these efforts, along with recent changes in Indonesia, offer glimmers of hope, says Supriatna. For example, Indonesia has a freer press than it used to, which is publicizing the crisis. In addition, the International Monetary Fund has put conditions on new loans to Indonesia, forbidding extension of oil-palm plantations and loans to loggers. International conservation groups are funneling money to the national parks and pressing the World Bank to tie debt forgiveness to forest protection. They have also established a trust fund to promote ecotourism and boost such forest crops as spices and rattan. "We're looking at a very serious problem," van Schaik says, "but for the first time in decades, there's reason for optimism." **–DAN FERBER**

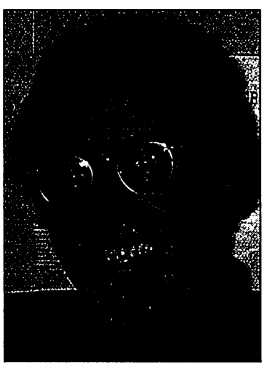
Dan Ferber is a writer in Urbana, Illinois.

EUROPEAN SCIENCE

Spain Opens Coffers to Keep Talent at Home

Like many top Spanish scientists in recent years, Miguel Beato coped with his country's prolonged science funding funk by working abroad. "I'd given up ever going back to Spain," he says. But now that Barcelona is building a $55 million biomedical research park and planning a biocenter at the University of Barcelona, Beato, a cell biologist at the University of Marburg in Germany, is contemplating the unthinkable: coming home.

Beato is not the only one impressed with Spain's sudden scientific resurgence. Late last month, the government announced a plan to boost science and technology spending over the next 4 years from $2.8 billion, or 0.9% of the gross national product in 1999, to the European average of 2% by 2003. Tasked with pushing this agenda is a new Ministry for Science and Technology, created last month by Prime Minister José Maria Aznar. "There is a real commitment by the government to give a major boost to research and development," says the ministry's newly appointed science policy chief Ramón Marimón. That's sorely needed, says molecular biologist Margarita Salas of the Center for Molecular Biology in Madrid. "Without this step," she says, "Spanish science is in serious danger of going downhill."



Brighter skies? Miguel Beato sees Spanish science picking up.

Researchers have been waiting for good news for more than a decade: The last significant hike for science funding was in the mid-1980s, when a booming economy allowed the government to more than double the science budget. "The consequences were remarkable," says Salas. "The number of scientists and the quality of the research shot up in a very short time." Beginning in the early 1990s, however, Spain's science budget stagnated, the victim of a general belt-tightening aimed at shrinking Spain's budget deficit.

Marimón and his boss, Science Minister Anna Birulés, have revealed little about how they plan to dole out the budget increase. However, they do say that basic research will be the main beneficiary in next year's budget, and that they hope to create 25% more positions for scientists by 2003. The latter initiative would address the worst problem nationwide, scientists say. "We can't even offer positions to the many well-trained young scientists who want to come back to Spain" after completing postdocs abroad, says Salas. Some help is coming from the regional governments, particularly Catalonia. Besides sponsoring the two new biomedical initiatives and for the first time appointing its own regional science minister earlier this year, Spain's affluent northeastern state has freed up funding for about 30 life science faculty positions at the University Pompeu Fabra in Barcelona. "Catalonia is showing Spain the way," says Beato, who now spends about 2 months a year at Pompeu Fabra as a visiting professor.

Private donors are also stepping up efforts to retain key scientists. In January, the Botin Foundation, run by the Bank of Santander, bestowed a windfall on cellular biologist José Jorcano of the National Research Center for Energy, Environment, and Technology—a grant for $1 million a year for up to 9 years to support his work on the etiology of cancer. And in February, the Juan March Foundation, known for endowing the arts, made a splashy entrance into Spanish science by announcing that it would award one $800,000-plus grant every year to a promising biomedical researcher under the age of 50. An international review panel is expected to select the first winner this fall.

