American Society of Plant Biologists

*Cultivating a better future through plant biology research*

**Official Written Testimony in support of the National Science Foundation's Fiscal Year 2014 Budget**

Submitted to the Subcommittee on Commerce, Justice and Science, and Related Agencies
Committee on Appropriations
United States House of Representatives
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Submitted by
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and
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On behalf of the American Society of Plant Biologists (ASPB), we submit this testimony for the official record to support the highest funding level possible for the National Science Foundation (NSF) for Fiscal Year (FY) 2014. ASPB and its members recognize the difficult fiscal environment our nation faces, but we believe that sustained investments in scientific research will be a critical step toward economic recovery and continued global competitiveness for our nation.

ASPB would like to thank the Subcommittee for its consideration of this testimony and for its strong support for the research mission of NSF.

Our testimony will discuss:

- Plant biology research as a foundation for addressing food, fuel, environment, and health concerns;
- The rationale for robust funding for NSF to maintain a well-proportioned science portfolio with support for all core science disciplines, including biology; and
- The rationale for continued funding of NSF education and workforce development programs that provide support for the future scientific and technical expertise critical to America's competitiveness.

ASPB is an organization of some 4,500 professional plant biology researchers, educators, graduate students, and postdoctoral scientists with members across the nation and

throughout the world. A strong voice for the global plant science community, our mission—achieved through work in the realms of research, education, and public policy—is to promote the growth and development of plant biology, to encourage and communicate research in plant biology, and to promote the interests and growth of plant scientists in general.

## Food, Fuel, Environment, and Health: Plant Biology Research and America's Future

Plants are vital to our very existence. They harvest sunlight, converting it to chemical energy for food and feed; they take up carbon dioxide and produce oxygen; and they are the primary producers on which most life depends. Indeed, plant biology research is making many fundamental contributions in the areas of energy security and environmental stewardship; the continued and sustainable development of better foods, fabrics, and building materials; and in the understanding of biological principles that underpin improvements in the health and nutrition of all Americans.

In particular, plant biology is at the interface of numerous scientific breakthroughs. For example, with high throughput experimental approaches facilitating extraordinary syntheses of information that are NSF-supported, plant biologists are using computer science applications to make tremendous strides in our understanding of complex biological systems, ranging from single cells to entire ecosystems. Understanding how plants function ultimately will result in better and more productive crops, new sources of fuel, and the development of better medicines to treat diseases like cancer.

Despite the significant positive impact plants have on our nation's economy and in addressing some of our most urgent challenges, including food and energy security, federal investments in plant biology research are modest. Still scientists have maximized and leveraged this funding in order to understand the basic function and mechanisms of plants, providing a foundation for vital advances in practical applications in agriculture, health, energy, and the environment.

To address future societal challenges that might be mitigated through investements in plant biology research and to prioritize community research efforts, ASPB organized a two-phase Plant Science Research Summit held in September 2011 and January 2013. With funding from NSF, the U.S. Department of Agriculture, the Department of Energy, and the Howard Hughes Medical Institute, the Summit brought together representatives from across the full spectrum of plant science research to develop a ten-year consensus plan to fill critical gaps in our understanding of plant biology in order to address the grand challenges we face. As a research community, our vision is to create plant systems that are flexible and adaptable to new and existing challenges by increasing the predictive and synthetic abilities of plant biology. In achieving these goals, the plant science research community will make significant contributions to:

- exploring, conserving and utilizing our natural resources;

- protecting, maintaining and improving crop productivity; and
- creating new plant-inspired industries.

ASPB expects to publish a report from the Plant Science Research Summit in spring 2013. This report will further detail the plant science community's priorities and the key initiatives needed to address the grand challenges facing the nation.

## Robust Funding for the National Science Foundation

***ASPB supports continuing to increase funding for NSF and encourages proportional funding increases across all of the scientific disciplines NSF supports.*** As scientific research becomes increasingly interdisciplinary with permeable boundaries, a diverse portfolio at NSF is needed to maintain transformational research and innovation.

NSF funding for plant biology specifically enables the scientific community to address cross-cutting research questions that could ultimately solve grand challenges related to a sustainable food supply, energy security, and improved health and nutrition. This notion is reflected in the National Research Council's report *A New Biology for the 21st Century* and the President's Council of Advisors on Science and Technology's (PCAST's) recent report *Agricultural Preparedness and the United States Agricultural Research Enterprise* and it will be addressed comprehensively in the Plant Science Research Summit's report. Additionally, ASPB enthusiastically supports the PCAST report's recommendation that calls for increased funding for NSF for basic science related to the agricultural sciences.

