source of fresh genetic variability. Interbreeding may be one of the secrets to the fast evolution of Darwin's finches, the Grants suggest, adding that hybrids may be an unrecognized factor in the evolution of many other animals.

On Daphne Major the two most common species of Darwin's finches are the medium ground finch (*Geospiza fortis*) and the cactus finch (*G. scandens*). Ground finches have blunt beaks that are well suited for cracking small seeds of perennials, and larger individuals can break open the harder, larger seeds of a plant called the caltrop. The cactus finches have pointier beaks that they use to devour the fruits and pollen of cactus.

Changes in the food supply have made natural selection favor birds with beaks of certain sizes and shapes at different times, the Grants have demonstrated—just as Darwin theorized. In 1977 a La Niña–related drought wiped out the plants that produce small seeds, and most of the ground finches died. But some big-beaked birds survived because they could feed on caltrop seeds. Within a few generations, the average ground finch beak evolved to be 4% bigger. But in 1983 the island was clobbered by La Niña's soggy twin, El Niño, whose rains triggered a frenzy of small-seed plant growth. Ground finches with small beaks were more efficient at eating the new seeds and had more offspring, shrinking the average beak by 2.5% within a few years.

Cactus finches have evolved as well, although natural selection has acted more weakly on them. When the 1983 El Niño swamped the birds' favored cactuses, birds with slightly blunter beaks could eat the small seeds of other plants. But the Grants found a paradox: Cactus finch beaks have been getting significantly blunter year after year, even though selection pressures from the birds' food source have diminished.

The reason, the Grants found, is that cactus finches have been fraternizing with ground finches—and the latter's genes are shaping the former's beaks. After the 1983 floods, female cactus finches starved as the larger males drove them away from the few remaining fruits. That left as many as five male cactus finches for every female. A few desperate males mated with female ground finches, which then produced perfectly healthy and fertile hybrids. These hybrids only mate with cactus finches, because they imprinted on the songs of their cactus-finch fathers. "The sons will sing the same song as the fathers sing, and the daughters, having paid attention to the songs of their father, will pick a cactus finch male when they grow up," Peter Grant explains. As a result, ground finch genes are flowing into the cactus finch gene pool—a process called introgression—making their beaks blunter.

Other biologists are surprised that two distantly related species can produce healthy hybrids that go on to play an important evolutionary role. Introgression is "something that's invisible unless you do work like the Grants have been doing for so long," says David Reznick, a biologist at the University of California, Riverside. "It may turn out to be much more important than people think."

This new source of genetic diversity makes it easier for a species with donated genes to adapt to a changing environment, the Grants claim. At the same time, introgression of the finch genes demonstrates just how leaky the barriers are between species. "It forces people to think of species much more as open genetic systems rather than closed ones with an impermeable membrane," says Peter Grant.

As for the finches' future, the Grants can say only that it promises to be as unpredictable as the past. Will *G. scandens* disappear as it acquires more and more *G. fortis* genes? "I think the fusion is taking place right now," says Peter Grant. As evolution unfolds on Daphne Major, the Grants and their students will be watching.

–CARL ZIMMER

Carl Zimmer is the author of *Evolution: The Triumph of an Idea.*

CREDIT: SAM KITTNER

DEFENSE SCIENCE

Jason Hooks Up With New Sponsor

An exclusive group of academic scientists is moving up the Pentagon food chain and will soon resume a 40-year flow of unvarnished technical advice to the U.S. government.

One month after the Defense Advanced Research Projects Agency (DARPA) acknowledged dropping its support of Jason (*Science*, 29 March, p. 2340), the group is nearing completion of a similar arrangement with the higher ranking Director of Defense Research and Engineering (DDR&E). The new relationship comes just in time for the next planning meeting of the self-selected group of scientists, who produce often-classified studies on a variety of issues. "It's important to have academics helping [the defense department] address tough problems," says Delores Etter, a former acting head of DDR&E who is now at the U.S. Naval Academy in Annapolis, Maryland. "Even more so since 9/11."

The ties between Jason and the military, formed in the wake of Sputnik, were severed last December after DARPA officials concluded that Jason had not kept up with the times and that its studies focused too heavily on physics. Jason disputed that assessment, noting that a third of its members were not physicists and citing recent studies ranging from modeling biological systems to building computers with molecular electronics. The

ScienceScope

De-Celeration Biotechnology's enfant terrible—Celera Genomics in Rockville, Maryland—is mellowing with age. Last week, it formally disavowed its youthful aim of becoming a worldwide purveyor of genome news and data, a goal once proclaimed by founder and former president J. Craig Venter, who left the outfit abruptly in January. Instead, Celera is morphing into a drug R&D firm and will operate primarily as a data provider to its parent organization, Applera Corp. of Norwalk, Connecticut.

Applera CEO Tony White announced on 22 April that an executive from within the company, Kathy Ordoñez, is being promoted to serve as president of both Celera Genomics and a subsidiary called Celera Diagnostics. White explained that an internal study concluded that the company could not profit in the long term by selling only data. So Celera's services will be combined with an online reagent and equipment supply operation to be known jointly as the Applied Biosystems Knowledge Business. White called it "a complete transformation."

Wilson Resigns Prominent gene therapy researcher James Wilson (below) will resign as director of the University of Pennsylvania's Institute for Human Gene Therapy in Philadelphia. The decision, announced last week by Penn officials, comes 31 months after the death of an institute research subject sparked intense scrutiny of the institute's procedures and widespread debate about the adequacy of human subject protections.

