



A New Biology for the 21st Century

In 2007, the National Academies published Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. The report argued that increased government investment in basic science research is essential for continued American economic strength. The “America Competes” Act, which included a call for a doubling of the NSF and DOE Office of Science budgets, was a direct response to this highly influential report.

The NIH, NSF and DOE recently asked the Board on Life Sciences to undertake a project called “A New Biology for the 21st Century.” Originally conceived as a kind of “Gathering Storm” for the life sciences, the project calls for an open-ended appraisal of the current state of the life sciences, the potential for progress through synthesis and integration, and the resultant implications for funding strategies, decision-making, infrastructure and education. Phillip Sharp (Institute Professor at MIT, NAS/IOM member and Nobelist) and Tom Connelly (Chief Technical Officer of DuPont and chemical engineer by training) are serving as co-chairs.

The project includes a “Biology Summit” on December 3, 2008 at which the leaders of the major biology research funding agencies (and private research foundations) will outline the great potential of biology research and the challenges in reaching that potential. Elias Zerhouni, Jim Collins, Tom Cech, Harold Varmus, Ray Orbach will be speaking at the Summit. Other speakers will include private sector “consumers” of life sciences research results, university presidents, and several cutting edge biology researchers who will illustrate the interdisciplinary, high impact biology research that’s already taking place. The proceedings will be quickly published as a workshop report that will be published early in 2009. That report will serve as a kind of “the promise and the challenges” teaser. The consensus committee report, to be published in fall 2009, then will provide the “here’s how to get there” recommendations.

The idea underlying the project is that biology is poised for a great synthesis. Biologists are increasingly able to combine their knowledge of individual biological “parts” into an understanding of the whole and to understand how living and physical systems are intertwined. A rich conceptual framework anchored in the theory of evolution allows biologists to apply knowledge gained about one living system to all others, multiplying the value of fundamental biological research. Enabled by increasingly powerful instrumentation and information processing capabilities, this fundamental change in the nature of biological science has implications for the culture of the biological research enterprise, how biological research is funded, the overall societal and economic impact of biological discovery and development, and the teaching of this new biology. The exciting promise of biology notwithstanding, achieving this level of synthesis and a true understanding of complex biological systems will be one of the most challenging of human endeavors — one that will demand new levels of cooperation and interaction across a dynamic, rapidly expanding discipline.

Among the questions the committee has been asked to consider are: What fundamental biological questions are ready for major advances in understanding? What would be the practical result of answering those questions? How could answers to those questions lead to high impact applications in the near future? How can federal agencies more effectively leverage their investments in biological research and education to address complex problems? In what areas would near term investment be most likely to lead to substantial long-term benefit and a strong, competitive advantage for the United States?