

Testimony of
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On
FY 2011 Appropriations for the Department of Energy Office of Science

Submitted to the
Senate Committee on Appropriations
Subcommittee on Energy and Water Development
Senator Byron Dorgan, Chair
Senator Robert Bennett, Ranking Member

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On behalf of the **Federation of American Societies for Experimental Biology (FASEB)**, I **respectfully request an appropriation of \$5.24 billion for the Department of Energy, Office of Science in FY 2011**. This figure is in keeping with President Obama's vision for doubling the DOE SC budget. Further, it will enable the Office of Science to continue supporting essential research programs that enhance human health and quality of life, invigorate the economy, bring the nation closer to energy independence, and drive scientific innovation.

FASEB is composed of 23 societies representing more than 90,000 members, making it the largest coalition of biomedical research associations in the United States. Our mission is to improve human health and welfare by promoting progress and education in biological and biomedical sciences.

The Office of Science is dedicated to investing in "the most exciting and daring research that human kind has ever conceived." The programs and facilities of the DOE SC enable important discoveries in computational sciences, environmental and biological sciences, and energy sciences. For example, DOE scientists are developing tools such as hollow glass microspheres, tiny glass capsules that are half the width of a human hair, which have applications ranging from targeted drug delivery to hydrogen storage for batteries. Additionally, work at the DOE national laboratories is increasing the capabilities of supercomputers, allowing for more efficient access to data and faster processing speeds. This and other research funded by the DOE SC drives cutting-edge science and technological innovations that ensure our nation's safety, bolster our nation's economy, and improve the day-to-day lives of the American people.

More than 25,000 researchers from various government agencies, academic institutions, and private industry use the DOE SC's state-of-the-art laboratories and research facilities every year. The national laboratory system is the most advanced of its kind and permits the agency to support vital research in a variety of fields, as well as interdisciplinary research that extends the basic research of many other federal agencies. In fact, much of the research funded by non-DOE science agencies would not be possible without the DOE's dedicated research infrastructure. At the Brookhaven National Laboratory the synchrotron particle accelerator, with its ability to produce intense light at a variety of wavelengths, is being used by medical scientists from the

National Institutes of Health. In research funded by the National Institute of General Medical Sciences, X-rays from the synchrotron are being used to study the structure of proteins involved in Alzheimer's disease. The Office of Science also provides support to many graduate students and early-career postdoctoral researchers. Almost half of the DOE SC's research funding supports projects at over 300 academic institutions nationwide.

Discoveries that Improve Health and Well-Being

DOE-supported scientists are making remarkable contributions to human health.

- **Restoring Sight to Patients with Vision Loss:** In conjunction with the National Science Foundation and the National Eye Institute, the DOE Office of Science helped to fund a team of ophthalmologists, engineers, and neuroscientists to create the first ever artificial retina. The groundwork for this development was laid by more than a century's worth of basic research into the structure and function of the eye. By drawing on the work of anatomists, biochemists, electrophysiologists and others, scientists were able to create a device delicate enough not to damage the eye yet complex enough to provide visual input to the human brain. The resulting artificial retina has been shown to restore some level of sight to those who have lost vision due to retinal disease. By 2011, the research team expects to start clinical testing on a version that will allow reading and facial recognition. These studies are bringing new hope to patients who have gone decades without sight.

- **Improving Bone Regeneration:** Following a fracture, the process of bone proliferation and healing takes several weeks, even months. A research team funded by the DOE SC is currently developing safe, effective, and inexpensive implant materials to improve this process and shorten healing time. They have identified a growth factor known as lysophosphatidic acid (LPA) that promotes bone regeneration with no detectable toxicity. What's more, LPA can be manufactured at the fraction of the cost of the other bone healing stimulators that are currently available. The next step is for researchers to combine LPA with a hydrogel that, when injected around a damaged bone, will release the growth factor in a controlled manner. This research has the potential to significantly reduce recovery time for the eight million Americans who suffer bone fractures every year.

- **Mitigating the impact of low dose radiation:** The DOE Low Dose Radiation Research Program funds basic research to determine the effects of exposure to low doses of radiation. Researchers long ago established that ionizing radiation, which is present in a wide range of occupational settings, can lead to breast cancer by causing genetic mutations. Recent research DOE has funded, however, has revealed that exposure to ionizing radiation also acts as a carcinogen by affecting the cell proteins responsible for cell-to-cell communication and cellular structure. Thus exposure may result in breast or other types of cancer, even where genetic mutations are not detectible, and the damage can amplify by translating to subsequent generations of cells. Understanding the fundamental cell biology of radiation exposure paves the way for the development of treatments for and protections against low-dose radiation.

Cleaner and More Secure Energy Future

Discoveries in fundamental energy sciences funded by DOE SC are already changing the way we use energy and paving the way for the next generation of environmentally-friendly, sustainable energy sources. Specifically, the Department's newly-formed Advanced Research Projects Agency-Energy (ARPA-E) is working on technologies to meet our most pressing energy needs.

- **Hydrogen Technologies:** Hydrogen is one of the most abundant elements on the planet, making it an appealing clean energy alternative. However, almost all hydrogen is locked up in water and other compounds. Researchers at the Savannah River National Laboratory are working to advance the most promising method of extracting hydrogen from water – the Hybrid Sulfur Process. This two-step reaction is driven by electricity and heat, both of which can be generated by a nuclear reactor. This simple, efficient process is slated to be used in conjunction with next-generation nuclear plants and has the potential to produce enough hydrogen to power more than one million fuel cell cars.
- **Carbon Capture Technologies:** Natural systems use an enzyme known as carbonic anhydrase (CA) to convert carbon dioxide to bicarbonate, which can then be transported out of tissue. A program funded through ARPA-E is working to apply this process to make the use of fossil fuels less environmentally damaging. The program will develop membrane technology for separating carbon dioxide from flue gas streams, using synthetic forms of CA. The synthetic analogue was created to be more robust than naturally-occurring CA, and thus able to function in harsh environments. This membrane technology developed by the DOE SC is one of many ways currently being explored to increase the efficiency of and reduce the cost involved in carbon capture.

Recognizing the Importance of DOE Research

In 2007, the passage of the *America COMPETES Act* demonstrated Congress's commitment to U.S. science and technology. Now, Congress has the opportunity to reassert this commitment by both reauthorizing *America COMPETES* and supporting the goal of doubling the budgets of DOE SC, NSF and NIST. Funding DOE SC based on the plan outlined in the President's budget will allow DOE to greatly enhance its groundbreaking research portfolio and permit it to confront current and future energy and health challenges. **In keeping with this vision for doubling DOE SC budget, FASEB recommends an appropriation of \$5.24 billion for the Department of Energy, Office of Science in FY 2011.**