member governments, gave final approval.

Although selecting missions by open competition may, to the outsider, seem like reducing science to the level of a game show, the scientists seem to like it. The pressure of the impending tournament means that proposals are honed that much closer to perfection, while having your work judged openly by your peers can be less dispiriting than rejection by a faceless committee. "The space science community is much more involved than in the United States," says Gehrels.

In search of greener pastures

For U.S. researchers, perhaps the biggest attraction of winning an ESA project is the stability: Once accepted, a project has a guaranteed budget to completion and a fairly strict timetable. ESA can do this because its science budget is agreed upon by the member states in 5-year chunks. "ESA is the only space agency with this advantage," says Bonnet. "It's an ideal situation for space scientists," because it reduces the lead time of projects, says physicist Peter Bender of the University of Colorado at Boulder. Bender is hoping for some of that stability himself: He is part of a consortium proposing a gravity-wave detector for M3.

In contrast, "There is no guaranteed funding [from NASA]; everything is done annually," says Massachusetts Institute of Technology physicist Claude Canizares, who chairs NASA's space science and applications advisory committee. Although space scientists recommend priorities every 10 years through a committee sponsored by the National Academy of Sciences, and they meet at 3-year intervals at Woods Hole to go over the list, there is no guarantee that even highly rated projects will fly. The reason? Congress and the White House chew over NASA's budget every year and in years when the belt is tightened, projects can be cut back, frozen, or canceled. Scientists then have to spend large amounts of their time in Washington lobbying to get their projects reinstated. "Every year you stick your neck out and hope it isn't cut off," says physicist Ho Jung Paik of the University of Maryland.

Paik should know. He has been working for the last 15 years on a superconducting gravity gradiometer for a NASA mission that has now been postponed indefinitely. Like many of his colleagues, Paik has now turned to Europe: He was involved in the STEP proposal for M2, is participating in several proposals for M3, and is collaborating with European researchers on an ESA-funded technology project to develop a superconducting gravity gradiometer. "Europe could well take the lead in geodesy," he says.

Part of NASA's problem, say researchers like Paik and Bender, is that the big three U.S. science projects—the x-ray observatory AXAF, the Cassini probe to Saturn, and the Mission to Planet Earth—are dominating the science budget. "There is less flexibility for other missions," says Bender. Canizares agrees that this was certainly true in the 1980s when the shuttle's ability to heft large payloads into orbit with ease led to a philosophy of big is best. The resulting monster projects —such as Hubble and GRO—turned out to be more difficult than expected and ate up the NASA budget. "Once you've invited an elephant into your house, it's very difficult to learn to accommodate it," he says. NASA, however, is now trying to make some difficult adjustments: All of the three current big projects have been cut back drastically and more emphasis is being put on small missions. "We're not quite in balance yet but we're getting there," Canizares says.

While NASA tries to transform itself, however, scientists are voting with their feet. "European space science is really making progress," says Paik. The Integral team is particularly looking forward to the beginning of the next century when, in addition to their own satellite, ESA's x-ray observatory XMM, one of Horizon 2000's cornerstone projects, will be in place. According to Dean: "The sky will be ours in the high-frequency range, and the Americans feel that."

–Daniel Clery

MARINE BIOTECHNOLOGY

Regulations Go Swimmingly

Here's a science policy puzzler: How does a proposal to give an extra $20 million a year to marine biotechnology researchers become a vehicle to regulate experiments involving the intentional release of transgenic fish? Such a transformation is no problem for the U.S. Congress, where every political action generates a reaction and compromise is the coin of the realm. But this case does have one rare feature: scientists and environmentalists joining hands to resolve a small part of a very contentious issue—the safety of genetically modified organisms.

Marine ecologist Chris D'Elia, director of the Maryland Sea Grant program, started the ball rolling in an attempt to rejuvenate the National Sea Grant College Program, a 27-year-old effort to foster ties between academic researchers and the marine industry. The project's budget has stagnated at $40 million for more than a decade, and to move it ahead D'Elia and his colleagues around the country put together a proposal for a new marine biotechnology research program. They sold the idea to Representative Gerry Studds (D–MA), chairman of the House Merchant Marine and Fisheries Committee, who in April introduced a bill (H.R. 1916) creating such a program, along with a national advisory board of experts to make sure the money would be spent on the best science. It authorizes $20 million in each of the next 2 years and $25 million in 1996 and 1997.

The bill caught the eye of Margaret Mellon, director of the national biotechnology center at the National Wildlife Federation, an environmental group that believes scientists don't always think enough about the environmental consequences of their work. The legislation, she realized, might be a way to plug a gap in existing federal regulations involving the intentional release of transgenic fish. That was a gap many marine researchers were already painfully aware of. Because there are no formal rules in this area, and because biotechnology regulation was a political football during the Reagan and Bush presidencies, it took 5 years for Rex Dunham of Auburn University to obtain permission to conduct experiments with transgenic carp and catfish kept in an outdoor, manmade holding pond.

Mellon took her concerns to a Studds aide, who began dealing, congressional style. The result, a bill both sides say they can live with, was passed on 13 July by the House of Representatives on a voice vote. The bill would create a mechanism for dealing with genetically modified organisms developed by researchers funded under the new program. It would require the Commerce Department, which runs the Sea Grant program, to make sure the work complies with safety standards being developed by the Agricultural Biotechnology Research Advisory Committee (ABRAC) for scientists funded by the U.S. Department of Agriculture.

On 18-20 August an ABRAC working group will meet in Minneapolis to hammer out what those standards should be. The group, chaired by fish geneticist Anne Kapuscinski of the University of Minnesota, would like to help all institutions and companies assess the risks posed by work being done in their laboratories and offer guidance on how to manage them to protect the ecosystem.

Similar legislation is expected to be introduced shortly in the Senate, although the chief sponsor, Senator Ernest Hollings (D–SC), would prefer to see an interagency biotechnology panel, coordinated by the president's science adviser, play the role now assigned to the Commerce Department. Hollings is also chairman of the relevant appropriations committee, which improves the chances, otherwise slim, that the research program can be funded for the 1994 fiscal year, which begins on 1 October.

–Jeffrey Mervis