Sorting Out Darwin's Finches

The Galápagos island birds known as Darwin's finches are famous as examples of how natural forces can drive the evolution of new species. Now Princeton University researchers have used genetic markers to describe the finches' first molecular family tree.

Ancestral warbler finch?

"This is one of the most important groups for our understanding of adaptive radiation," the process by which a species differentiates to fit different niches, says University of British Columbia evolutionary biologist Dolph Schulter. "It seems incredible that we've not had a molecular phylogeny by now" to match the phylogeny based on physical traits that was developed in the 1940s.

Described by Charles Darwin 140 years ago, the 14 species of finches vary widely. Classic finch types have short, stout beaks good for breaking seeds, while warblerlike species sport long, narrow beaks for insect eating.

Researchers have had little success verifying the finch family tree with allozymes or mitochondrial DNA, because the time scale of this radiation, less than 3 million years, is too short. But now evolutionary ecologist Kenneth Petren, with Peter and Rosemary Grant, have examined 16 microsatellite markers on genomic DNA drawn from the birds' blood. The markers "show variation on exactly the correct time scale" for distinguishing between species, says Petren. The new results, published in the 22 February *Proceedings of the Royal Society B*, also support the notion that the ancestor of all Darwin's finches resembled the pointy-beaked warbler finch (photo).

Fresh Corps of Engineers

The National Academy of Engineering last week elected 80 U.S. engineers—two of them women—and eight foreign associates to membership. The academy now has 1984 U.S. members and 154 foreign associates. Their names can be found at www.nae.edu

Broad-Gauge Vaccine for Malaria?

A team of scientists in the U.S. and India has put together a synthetic protein that it hopes will lead to a malaria vaccine that offers "multiple layers" of immunity. The protein has been shown to stimulate antibody responses to the disease in rabbits, and monkey trials are now under way.

Malaria causes 1.5 million to 3 million deaths a year, mostly in sub-Saharan Africa. The parasite has a complex life cycle—it heads for the liver, where it proliferates and then goes into the blood. That has made it difficult to develop an effective vaccine. Recent efforts have tried to produce immunity to several of the parasite's life stages at once.

The new vaccine is based on information gleaned from looking at antibodies in the blood of Kenyans who have acquired natural immunity to the disease. Altaf Lal of the U.S. Centers for Disease Control and Prevention in Atlanta and colleagues in India assembled 21 gene fragments that code for parasite proteins from various stages of the life cycle. They strung the genes together and inserted them into a virus that can infect insect cells and force them to produce the artificial protein.

Researcher Seyed Hasnain, an immunologist at the National Institute of Immunology, New Delhi, says the work, reported in the 16 February issue of the *Proceedings of the National Academy of Sciences*, "opens up a whole new strategy" for designing a malaria vaccine. Lee Hall of the U.S. National Institute of Allergy and Infectious Diseases agrees. But he warns the testing is still at "an early stage" and that other promising candidates have failed clinical tests.

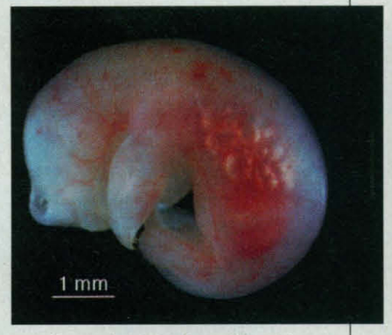
Marsupial Pouch Trick

Canadian and Australian scientists have found a mammal—a mouselike Australian marsupial—that in early life breathes through its skin instead of its lungs.

Many lower vertebrates, especially amphibians such as toads, can take in some oxygen and expel carbon dioxide via their skin, says respiratory physiologist Jacopo Mortola of McGill University in Montreal. But mammals have not been thought to do this because of their thick skins—needed to avoid water loss—and the large amount of oxygen they need to maintain body heat.

The infant Julia Creek dunnart, however, which is only 4 millimeters long, lacks adequate muscle to power its tiny lungs, says Mortola. Placing newborn dunnarts in a metabolic chamber that measures gas pressures, Mortola and his Australian colleagues found that up to 90% of their gas exchange occurs initially through their thin, translucent skin rather than the lungs. By 1 month, however, the animals have gradually shifted almost all their reliance to their lungs. The scientists say the dunnarts can pull off this stunt because they need less oxygen than other mammals do, and the mother's pouch supplies automatic thermoregulation.

Physiologist Jay Farber of the University of Oklahoma Health Sciences Center in Oklahoma City says he's "surprised" at the finding. He himself has examined newborn opossums, also marsupials but much larger, and failed to find evidence of skin respiration. Because skin porous enough to take in air also allows water to escape, says Farber, tiny newborns run the risk of drying out before they make it into the pouch. "It's quite an accomplishment if your skin can simultaneously be adapted to support gas exchange and at the same time prevent desiccation."



Newborn dunnart has thin skin with rich blood supply to bypass lungs (whose air sacs are visible in photo) till they're ready.

CREDITS: (TOP) LUKAS F. KELLER; (BOTTOM) J. MORTOLA/P. FRAPPELL/P. WOOLLEY