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Congress Learns about 21st Century Biology

ROBERT E. GROPP

Last year, the National Research Council (NRC) issued *A New Biology for the 21st Century: Ensuring the United States Leads the Coming Biology Revolution*. Described by some scientists as biology's "moon shot," the 112-page report makes a case for new research and funding models that can stimulate fundamental discovery and solve complex problems in the areas of environment, energy, agriculture, and health. Policymakers have since begun to consider the report's recommendations.

In June, shortly after the House of Representatives passed its version of the America COMPETES Reauthorization Act of 2010—legislation to reauthorize the National Science Foundation (NSF) and several other federal science programs—the chamber's Subcommittee on Research and Science Education convened a hearing to examine the future of the biological sciences. Spurred in part by the NRC report, the hearing considered how potential scientific advances can be translated into technologies that benefit society, and how to prepare researchers to thrive in areas of research that do not fit easily into a single academic department.

In his opening remarks, Subcommittee Chairman Daniel Lipinski (D-IL) shared an amusing and informative recollection: "Biology was not my favorite subject in high school—although that may be because it was first semester freshman year and we had to dissect the fetal pig—the new, 21st century biology has me much more interested. I was trained as a mechanical engineer, and when I hear people talking about cells as a systems design problem, I understand the important role of engineers and physicists working in biology."

Testifying before the panel, James P. Collins suggested that biology "will flourish in the 21st century by sustain-

ing strength in core disciplines while simultaneously supporting research at the intersection of the natural, physical, and social sciences, as well as engineering. Research at these disciplinary edges holds great promise for addressing problems in energy, the environment, agriculture, materials, and manufacturing." Collins, AIBS president-elect and Virginia M. Ullman Professor of natural history and environment at Arizona State University, was the assistant director for biology at NSF when it, the Department of Energy, and the National Institutes of Health commissioned the NRC report.

The environmental sciences offer promising research opportunities. "Interdisciplinary research is advancing our basic understanding of challenges such as global change and global loss of biodiversity and suggesting ways in which we might mitigate these changes," Collins testified. "NSF-supported sensing systems in the Long Term Ecological Research Network and in the proposed National Ecological Observatory Network are designed to gather enormous quantities of data continuously. These networks of sensors, computers, and people promise to transform how we test basic ecological theory and apply the results."

As this research matures, Collins advised, researchers need new tools. Fast, highly accurate molecular techniques for identifying species will be important, as will efficient computer algorithms for analyzing, visualizing, and storing large quantities of data.

"Students entering these fields must be skilled in quantitative and computational methods, [and] understand how to draw on multiple disciplines to address problems," Collins said.

Representative Vernon J. Ehlers (MI), a PhD physicist and the panel's

ranking Republican, said he is still getting his head around the report's recommendations. He told a story about a friend who, after receiving the Nobel Prize in Physics, decided that the important problems are in the biological sciences. Unfortunately, Ehlers noted, his friend has had less impact in biology than his friend anticipated, highlighting the need to support the development of young scientists. It may be better to prepare young scientists to work in more than one field, rather than expecting a scientist to master one field before working in another.

Keith Yamamoto, chairman of the National Academy of Sciences Board on Life Sciences and professor of cellular and molecular pharmacology at the University of California, San Francisco, alluding to the long wait many scientists must endure before receiving their first grant, told the subcommittee that increasing the training period for scientists is not the way to proceed. He suggested that new scientists should be grounded in one discipline but able to work and communicate with colleagues from other fields.

Although the subcommittee hearing was a signal that lawmakers are interested in the recommendations outlined in *A New Biology*, it remains to be seen whether the scientific community is ready to embrace the report's findings. Moreover, are the federal agencies that fund scientific research and education prepared to implement the recommendations?

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