The September 1999 death of patient Jesse Gelsinger prompted federal officials to shut down eight gene-therapy trials at the institute and to consider stripping Wilson of authority to oversee research involving human subjects (*Science*, 12 May 2000, p. 951). Wilson's troubles—and gene therapy's dimming promise—prompted an internal Penn committee to conclude that the $13 million institute should "broaden its scientific focus to include cell-based therapies, as well as stem cell biology and molecular virology," according to an e-mail sent to faculty members last week by medical school dean Arthur H. Rubenstein. The memo's contents were first reported by *The Philadelphia Inquirer.*

Wilson could not be reached for comment. In his e-mail, Rubenstein said Wilson will resign 1 July but will remain at Penn as a researcher and professor.

PALEONTOLOGY

'Fantastic' Fossil Helps Narrow Data Gap

The ancient lakebeds of China's Liaoning Province, renowned for their treasure trove of feathered dinosaurs, have yielded another gem: the complete, fur-shrouded skeleton of the most ancient placental mammal yet discovered. "It is fantastic," says Guillermo Rougier, a paleontologist at the University of Kentucky, Louisville. "The really key point of this specimen is that it's so complete."

The shrew-sized creature—described in this week's issue of *Nature* by Qiang Ji of the Chinese Academy of Geological Sciences in Beijing, Zhexi Luo of the Carnegie Museum of Natural History in Pittsburgh, Pennsylvania, and colleagues—is called *Eomaia*, from the Greek for "dawn mother." It lived during the early Cretaceous period, a time when the world was dominated by the far more varied and numerous dinosaurs. Its age and characteristics place it near the base of the placental-mammal family tree. Although none of *Eomaia*'s own descendants are alive today, scientists say the specimen's beautifully preserved anatomical features can help them pin down relationships among early mammals as well as serve as a reference point for sorting out living placental groups. Luo and Ji's team also argues that the fossil helps resolve differences between the fossil record of mammal evolution and molecular evidence from living groups.

Mint condition. *Eomaia*'s perfect skeleton sheds light on how Mesozoic mammals evolved.

CREDITS: (LEFT TO RIGHT) JI *ET AL.*, *NATURE*; MARK A. KLINGLER/CMNH

Eomaia is the fourth kind of mammal so far discovered in the 125-million-year-old Yixian Formation in Liaoning. The other three belong to extinct lineages of Mesozoic mammals that are distantly related to placental mammals. *Eomaia* is much closer to placentals; features of its teeth place it in Eutheria, the group that includes all the living placentals as well as extinct mammals that are closer to placentals than to marsupials. The next oldest known complete eutherian fossil comes from an animal that lived 40 million years later.

Eomaia's position at the base of the eutherian group gives it far more weight than its estimated 20 grams, paleontologists say. "It really helps us link living placental mammals and extinct Mesozoic groups," Rougier says. When trying to figure out the relationships of placental orders, paleontologists need to know which anatomical traits came from ancestors and which are newly evolved—sometimes an impossible task when the most ancient eutherians were known only from teeth and jaws. Now they can compare traits with the entire skeleton of the most ancestral eutherian, as they do with less ancestral eutherian skeletons from 85-million-year-old rocks in Mongolia.

By pushing back the earliest record of eutherians some 5 million to 10 million years and adding to the known diversity of the earliest eutherians, *Eomaia* also goes a little way toward closing a longstanding gap between fossil evidence and molecular dates for milestones in mammalian history. By studying the genes of present-day animals, molecular geneticists have concluded that eutherians diverged from marsupials 170 million years ago, says Mark Springer, an evolutionary biologist at the University of California, Riverside. The latest molecular data also suggest that modern orders of mammals arose and began to diversify about 104 million years ago—some 40 million years before their undisputed fossil record begins.

By showing that placental mammals had already begun diversifying by 125 million years ago, Luo says, his team's fossil meshes with the molecular evidence. But others say

ScienceScope

More Than MOST A U.S. science delegation met this week with its Chinese counterparts in Beijing, the 10th such meeting in a process that began in 1979. The official agenda touched on ongoing cooperation in a half-dozen areas ranging from energy and agriculture to public understanding of science. But U.S. presidential science adviser John Marburger, leading the first group representing the Bush Administration, added something to the mix: a request that China make the leaders of its burgeoning research enterprise more accessible to outsiders.

"The original agreement was with the Ministry of Science and Technology [MOST], which selects the delegation," says Marburger. "But other ministries have thriving research programs, too, and we want to see whether this umbrella agreement has sprung any leaks and if there are better ways of doing business."

A MOST official said that other ministries are invited as appropriate and that the agenda dictates who will attend. But Marburger says that it might be more efficient to have all the research heavyweights at the table so the two countries could discuss "the big questions."

Academic Discourse Britain's House of Lords has moved to protect researchers from a controversial new export-control law. Academics feared that the law, intended to prevent the export of sensitive technologies to hostile countries, could hamper international science collaboration and training (*Science*, 22 February, p. 1443). Under pressure from the Association of University Teachers and Universities UK, a cross-party coalition of Lords voted last week to add language exempting routine scientific information sharing unless a researcher knew, or should have known, that the information could be used to construct weapons of mass destruction. The amendments would also prevent officials from using the law to restrict the movement of students or researchers.

Science Minister David Sainsbury argued before the vote that the academic freedom clauses could create unwanted loopholes. But academic groups hope that the government will accept the changes when Parliament takes up the proposal later this year.

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