Outside Witness Testimony
Judith S. Bond, Ph.D., President
Federation of American Societies for Experimental Biology
Before the
Subcommittee on Commerce Justice Science and Related Agencies
United States House of Representatives
March 21, 2013

Chairman Wolf, Ranking Member Fattah, and distinguished members of the Subcommittee, thank you for the opportunity to testify on behalf of the National Science Foundation (NSF). I am a Professor Emerita and former Chair of Biochemistry and Molecular Biology at Penn State College of Medicine in Hershey PA. I come before you today in my capacity as the President the Federation of American Societies for Experimental Biology (FASEB), an umbrella organization representing 26 scientific and engineering professional societies and more than 100,000 researchers, to request a fiscal year 2014 budget of $7.4 billion for NSF.

NSF is the only federal research agency dedicated to advancing fundamental research and education across all fields of science and engineering. NSF serves as the primary federal funding source for research in fields such as mathematics, computer science, basic biology with direct application to human health, and the social sciences. In addition to fostering scientific research, the agency undertakes innovative efforts to strengthen science, technology, engineering, and mathematics education nationwide. These grants, awarded to projects of the highest quality and greatest significance in all 50 states, are selected using a rigorous merit-review process that evaluates proposals on both scientific and societal value.

Recent examples of outstanding NSF funded research include using light to better understand the brain. The overwhelming complexity of the brain limits our ability to understand and treat neurological and psychiatric illnesses. The emerging technique of optogenetics represents a promising approach to overcoming this limitation by deconstructing the brain's complexity. Using light-responsive proteins, genetically introduced into the cells of living organisms, optogenetics allows the behavior of highly specific and functionally similar populations of cells to be controlled. Researchers are using optogenetics to make phenomenal progress in the expansion of our knowledge of the brain, which lays the foundation for the next generation of new breakthrough therapies for Parkinson's disease and other devastating disorders.

NSF is also supporting the exciting work aimed at building biological machines. Using only hydrogel, heart cells, and a 3-D printer, researchers have created cell-powered, non-electric walking machines. The locomotion of the "bio-bot" is driven by the beating of heart cells. By integrating different types of cells that are sensitive to specific environmental stimuli, such as a drugs or toxins, bio-bots could be used as sensors. Eventually, bio-bots may be used as neutralizers of toxic chemicals and could be customized for applications in medicine, energy, defense, and the environment.

In addition, NSF supports studies aimed at using biodiversity to develop biofuel alternatives. The search for alternate energy sources is growing in economic importance as the fossil fuel supply rapidly depletes and concerns about its environmental effects grow. NSF-supported research at the Cedar Creek Ecosystem Science Reserve is exploring the use of prairie biomass as an

alternative biofuel to corn and soybean monocultures. Prairie plots with higher species diversity yield a greater energy gain than monocultures, and sequester larger amounts of carbon dioxide in soil and in underground root systems. The discoveries at Cedar Creek suggest that high-diversity prairie biomass may be a viable biofuel alternative for our nation's energy needs that minimizes production of greenhouse gases, while simultaneously providing wildlife benefits and ecosystem values.

Another example of the groundbreaking science being funded by NSF is in the area of hearing loss research. Recently, a team of scientists has determined the 3-D atomic structure of an important component of inner ear hair cells essential for both hearing and balance. Inner ear hair cells have bundles of cilia on their exposed surface that convert sound and head position information into neural signals. The maintenance of physical linkages among cilia in the bundles is critical to proper functioning of the inner ear. Genetic mutations in the proteins responsible for this linkage often result in congenital deafness and balance disorders. Armed with the atomic structure and biological mechanism, results of this research will position researchers to develop more powerful therapeutic interventions for hearing impairment and balance deficits.

Finally, NSF plays the crucial role of nurturing the next generation of scientists. An NSF program to prepare future scientists and engineers, the Graduate Research Fellowship Program (GRFP) annually awards approximately 2,000 three-year fellowships to outstanding graduate students pursuing advanced degrees in science, technology, engineering, or mathematics. NSF graduate research fellows have become leaders in the scientific community, including Brian K. Kobilka, the 2012 Nobel Prize winner in Chemistry and Serge Haroch and David J. Wineland, who received the 2012 Nobel Prize in Physics.

At a time when the United States faces unprecedented fiscal challenges, scientific and technological advances are needed to keep our nation globally competitive and enable the economic growth that is born out of discovery and innovation. NSF's broad portfolio of fundamental research expands the frontiers of knowledge, and fuels future innovation. Furthermore, through its education and training initiatives, NSF ensures the development of a world-class scientific and engineering workforce, including at research institutions and high-tech companies.

NSF-funded research is a critical source of scientific breakthroughs, many of which provide the basic knowledge that fuels innovation in other, more mission-oriented agencies. Failure to build on prior NSF investments and continue support for the agency as science expands, would slow the pace of discovery, discourage the next generation of scientists and engineers, and sacrifice our position as the global leader in innovation. Therefore, FASEB recommends a minimum funding level of $7.4 billion for the National Science Foundation in FY 2014 to prevent contraction. Our broader goal is a sustainable research program, a return to the demonstrated capacity level, and a funding trajectory reflective of the America COMPETES Act reauthorization. Our recommended increase of $304 million would fund an additional 324 projects.

Again, thank you for the opportunity to offer FASEB's support for NSF. I close happy to work with the Subcommittee to strengthen NSF and to further its mission to foster innovation.