Foote, who planned the automation.

With so many good ideas floating around, the AGRF's future should be rosy, but many researchers who spoke with *Science* are concerned that the government's overall support for genome research remains skimpy. "Great. Glad they're doing something, but look what's happening elsewhere," says one. Compared to the tens and hundreds of millions spent on genome programs in other countries, "it's a drop in the bucket," he says.

And a big boost is not likely soon. While the National Health and Medical Research Council will support genome research (and AGRF costs) within present granting programs, it will only consider allocating specific funds if new money becomes available, says nephrologist Judith Whitworth of St. George's Hospital in Sydney, who chairs the council's medical research committee. And that prospect, says John Bell, a top administrator at the Department of Industry, Science, and Technology, is "hard to predict, but personally I don't think it's very good."

Researchers are hoping to tap other sources of funding to make up some of the shortfall. Foreign money, both public and private, supports some genetics research in Australia, and Mattick has high hopes of attracting foreign projects to the AGRF from the growing scientific powers in the Asia-Pacific region as well as countries with well-established genome programs but little service capacity. "The new program is a great idea," says HUGO's Sutherland. "But without more project funding, the benefit of all this won't be realized." Last month's announcement will, however, at least give Australia the basis for a strong start.

–Patricia Kahn

MARINE GEOSCIENCE

Navigating Shrinking Financial Seas

ASHLAND, OREGON—Deep-sea oceanography, like some other areas of high-tech science, is getting a cold splash of fiscal reality these days. The field was once supported by several different agencies, but many funding sources have largely dried up, thanks to new defense priorities and congressional budget cuts. As a result, the National Science Foundation (NSF) now finds itself funding the lion's share of research in everything from the geochemistry of deep-sea vents to the development of new undersea robotic craft.

Given the shrunken pie, what should be the field's intellectual course over the next 20 years? Representatives of NSF's Marine Geology and Geophysics (MG&G) program and Ocean Drilling Program (ODP) posed that question to a select group of about 40 marine researchers invited to a gloves-off workshop here in December.* They got an emotional response. Researchers offered ideas ranging from more interdisciplinary research to better public relations, but if there was one single theme, it was this: hard choices lie ahead.

The meeting was a first for these programs, which include such diverse fields as solid earth, climate, fluids, and sedimentary processes. Acting MG&G program director David Epp insisted that the gathering was not about funding priorities. But his audience wasn't convinced. In the workshop's first open forum, marine geoscientist Peter B. Kelemen of Massachusetts's Woods Hole Oceanographic Institution pointedly told Epp and his associates, "You can try to pull the wool over our eyes any old way you want, guys, but you can't hide the fact that this meeting is secretly designed to address resource shortages by fiddling with [research] priorities." And certainly, other scientists behaved as if funding was at stake. After a talk on midocean ridges, one scientist stood up and demanded to know why ridges needed more study, asking, "Haven't you already answered the key questions?"

Such scrabbling for a piece of the funding pie is new to deep-sea oceanographers. Ocean sciences have been getting a shrinking share of federal research dollars (see chart), but until the mid-1990s, deep-ocean researchers could tap several sources, including the Defense Department's Office of Naval Research (ONR) and the National Oceanic and Atmospheric Administration, as well as the Department of Energy and the U.S. Geological Survey, for grants. But Congress cut the budgets of the latter three agencies. And although ONR remains a major player, spending about $150 million on science and technology in 1995, its research mission has changed, due to the end of the Cold War. The agency previously focused "on open-ocean and antisubmarine warfare" because of the Soviet threat, says Thomas Kinder, a program manager in coastal dynamics at ONR. "But now, because of things like Somalia and Desert Storm, the emphasis is on littoral [coastal] warfare," and on getting landing craft safely onto hostile shores.

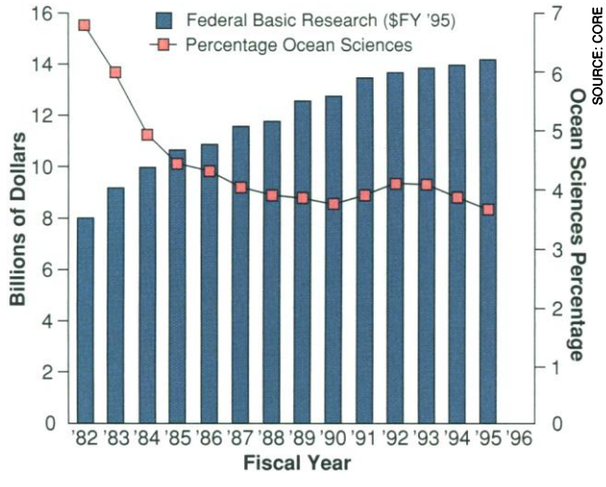
Thus, in 1990, 80% of ONR's research budget was set aside for the open ocean; today, the share has shrunk to 30%, with 40% earmarked for littoral studies, ONR officials say. As a result, researchers fear they'll lose the edge on deep-sea technologies, such as deep-sea observatories that can sample and record data from the ocean's floor. "This science is so driven by the need to get to the sea floor and retrieve data that the loss of ONR grants has really hit it hard," explained Marcia K. McNutt, a marine geoscientist at the Massachusetts Institute of Technology.

NSF hasn't focused on such hardware in the past, but it is now left to play the role of sugar daddy, with a 1996 kitty of about $21 million for its MG&G program and about $40 million for ODP. Those budgets have been flat in recent years, making it hard to fund additional applicants. "It means we have to change," perhaps by funding more tools for research, NSF's Epp said after the meeting, "but the community must as well."

By the workshop's end, most scientists seemed to agree that the solution lay, not in pitting fields against each other, but in working together on interdisciplinary projects that stretch limited dollars. For example, the sedimentologists, puzzling over such basic questions as how sandbars form, are ripe to work with geophysicists to "quantitatively model such processes," says Epp. The group also suggested more publicity for ocean research and cultivating private funding sources, such as oil exploration companies. And despite the frustrations that emerged at the meeting, many scientists said they welcomed the opportunity to work with NSF to envision the field's future—and to chart the hazardous fiscal waters ahead.

–Virginia Morell

* Future of Marine Geosciences Workshop, 5-7 December.



Flowing downhill. Ocean sciences' share of research funding has been declining.