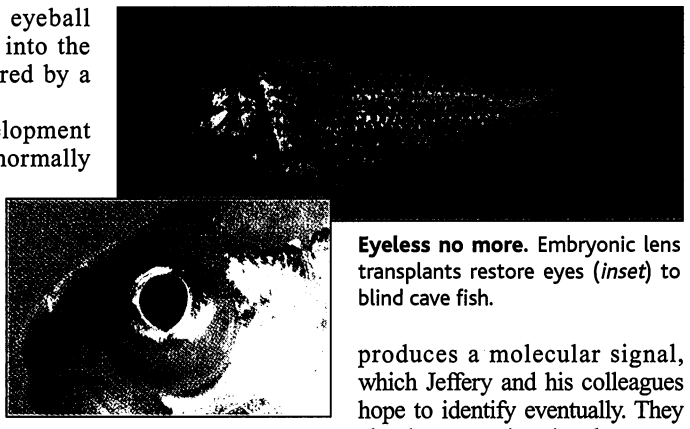
in normal eyes. The eyeball gradually sank back into the socket and was covered by a flap of skin.

Because eye development seemed to progress normally until the lens degenerated, Jeffery and Yamamoto wondered whether this disintegration was triggered by a signal from the embryo or from the lens itself. To find out, Yamamoto removed the embryonic lens from one eye of a blind cave fish embryo and replaced it with a lens from a surface fish embryo. He also did the opposite experiment, replacing the lens of an embryonic surface fish with one from a cave fish embryo. In all cases, he labeled the transplanted tissue with dye so he could track what happened to it. "It's not a complicated experiment, but it really [was] very elucidative," says Mathers.



Eyeless no more. Embryonic lens transplants restore eyes (*inset*) to blind cave fish.

In both types of transplants, the lens behaved as if it were still in its original embryo. The one from the cave fish degenerated, even though it was in an environment conducive to further development, whereas the lens from the surface fish thrived in the cave fish embryo and the eye differentiated, forming a cornea, anterior chamber, and iris. These results show that "the lens plays a central role" in determining whether the eye develops, comments David Beebe, a developmental biologist at Washington University School of Medicine in St. Louis. Jeffery doesn't know, however, whether the fish can actually see, as a vision test is quite difficult to devise.

Other recent work by Jeffery and his colleagues may explain why the lens undergoes programmed cell death in the cave fish. The researchers looked at early embryos for changes in the expression of a variety of proteins that help specify how cells differentiate into specific organs and tissues. As they reported last month in Boulder, Colorado, at the annual meeting of the Society for Developmental Biology, cave fish embryos seem to make more of a protein called Sonic hedgehog in the area destined to be the head. As a result, fewer cells are set aside to form the eyes (*Science*, 23 June, p. 2119). Jeffery suspects that with fewer cells to start with, the precursor lens may wind up smaller than usual, perhaps too small to survive, and therefore decays. "It's possible you are looking at a single gene defect that has caused a drastic developmental change," Mathers notes.

Still unclear, however, is how the embryonic lens of the sighted surface fish triggers further eye development. Presumably the lens produces a molecular signal, which Jeffery and his colleagues hope to identify eventually. They also hope to pinpoint the genes involved in eye development in *A. mexicanus*. Studying different populations of the fish may provide clues to these genes, notes Beebe: Because populations became isolated when the fish could see and became blind independently, different mutations may be involved in each population.

–ELIZABETH PENNISI

CREDITS: YAMAMOTO *ET AL*

EUROPEAN SCIENCE

Urgent Call for Research Overhaul

BERN—The European Union is in danger of losing ground in the global research competition unless its member nations devote more resources to science, restructure the E.U.'s flagship research program, and develop a Europe-wide science strategy, an expert panel says. The recommendations are music to the ears of E.U. Research Commissioner Philippe Busquin, who has been arguing for major changes along those lines.

In a report issued on 20 July, the 11-member panel calls for "an urgent reengineering of the overall management and administration" of the E.U.'s Framework Program. Framework 5—which provides $17 billion over 5 years for multinational research efforts and scientific networking—should be made more flexible to respond to hot new research fields, the report suggests, and its complex grant-application procedures should be made "much simpler and easier to understand."