Despite these promising signs, some observers are not convinced that the long drought is over. "There have been too many words and too little action in the past. We have to wait and see what really happens," says neurobiologist José Lopez-Barneo of the University of Seville Medical School. However, he adds, "simply having the word 'science' back on the political agenda and a ministry devoted to it is a giant step forward." **–MICHAEL HAGMANN**

CONSERVATION BIOLOGY

California Team to Map Rare Species' DNA

To help unravel genetic kinship among mammals, the San Diego Zoo and Amersham Pharmacia Biotech announced last week that they are launching the first systematic effort to decode the DNA of endangered species. Over the next year, the team plans to sequence key portions of the genetic code of one representative of each of the 146 mammalian families. Many of the animals are from a menagerie that most visitors to the San Diego Zoo never get to see—a "Frozen Zoo" of stockpiled DNA, from rare Przewalski's horses to western lowland gorillas.

DNA on ice. Sequencing effort will tap CRES's Frozen Zoo of tissue samples.

Using Amersham's capillary sequencing machines, the project aims to generate complete sequences of the DNA in the mitochondria, tiny powerhouses outside the cell's nucleus that produce chemical energy. Because mitochondrial DNA mutates at a fairly reliable rate, scientists can judge how long ago species diverged according to differences in mtDNA sequences. These biochemical clocks will help sort out little-known relationships within families such as the insectivores, says geneticist Oliver Ryder of the San Diego Zoo's Center for Reproduction of Endangered Species (CRES): "I think we'll gain fantastic insights into molecular evolution."

Conservation experts welcome the project. "It's a positive step toward unlocking important new genetic data that eventually will be useful for managing endangered species," says David Wildt of the Smithsonian Institution's Conservation and Research Center in Front Royal, Virginia. Indeed, such projects

CREDITS: (LEFT TO RIGHT) M. BEATO; SAN DIEGO ZOO

are already under way: Scientists are now using mtDNA sequences to distinguish between populations of southern and eastern black rhinos. But this appears to be the first time that a biotech firm has leaped into the field as a partner. "It's encouraging to see a major molecular biology company putting effort into conservation research," says William Jordan of the Institute of Zoology in London.

The CRES-Amersham team will exploit what may be the world's biggest collection of DNA samples from endangered species: cell lines from more than 4300 individuals representing 370 species and subspecies. Since 1976, CRES staff have been snipping pea-sized patches of skin from animals in the zoo and extracting fibroblasts, tissue-repairing cells that happily divide in the test tube, even after being stored for years in liquid nitrogen. The research effort has helped solve some puzzles in captive breeding. For instance, CRES researchers, frustrated that a dwarf antelope called the dik-dik often produced sterile offspring, found after examining the animal's chromosomes in the late 1980s that two outwardly indistinguishable dik-dik species at the zoo were attempting to mate. Putting them in separate pens by chromosome type fixed the problem.

The new effort will specialize in the underdogs of the animal kingdom. "We'll choose rare species over common ones," says CRES geneticist Oliver Ryder. Obvious choices, he says, include the peccary, the okapi, and the three-banded armadillo. CRES's Frozen Zoo, with DNA from more than 100 mammalian families, will provide a strong foundation. "To start from scratch would take years and years," says Ryder. And his group is forging collaborations with other centers to find DNA from mammals poorly represented in the Frozen Zoo. For instance, Robert Baker's laboratory at Texas Tech University in Lubbock has agreed to provide DNA samples from select rodents and bats.

The team expects it will take about a year to generate the mtDNA sequences, which run to about 16,000 base pairs each. All the data will be made freely available to the public. Shining a spotlight on rare animals could aid conservation efforts, says Wildt: "The project will help increase public awareness of the need for much more biomedical research directed at wildlife species."

According to Ryder, the sequencing project points up the value of DNA banks, which he and several colleagues have urged the scientific community to expand through an ambitious effort to compile DNA samples of all endangered animal species (*Science*, 14 April, p. 275). He emphasizes, however, that gathering genetic data on endangered species must go hand-in-hand with measures to preserve habitats. "That is the only way to really save species," he says.

