Golden Opportunities Seen in Biology

Just when funds for new initiatives in the life sciences are dwindling, along comes the National Research Council with a 425-page wish list for biological research. In a new report entitled "Opportunities in Biology,"* the NRC says that biology has entered a golden age in which practical advances in medicine, agriculture, and environmental management can be expected. "There has never been a time when any field of science could be more promising for human welfare and for basic understanding than biology is at the present," says Peter Raven, director of the Missouri Botanical Garden and chairman of the NRC committee that authored the report. But the advances may not occur, the report warns, unless the United States commits more funds for research and equipment and broadens the scope of biology education.

While the report does not make specific budget recommendations, it is nevertheless meant to help boost funding. The chapters are peppered with examples of advances in medicine and agriculture that arose directly from basic research. The report "can be used by agency officials in arguing for the importance and value of an area," says John Burris, executive director of the NRC's Commission on Life Sciences.

Nearly 20 years have elapsed since the last NRC survey of biology. And the current effort, which was nearly 3 years in the making, documents just how dramatically the face of biology has changed since then.

The field has not only grown in scope and size, but it has become increasingly dependent on complex instruments, the report notes. Meanwhile, even as total federal funding for biological sciences rose by 72% in constant dollars between 1970 and 1985, the amount spent per Ph.D.–level biologist dropped by 18% between 1973 and 1983 due to growth of the field. At the same time, the list of necessary equipment was expanding to include such pricey items as flow cytometers, peptide synthesizers, and supercomputers. The report's authors found that nearly 60% of biology department heads said their researchers are unable to carry out critical experiments due to lack of equipment. "There is almost no area we emphasize [in the report] that couldn't benefit by doubling the funding," Raven says.

A major trend documented by the report is the merging of disciplines. "During the past two decades, biological research has been transformed from a collection of single-discipline endeavors to an interactive science in which traditional disciplines are being bridged," it states.

But that merging, fueled largely by advances in molecular techniques, does not mean biology has been reduced to a handful of common principles, says Raven. "The field has gotten so fantastically broad that no [one person] can think about it all," he remarks. That puts a new premium on interdisciplinary cooperation and education, two areas addressed by the report. NRC's Burris hopes that the report—with its discussion of the state of research in areas ranging from molecular structure and function to ecology and ecosystems—will help biologists learn about the state of research in areas outside their own and will encourage them to build new collaborations where fields or techniques have converged.

The increased dependence of biologists on complex instrumentation and computers also puts a premium on interdisciplinary education, says Raven, because it creates a need for biologists who are also well-versed in computer science, engineering, chemistry, and physics. "We call for dual majors at the graduate level, so people will really be expert practitioners in both areas, Raven says. "We're afraid that if biologists simply use the other fields [without being experts in them] that they'll never be able to do the best that they're capable of."

The authors of the report also lend their voices to the growing chorus calling for an expanded scientific work force. They recommend efforts to recruit minorities and women into biology and urge that bachelor's and master's programs in the biological sciences be beefed up.

While the report brims with excitement about the potential for progress in all areas of biology, Raven, a plant ecologist, has a personal concern about a growing split in the field. While most areas of biology have been unified and interwoven through advances in molecular genetics, Raven sees ecology sitting on the other side of a widening divide, at a time when worldwide environmental crises cry out for ecological study. It is up to universities to maintain a balance in undergraduate biology education, he says. "It is necessary for human beings to be extremely well informed about [ecology], and that won't happen if all it is is the last three lectures in a biology course."

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*"Opportunities in Biology," National Academy Press, Washington, DC, 1989.

Budget Fix Hits Research Grants

Last week, 2 months after fiscal year 1990 began, Congress and the Bush Administration finally reached agreement on a combination of tax increases and across-the-board budget cuts to bring the federal deficit below $110 billion, as required by the dreaded Gramm-Rudman-Hollings deficit reduction law. As a result, funds already appropriated by Congress for all federal agencies will be trimmed by 1.4%, which in turn will mean that the size and number of research grants awarded this year by the National Institutes of Health and the National Science Foundation are likely to be reduced.

Coming on top of an already severe squeeze on new grants, these cuts will be painful. But the misery might have been worse. If Congress had not acted, Gramm-Rudman would have taken a 5.3% bite out of agency budgets.

At press time, NIH officials were not certain how much flexibility they would have in protecting noncompetitive and competitive grants from the cutbacks. NIH budget officials predicted that grant sizes would be trimmed slightly. This, they said, would be preferable to cutting the number of new competitive grant awards, which are already declining (*Science*, 24 November, p. 988). Even under the $7.7-billion NIH budget passed by Congress last month, funding for new competitive grants was slated to fall from $995 million to $985 million. It may now be cut further by 1.4%.

NSF officials also were unsure how they would handle the reductions to their $2.07-billion budget. Controller Sandra Toye said no decisions would be made on cutting the number of new research grants or on trimming grant sizes until the agency hears from the Office of Management and Budget (OMB) on whether it must apportion the cuts uniformly across all accounts. Similarly, officials at the National Aeronautics and Space Administration are awaiting word from OMB before making firm decisions on where to make reductions in the agency's $12.4-billion budget.

Over at the Department of Energy (DOE), the estimated $30-million cut required in the Office of Energy Research's $2.17-billion budget may reduce operating time at particle accelerators and various user facilities at national laboratories. DOE officials are optimistic, however, that OMB will permit some flexibility in deciding how the cuts will be distributed across research programs.

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