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.

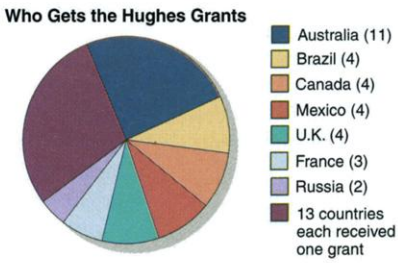
The program builds upon two highly praised regional initiatives, one in Eastern Europe and the other serving Canada and Latin America, that support individual scientists working in a broad range of fields. The charity saw an opportunity to prop up an underfunded area, says institute president Thomas 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.

CREDIT: (PHOTO) MICHAEL SILVER

that afflicts as many as 20 million people worldwide. Deidre Carter of the University of Sydney notes that the grant is especially welcome "at a time when morale in Australian universities and the research community is very low."

Briones plans to use some of his grant money for travel. "I want to go to high-quality meetings where I can meet people smarter than me," he says. **–RICHARD STONE**

GENOMICS

Wellcome Trust Backs Genome Computation

What began as a one-man crusade now has the weight of the world's largest medical research charity behind it. Last week the U.K.-based Wellcome Trust announced that it would spend $13 million over 5 years to fund hardware and software designed to analyze newly sequenced human DNA. Its support of a project called Ensembl (www.ensembl.org) reflects a growing appreciation of the importance of computers to interpret the human genome.

Tireless crusader. New funds for Ensembl will provide Tim Hubbard with more help.

Ensembl was started in early 1999 by Tim Hubbard, a bioinformaticist at the Sanger Centre near Cambridge, U.K. He began developing computer programs to sort through the vast amounts of data generated by sequencing efforts, which simply determine the order of bases—A, G, T, and C—along each chromosome. However, the sequence has little value or meaning until scientists locate the genes these bases encode and figure out their functions. By midyear, Hubbard had teamed up with Sanger's Michele Clamp, Ewan Birney of the European Bioinformatics Institute (EBI), also in Cambridge, and a few other colleagues to set up automated preliminary analysis of the rapidly emerging rough draft of the human genome.

"The Ensembl budget was cobbled together," Birney recalls. "We were working off bits and bobs of other budgets." By making their rudimentary analysis available to everyone, they also hoped to prevent the genome from being patented by private concerns.

The Wellcome money will put the project on much firmer footing. It allows the 10-person Ensembl staff to triple over 5 years and greatly increases its computing capacity, adding "the equivalent of hundreds, perhaps thousands, of personal computers," notes EBI's Graham Cameron. This investment "will speed up the annotation of the human genome," predicts David Haussler, a bioinformaticist at the University of California, Santa Cruz. "It puts them in a better position to tackle the large bioinformatics problems that are looming."

The new funds will be split between the Sanger Center and EBI, which is an outpost of the European Molecular Biology Laboratory in Heidelberg, Germany. The money arrives at a critical time for EBI, one of the world's three archives of genomics data, whose budget has been hit by changes in the European Union's policies for supporting scientific infrastructure (*Science*, 25 February, p. 1401). It's also "a vote of confidence [in the field] and a commitment by the Wellcome Trust," notes David Lipman, director of the National Center for Biotechnology Information in Bethesda, Maryland.

The award reflects a growing interest in bioinformatics by funding agencies. Haussler, for example, is one of 12 computational biologists who have just been appointed as investigators for the Howard Hughes Medical Institute. The U.S. National Human Genome Research Institute plans to create a network of centers of excellence, several of which will focus on computational biology. The award to Ensembl also kicks off the Wellcome Trust's $150 million initiative in functional genomics, which follows the recent completion of the rough draft of the human genome. "We didn't feel we could wait," says Celia Caulcott, a Wellcome Trust program manager. **–ELIZABETH PENNISI**

EVOLUTION

Parasites Make Scaredy-Rats Foolhardy

Long before *The X-Files*, Robert Heinlein wrote about parasitic aliens that alter human minds. In his 1955 novel, *The Puppet Masters*, slug-shaped creatures arrive on Earth and clamp themselves to people's spines, forcing their hosts to help spread their kind across the planet. Although the rabidly anticommunist Heinlein may have been less interested in biology than in finding an allegory for the Red Menace, *The Puppet Masters* proved scientifically prophetic: Some parasites, it turns out, alter the behavior of their hosts for their own benefit.

In the 7 August issue of the *Proceedings of the Royal Society of London B*, researchers at Oxford University offer a striking demonstration of this ability by the protozoan *Toxoplasma gondii*. Rats, the intermediate hosts of *Toxoplasma*, appear to lose their fear of cats when the parasite infects them. And cats, not coincidentally, are *Toxoplasma*'s final host. By precisely altering rat brains, the parasite potentially increases its chances of completing its life cycle. "They certainly have demonstrated that the parasite is changing behavior in a rather specific way," comments Hilary Hurd, a parasitologist at Keele University in the United Kingdom. "It's fascinating that this happens."

What makes the story all the more fascinating is that *Toxoplasma* is extremely common in humans. Perhaps half of all people on Earth carry its cysts in their brains without visible effects. (It is dangerous only when it invades a host with a weak immune system, such as AIDS patients or fetuses, where it can cause brain damage or even death.) Recent research has hinted that even in this latent form, however, *Toxoplasma* may create subtle changes in personality.

The relatively innocuous *Toxoplasma* is an unlikely candidate for a mind bender. Dwelling in a cat's bowels, it produces egg-like oocysts that leave its host's body along with the feces. The oocysts can survive in soil for decades, waiting for a rat or some other warm-blooded mammal or bird to pick them up. Once inside an intermediate host, the parasite invades cells and replicates. *Toxoplasma* elicits a strong immune response, which prompts the parasite to form tough-coated cysts in which it finds refuge until its host happens to be eaten by a cat. The mildness of *Toxoplasma*'s effects on its intermediate host make good evolutionary sense: It's not in the parasite's interest to be lethal, as cats find dead animals distasteful.

Yet a parasite's gentleness need not mean that it's passive. Since the 1960s, parasitologists have documented various ways in which parasites may alter their intermediate hosts to improve their chances of infecting a final host. The lancet fluke *Dicrocoelium dendriticum*, for example, forces its ant host to clamp itself to the tip of grass blades, where a grazing mammal might eat

Mind bender. *Toxoplasma* causes rats to lose their aversion to cat scent.

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