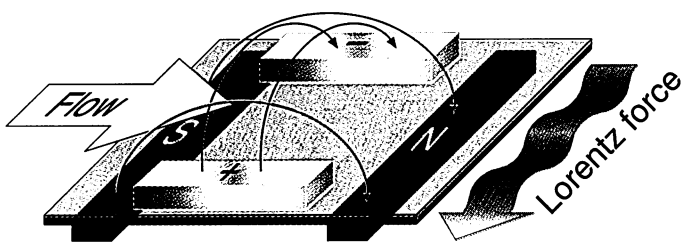
Amersham declines to reveal how much it plans to invest in the project. But even though Amersham is giving away the data, says Robert Feldman, production sequencing and collaborations manager, the high-throughput DNA sequencing company does have something valuable to gain: experience. "We're looking to work on as many different kinds of DNA as we can get our hands on," he says. "That will help us understand our customers' needs better"—not to mention the needs of peccaries, okapis, and three-banded armadillos.

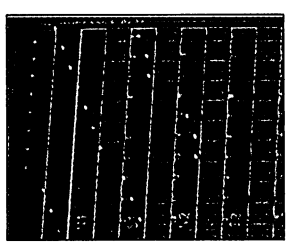
–RICHARD STONE

HYDRODYNAMICS

Electromagnetic Tiles May Cut Turbulence

Turbulence is as expensive as it is inevitable. Whether it is a submarine sneaking around the bottom of the ocean, an airplane bouncing overhead, or oil bubbling through a pipeline, the turbulent eddies that form when a fluid streams over a fast-moving surface drag against the surface like sandpaper scraping over wood. Overcoming this drag force requires fuel, and fuel costs money—lots of it. By some estimates, a general method of reducing turbulent drag by 10% could save billions of dollars and eliminate tons of burnt-fuel pollutants.





Making waves. Electrodes and magnets create turbulence-busting forces where tile meets water.

With that kind of money at stake, many scientists are searching hard for such a method—so far, with little success. But on page 1230 of this issue, mechanical engineer Yiqing Du of the Massachusetts Insti-

ScienceScope

Pole Researcher Dies A young astrophysicist has died at the South Pole. The loss has devastated the remaining nine scientists, who are part of a 49-member team wintering over at the pole, and has left a telescope out of operation.

Rodney Marks (right), 32, died on 12 May of heart failure hours after experiencing breathing problems that began as he walked from a research building to the station. Marks had passed all physical exams before heading to the pole last October, and he had wintered over before, in 1998. The cause of death won't be known until his body is flown out in November, when the station becomes accessible.

Marks was the sole operator of the Antarctic Submillimeter Telescope and Remote Observatory (AST/RO), which is mapping emissions from atomic carbon and carbon monoxide in the Milky Way. Before he died, Marks had been fixing a tricky problem with one of the telescope's receivers, which must be chilled to near absolute zero. "We don't yet know how hard it will be for others to put things back into working order," says AST/RO project manager Adair Lane of the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts.

The Science of Diplomacy Acting on the recommendations of a National Academy of Sciences panel, Secretary of State Madeleine Albright this week announced that her agency will do more to stock up on science-savvy diplomats. Last October, the panel's report concluded that technical controversies were moving to the top of the diplomatic agenda just as the State Department was losing knowledgeable staff (*Science*, 15 October 1999, p. 391).

To reverse that trend, on 15 May Albright released a plan for following up on the panel's dozen recommendations, including appointing a top-level science adviser and completing by this fall a study that will identify embassies in need of scientific talent. But improvements could take years, she cautioned: "It doesn't take a physicist to know that change is harder than inertia." Indeed: Several candidates have already turned down the adviser's job, sources say.

Contributors: Michael Balter, Robert Koenig, Erik Stokstad, David Malakoff

CREDITS: (TOP) A. HARPER/CENTER FOR ASTROPHYSICAL RESEARCH IN ANTARCTICA; (BOTTOM, INSET) G. KARNIADAKIS *ET AL*/BROWN UNIV