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National Academy of Sciences

National new biology initiative offers potential for 'remarkable and far-reaching benefits'

WASHINGTON -- A report released today by the National Research Council calls on the United States to launch a new multiagency, multiyear, and multidisciplinary initiative to capitalize on the extraordinary advances recently made in biology and to accelerate new breakthroughs that could solve some of society's most pressing problems -- particularly in the areas of food, environment, energy, and health.

The report was requested by the National Institutes of Health, National Science Foundation, and U.S. Department of Energy, which asked the committee that wrote the report to look at how best to build upon recent scientific developments such as the Human Genome Project.

Advances in many technologies have allowed biologists to observe life at levels of detail that were once thought impossible. Interpreting the vast amounts of data being generated by these innovations and developing practical solutions to major challenges will require collaboration among scientists and engineers from many disciplines. And despite the potential of these recent advancements, the committee said that the design, manipulation, and prediction of complex biological systems needed for practical applications are "well beyond current capabilities."

The committee used the term "new biology" to describe an approach to research where physicists, chemists, computer scientists, engineers, mathematicians, and other scientists are integrated into the field of biology to create the type of research community that can tackle society's big problems. "'The new biologist' is not a scientist who knows a little bit about all disciplines, but a scientist with deep knowledge in one discipline and a 'working fluency' in several," the report says. To be sure, biologists are already working successfully in many instances with other scientists and engineers. But for collaborations to take advantage of advances in imaging, high-throughput technologies, computational science and technology, and others, a major new initiative is needed, the committee concluded.

The national new biology initiative should have a timeline of at least 10 years and funding in addition to current research budgets, and it should be an interagency effort to reflect the interdisciplinary approach to research, the committee emphasized. The report also underscores the importance of making information technologies a priority in the initiative given that information is the "fundamental currency" of the new biology.

"A new biology initiative would be a daring addition to the nation's research portfolio, but we believe the potential benefits are remarkable and far-reaching," said Phillip Sharp, co-chair of the committee that wrote the report and Institute Professor for the Koch Institute for Integrative Cancer Research at the Massachusetts Institute of Technology, Cambridge.

The report describes four broad challenges where the new initiative could accelerate the emergence of an integrated approach to biology and bear its "first fruits." For starters, it could meet food security challenges by developing the capacity to quickly adapt plants to any growing conditions. The initiative also could be used to address environmental issues by making it possible to monitor ecosystems and diagnose and repair ecosystem damage. On the energy front, the new biology initiative could speed the development of alternatives to fossil fuels by optimizing systems for turning plant cellulose into biofuel. A fourth goal should be to advance so-called personalized medicine by making it possible to monitor and treat a person's health in a manner that is tailored to that individual, the goal being to provide individually predictive surveillance and care.

"We need to set big goals, and let the problems drive the science," said committee co-chair Thomas Connelly Jr., executive vice president and a member of the office of the chief executive for E. I. du Pont de Nemours & Co.

The report says that by targeting society's major challenges, the initiative would provide an opportunity to attract students who want to solve real-world problems to scientific fields. The initiative will need to devote resources to interdisciplinary education to support the training of new biologists, the report adds.

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Copies of A NEW BIOLOGY FOR THE 21ST CENTURY: ENSURING THE UNITED STATES LEADS THE COMING BIOLOGY REVOLUTION are available from the National Academies Press; tel. 202-334-3313 or 1-800-624-6242 or on the Internet at HTTP://WWW.NAP.EDU. Reporters may obtain a copy from the Office of News and Public Information (contacts listed above).

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