Taking a broader perspective, the panel—scientists, academics, and business leaders from 11 E.U. states—contends that the Framework Program (which accounts for only 5% of Europe's total spending on research) by itself cannot chart a course for European research. They recommend that member nations find better ways to coordinate national research efforts. The panel, appointed by the European Commission, also calls on E.U. member nations, which now spend an average of about 2% of their gross domestic product on R&D, to step up public

ScienceScope

Rephrase the Question The overhead that the federal government pays for universities to subsidize research done on campus is an incendiary topic, capable of infuriating Congress and deposing college presidents. So perhaps it's not surprising that two reports issued this week generate more heat than light.

The first, by RAND's Science and Technology Policy Institute (www.rand.org), estimates that universities are shortchanged from $700 million to $1.5 billion a year in a $15 billion portfolio of federally funded academic research. It also argues that any government attempt to force universities to pick up even more of their so-called indirect costs could shrink research efforts.

Unfortunately for presidential science adviser Neal Lane, who assigned RAND the study, Congress in 1998 had asked the White House for a report on ways to *reduce* indirect costs, including a comparison of university rates with those charged by industrial labs. So after Lane saw a draft version this winter of the RAND report, he quickly ordered up a study by his own Office of Science and Technology Policy. That brief report takes a more neutral tone by, for example, laying out the pros and cons of four options to further cut overhead costs.

Legislators are especially interested in whether the system favors wealthier universities, says a Senate aide. "But we need to read the reports before we decide whether to propose any changes," he says. Both reports, however, complain that there are insufficient data for a meaningful analysis and urge the government to make more information available.

Staying or Going? France's giant basic research agency, the CNRS, may soon have a new leader. The 3-year term of its current director-general, physicist Catherine Bréchignac, expired 18 July. But as *Science* went to press, the government had yet to decide whether to renew her mandate. The holdup is due to a disagreement between French President Jacques Chirac, who wants to keep Bréchignac, and Prime Minister Lionel Jospin, who wants to dump her, according to the daily *Le Figaro*. If Bréchignac goes, potential replacements include the directors of two research centers in the Paris suburbs: biologist Pierre Tambourin, head of the GENOPOLE research complex in Evry, and mathematician Jean-Pierre Bourguignon, chief of the Institute of Advanced Scientific Studies in Bures-sur-Yvette. A decision is expected by early August.

Contributors: Andrew Lawler, David Malakoff, Jeffrey Mervis, Michael Balter

SHORING UP THE FRAMEWORK

Urgently reengineer the Framework Program's management

Better coordinate E.U. member states' R&D policies

Increase R&D spending throughout E.U. to 3% of GDP within 10 years

Encourage researchers to submit proposals for "riskier" projects

and private research investment to "at least 3%" over the next decade.

The E.U. and its member states currently pay research short shrift, says panel chair Joan Majó, a former Spanish industry minister. "Science is becoming so important for Europe now that it can't be left only to the national research ministers," Majó, an engineer by training, told *Science*. Although Framework plays a key role in promoting collaboration across Europe, he says, "we need to improve that program and also take wider initiatives to coordinate European research."

Some of the panel's recommendations dovetail with Busquin's effort to develop a "European Research Area" (ERA) to help coordinate what he called the "fragmentation, isolation, and compartmentalization of national research efforts" in the E.U.'s 15 member states (*Science*, 21 January, p. 405). In a statement, Busquin said he agrees with the Majó report's overall thrust. E.U. research programs alone, he says, "will not be enough to meet the challenges faced by European research."

The Majó report—which examined Framework programs from 1995 to 1999—tapped a vein of frustration among bench scientists. "We found many researchers who are concerned about the excessive bureaucracy and about the means of evaluation," says Majó panel member Jeanne E. Bell, a neuropathologist at the University of Edinburgh in the U.K. Nearly two-thirds of the 2275 scientists and others who responded to a questionnaire about the Framework programs said they thought "the whole application process was too slow and/or costly."