The NSF Directorate for Biological Sciences (BIO) is a critical source of funding for scientific research, providing 62 percent of the federal support for non-medical basic life sciences research at U.S. academic institutions and beyond. BIO supports research ranging from the molecular and cellular levels to the organismal, ecosystem, and even biosphere levels. These investments continue to have significant pay offs, both in terms of the knowledge directly generated and in deepening collaborations and fostering innovation among communities of scientists.

The Biological Sciences Directorate's Plant Genome Research Program (PGRP) is an excellent example of a high impact program that has laid a strong scientific research foundation for understanding plant genomics as they relate to energy (biofuels), health (nutrition and functional foods), agriculture (impact of changing climates on agronomic ecosystems), and the environment (plants' roles as primary producers in ecosystems). *ASPB* ***asks that the PGRP be funded at the highest possible level and have sustained funding growth over multiple years to address 21st century challenges.*** Furthermore, in light of the need to create cyberinfrastructure across a wide range of scientific disciplines, ASPB supports efforts to homogenize metadata formats and enhance data sharing.

Without significant and increased support for BIO and the NSF as a whole, promising fundamental research discoveries will be delayed and vital collaborations around the edges of scientific disciplines will be postponed, thus limiting the ability to respond to the pressing scientific problems that exist today and the new challenges on the horizon. Addressing these scientific priorities also helps improve the competitive position of the United States in a global marketplace.

## Continued Support for NSF Education and Workforce Development Programs

The National Science Foundation is a major source of funding for the education and training of the American scientific workforce and for understanding how educational innovations can be most effectively implemented. NSF's education portfolio impacts students at all levels, including K–12, undergraduate, graduate, and postgraduate, as well as the general public.

As NSF embarks upon a new effort to rethink and improve graduate education in the United States, ASPB is supportive of new ideas that will enhance student learning, training, retention, access, and recruitment. Furthermore, ***ASPB urges the Subcommittee to support expanding NSF's fellowship and career development programs—such as the Postdoctoral Research Fellowships in Biology, the Graduate Research Fellowship (GRF) and the Faculty Early Career Development (CAREER) programs***—thereby providing continuity in funding opportunities for the country's most promising early career scientists. ***ASPB further encourages the NSF to develop "transition" awards that will support the most promising scientists in their transition from postdoctoral research to independent, tenure-track positions in America's universities.*** The NSF might model such awards after those the National Institutes of Health offers.

Furthermore, the nearly seven-year median for a life-science PhD in the United States contrasts with other nations where students specialize earlier, thus entering doctoral programs with more uniform and advanced scientific foundations. To focus more attention on new types of skills, such as private-sector experience and data-science training, NSF may wish to consider encouraging universities to tailor undergraduate curricula to allow committed students to enter PhD programs without needing a significant amount of textbook-style coursework. One way to do so would be to offer a seamless, seven-year curriculum that combines bachelor's and doctoral education, thereby making the career path more attractive and reducing costs to investigators, institutions, and funding bodies. NSF may wish to fund exploration and development of this kind of program or curriculum.

ASPB urges support for NSF to further develop programs aimed at increasing the diversity of the scientific workforce by leveraging professional scientific societies' commitment to provide a professional home for scientists throughout their education and careers and to help promote and sustain broad participation in the sciences. Discrete focused training

and infrastructure support programs for Hispanic Serving Institutions, Historically Black Colleges and Universities, and Tribal Colleges and Universities remain vitally important, because they foster a scientific workforce that reflects the U.S. population.

ASPB urges support for education research that enhances our understanding of how educational innovations can be sustainably and most effectively implemented in a variety of settings. NSF programs such as Transforming Undergraduate Education in STEM, Discovery Research K–12, and Widening Implementation and Demonstration of Evidence-based Reforms (WIDER) provide opportunities to expand NSF's research and evaluation efforts to address scale-up and sustainability. Additionally, investigating and supporting effective approaches toward rolling out across the K-16 continuum the new vision for undergraduate biology education articulated in the 2010 Vision and Change report are particularly valuable. ***ASPB encourages continued support for education research programs within NSF's Education and Human Resources portfolio with a focus on understanding how previous investments in educational strategies can be made most effective.***

Grand research challenges will not be resolved in a year, an administration, or a generation, but will take continued attention and investment at federal research agencies, such as the National Science Foundation, over decades.

Thank you for your consideration of our testimony on behalf of the American Society of Plant Biologists. Please do not hesitate to contact us if we can be of any assistance in the future.

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