein molecules such as kinesin convert chemical energy into mechanical energy for movement. Sheetz and his colleagues present their findings in the Feb. 4 NATURE.

In their experiments, Sheetz and his group mixed kinesin with a suspension of tiny plastic beads, each about 190 nanometers in diameter. They then applied the kinesin-coated beads to a sample of microtubules adhering to a thin glass plate. By using an optical microscope to track bead positions, the researchers could follow their movements along the microtubules and deduce how the kinesin was doing its job.

The key step in getting the technique to work was developing a computer program for analyzing the low-contrast bead images produced by an optical microscope. Washington University's Jeff Gelles worked out a way to maximize the amount of positional information obtainable from such images, as recorded on a video disk.

The researchers were surprised to see how rigidly the kinesin binds beads to microtubules. The attached beads seem to be strongly resistant to the continual molecular battering of brownian motion. In contrast, unattached beads move about randomly. Furthermore, kinesin molecules appear to select and then move along one of the dozen or so filaments that make up a typical microtubule bundle instead of jumping from one filament to another.

"One of the biggest problems we have right now is knowing what to do with these data and how to interpret them," says Sheetz. "People haven't been thinking in terms of measurements on this nanometer scale before because it hasn't been possible."

— I. Peterson