

**Outside Written Testimony for the record from the
American Society for Microbiology to the
Subcommittee on Energy and Water Development and Related Agencies
Committee on Appropriations, United States Senate
FY 2021 Appropriations for the Department of Energy, Office of Science
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Submitted on behalf of: Allen Segal, Director of Public Policy and Advocacy
American Society for Microbiology, 1752 N Street, NW, Washington, DC 20036
(202) 737-3600; ASegal@asmusa.org

The American Society for Microbiology (ASM) is one of the largest professional societies dedicated to the life sciences and is composed of 30,000 scientists and health practitioners. ASM's mission is to promote and advance the microbial sciences.

The DOE Office of Science is a leader in advancing critical industries of the future, including quantum information science, artificial intelligence, high performance computing, advanced communications networks, future energy technologies and engineering biology. As we rise to meet the challenges of the 21st Century, Department of Energy (DOE) Office of Science funding remains vitally important for the microbial sciences. **ASM urges Congress to fund the DOE Office of Science at \$7.4 billion in fiscal year (FY) 2021, an increase of 4% over FY2020.**

Funding from the DOE Office of Science through the National Laboratories, universities, and other programs has generated some of our most economically important innovations and is the primary driver of basic research in the physical sciences, as well as critical areas of genome-scale, quantitative analysis of microbial research. This support has enabled researchers to use microbes to solve energy and environmental problems, and to bring those solutions to scale by developing empirical, computational, and mechanistic modeling tools. Office of Science funding led to the creation of the Bioenergy Research Centers, which support research into viable and sustainable domestic biofuel and bioproducts industries. More recently investments in the National Microbiome Data Collaborative, an open source database will lead more effective analysis of microbiome data and better coordination of multidisciplinary microbiome research across the federal government. DOE National Laboratories are now being deployed in the fight against COVID-19, using their supercomputing and modeling capabilities to both understand components of the virus and to find drug compounds to treat it.

Microbial research is needed to face 21st Century challenges

Our society faces a number of large, complex, and interconnected challenges, many of which can be addressed through microbial research. For example, a growing population means that more food is required, and inexpensive renewable sources of energy, fuels, and chemicals are essential for continued economic growth. However, it has become increasingly challenging to meet the needs of society for these products without also considering environmental tradeoffs.

In recent testimony before the House Science, Space, and Technology Committee, ASM Secretary Dr. Tim Donohue from the DOE Office of Science-funded Great Lakes Bioenergy Research Center spoke to the potential of bio-based investments to:

- Develop sustainable strategies to feed an ever-growing population by increasing plant and agricultural productivity and quality;
- Provide strategies to ensure that future US citizens enjoy clean air, water, and a high standard of living;
- Transform human health by providing everything from new pharmaceuticals, reagents for precision medicine, and next generation antibiotics; and
- Produce cost-competitive fuels, chemicals, and materials from abundant renewable resources.

These and other advances in decarbonization, the production of biomaterials or bio-based polymers, and others based on new microbial catalysts will only happen with strong and stable investments in the Office of Science. Some of the most powerful scientific advances have emerged from DOE collaborative research. These include essential elements of the Human Genome Project, integrating biology with computing to launch a biotechnology revolution, new biofuel energy produced with microbial enzymes or improved microbial hosts, and laying the groundwork for a new bioeconomy that generates products from renewable organics. Increased investment in the Office of Science is necessary to ensure that the U.S continues to lead in microbe-based research and development.

DOE Spawns Innovation

In its stewardship of innovation at DOE's National Laboratories, universities, and other programs, the Office of Science is a critical partner in advancing areas of national need, supporting research in key emerging areas including artificial intelligence and microbiome research. Thousands of projects funded by NIH and NSF utilize DOE facilities each year, and more than 50 Fortune 500 companies and many small businesses use these facilities to conduct the underlying research required to develop new technologies and products that drive the economy, including the growing bioeconomy.

In FY 2021, the Office of Science will continue to make strategic investments in innovative high-risk, high-reward research areas, such as the National Microbiome Database Collaborative (NMDC). Recent advances in DNA sequencing technologies have increased our awareness of the complexity and diversity in networks of microorganisms. Yet there remains much to discover regarding how microbiomes function as communities, interact with their hosts and environment, and how they can be leveraged to improve health and ecosystems. As noted in the Interagency Strategic Plan for Microbiome Research, microbiome data is "Big Data", which requires consistent and reliable database and resource coordination to facilitate data collection, analysis, interoperability, and data sharing. The NMDC is a new initiative aimed at empowering this type of microbiome research. It was funded at \$10 million in FY 2020 from the Office of Science. Spearheaded by Lawrence Berkeley National Laboratory, in partnership with Los Alamos, Oak Ridge, and Pacific Northwest national laboratories, the NMDC is leveraging DOE's existing data-science resources and high-performance computing systems to develop a framework that

facilitates more efficient use of microbiome data for applications in energy, environment, health, and agriculture.

Discoveries in targeted areas such as quantum science and technology, genomics, microelectronics, and machine learning have potential far-reaching impacts that spawn the creation of new industries. For example, DOE has also taken the lead on bio-based energy, transportant fuel and chemicals innovation. The Office of Science currently funds four Bioenergy Research Centers, which support research into viable and sustainable domestic biofuel and bioproducts industries. These 4 Centers are developing viable and sustainable domestic biofuels and bioproducts derived from non-food plant biomass, such as poplar, switchgrass, and sorghum. This research will lead to lower greenhouse gas emissions, bring jobs to rural areas, and boost our energy security.

Our nation's ability to make significant advances in solving energy and environmental problems depends on advances in the microbial sciences. This will only be possible if Congress continues its commitment to robust and sustained funding increases for the Department of Energy's Office of Science.