Similar frustrations underlie a second report issued last month by a separate expert group that focused more on the role of the E.U.'s Joint Research Center. The report, by an eight-member group chaired by Viscount Etienne Davignon, criticized the way the E.U. decides which areas to fund under Framework. "In the past, the task has been underresourced, and too frequently influenced by budgetary and political—rather than scientific—considerations," said the panel.

Revamping big programs is not easy in the E.U., but with support from Busquin, the new reports may have an impact on the development of the next Framework Program, which begins in early 2003. Busquin says he wants a "thorough rethink" of plans for Framework 6, with the ERA one of the templates for planning. Other changes are already in the works. Research ministers of the member nations, meeting last month in Lisbon, gave Busquin the green light to pursue several ERA initiatives, including efforts to better network European research centers, increase the mobility of researchers, and conduct a "benchmarking" study of European research.

Majó, who heads the Catalonian Institute of Technology in Barcelona, says a broad perspective is needed. "The absence of research policy is due to the lack of a real strategy for the future of Europe," he says.

–ROBERT KOENIG

BIOMEDICAL RESEARCH

Hughes Grants Target Infectious Diseases

Marcelo Briones studies Chagas' disease, a chronic and debilitating illness affecting 18 million people in Latin America. But this week, when he felt his knees go weak, it wasn't from contemplating the terrible human suffering wrought by the parasite. Briones, of Federal University in São Paulo, Brazil, had just learned he would be getting a 5-year grant from the Howard Hughes Medical Institute under a new program that funds 45 scientists in 20 countries. The $15 million initiative, which supports research on a variety of infectious and parasitic diseases, marks the first Hughes program outside the United States that is tailored to a specific research area.

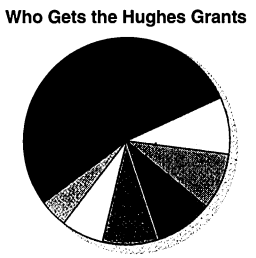
The program builds upon two highly praised regional initiatives, one in Eastern Europe and the other serving Canada and Latin America, that support individual scientists working in a broad range of fields. The charity saw an opportunity to prop up an underfunded area, says institute president Thomas Cech. "The economic incentive for research [on these diseases] by large pharmaceutical companies is very limited," he says. "They may never recoup a large research investment by future sales."

Experts say they are surprised that the institute, traditionally a bastion of basic research, is venturing into a more applied arena. But "the more the merrier," says Richard Lane, head of International Programs at The Wellcome Trust charity in London, which itself supports much work in the area.

The grantees, chosen competitively, say the Hughes award will allow them to do work that might never have been funded by their national programs. Malaria researcher Ross Coppel of Monash University in Victoria, Australia, wants to examine the enzymes that build the thick and waxy cell walls of mycobacteria, the type of bugs that cause tuberculosis and leprosy. Knocking out one or more of these enzymes could make these bugs more vulnerable to antibiotics. "Granting agencies are often loath to support investigators who are making a major switch of this sort," says Coppel, one of 11 Australians, the most from any one country (see pie chart).

The 5-year duration also gives researchers the luxury to travel down paths they might otherwise have ignored. "This gives me the security to try some really ambitious approaches without having to worry about a renewal after just 2 years," says Geoff McFadden of the University of Melbourne in Parkville. Building on work showing that herbicides kill the malaria parasite in culture, McFadden is investigating the novel idea that herbicides might work as human drugs by targeting the chloroplast found not only in the malaria parasite, but in related protozoa that cause diseases such as toxoplasmosis and coccidiosis.

Besides paying for supplies and equipment, the awards—ranging from $225,000 to $450,000 a year—are also expected to help support hundreds of young scientists and to strengthen the scientific infrastructure in participating countries. Thomas Egwang of the Medical Biotechnology Labs in Kampala, Uganda, who recalls "breaking into a grin and punching the air in delight" upon hearing about his grant, will teach how to apply advanced molecular biology techniques to studies of river blindness, a fly-borne parasitic disease



Prize trio. These University of Melbourne scientists—from left, Brendan Crabb, Malcolm McConville, and Geoff McFadden—helped Australia win the largest number of Hughes awards.

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