



Sandia National Laboratories is a premier U.S. Department of Energy (DOE) national-security laboratory, where the best and the brightest partner on exciting projects that can literally change the world. We provide innovative, science-based systems engineering solutions to the most challenging problems that threaten peace and freedom for our nation and the globe.

Sandia's biological-sciences personnel work at three sites: our R&D laboratory in Livermore, California; our corporate headquarters in Albuquerque, New Mexico; and the Joint BioEnergy Institute, a U.S. DOE Bioenergy Research Center in Emeryville, California. Sandians at each facility are equipped with state-of-the-art research instruments and collaborate with experts and support personnel in a wide variety of technical and nontechnical fields.



Using Biology to Solve Important National-Security Problems



Biodefense and Emerging Infectious Diseases

Sandia's BEID Program helps the nation anticipate and defend against biothreats, such as biological weapons and emerging infectious diseases. Our work integrates advanced technologies with a deep understanding of the molecular mechanisms of pathogenesis and host-pathogen interactions—especially the human immune response. Our scientists are developing assays, novel materials, and platforms for detecting pathogens and for discovering therapeutic targets. Sandia researchers are also exploring the interrelationships between infectious diseases and the human microbiome.

Examples of Sandia's work in this area:

- **Microscale Immune and Cell Analysis (MICA).** An integrated platform for single-cell manipulation and cellular-signaling interrogation, leading to discoveries in innate immunity and host-pathogen interactions at the molecular level.
- **Rapid, automated, point-of-care system.** A portable, rapid device that measures disease and toxin biomarkers in microscopic volumes of blood, saliva, or urine at the earliest stages of infection, resulting in time-critical presymptomatic diagnostic information.
- **Viral hemorrhagic fever pathogenesis.** A systems biology project that is using a microfluidic cell-isolation platform to discover how viruses provoke lethal cytokine production.



Opportunities for biological scientists and bioengineers at Sandia abound in the following areas:

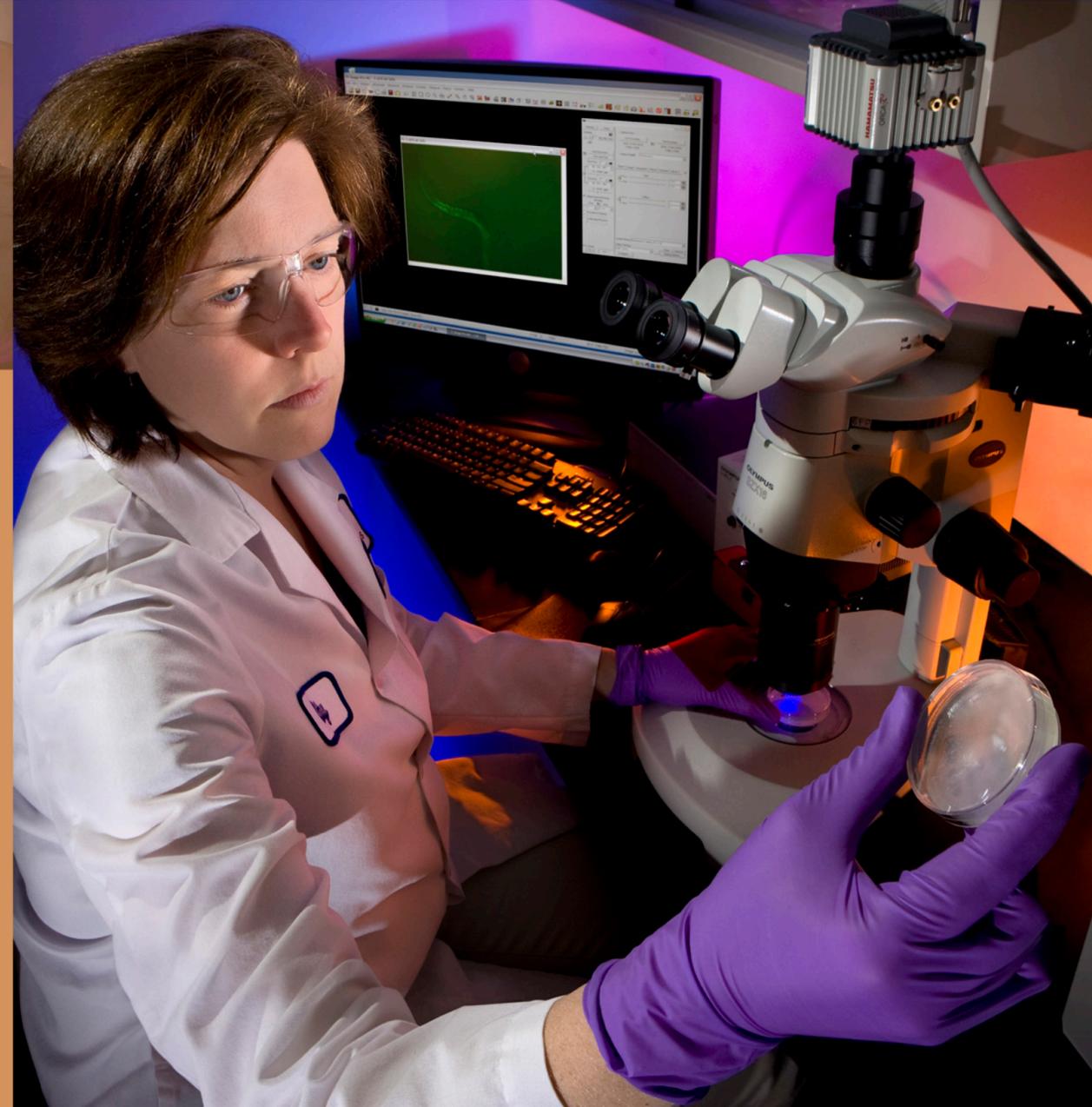
- Biochemistry
- Biofuels
- Biomaterials design
- Carbohydrate chemistry
- Computational biology
- Computational chemistry
- Medical diagnostics
- Metabolic and protein engineering
- Microfluidics
- Photosynthetic microorganisms
- Protein structure/function determination
- Proteomics
- Single-cell host-pathogen studies
- Therapeutics screening

Sandia provides employees with comprehensive benefits packages that include competitive salaries; medical, dental, and vision benefits; 401(k) savings plans; and paid time off. We value our employees as our greatest asset and support them in their efforts to achieve a personal balance among home, work, and the community.

To learn more about career opportunities at Sandia, go to www.sandia.gov/careers.



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the U.S. DOE's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND 2009-6648 P



Biofuels

In the fight against global warming, the need to develop clean, green, and renewable sources of energy has become an international call to action. Sandia researchers are working to minimize climate change and reduce U.S. dependency on foreign oil by studying the sustainability and environmental impact of bio-fuel production. Our scientists are investigating biomass structure and decomposition, the large-scale cultivation of algal biomass, the breakdown of biomass into constituents for fuel conversion, and the conversion process itself.

Examples of Sandia's work in this area:

- **Algae biomass feedstock.** An initiative to develop algae as a biomass feedstock by cultivating new algae strains, as well as enhanced extraction and conversion technologies to decrease the cost of producing fuels from algae.
- **Bacterial fermentation.** An effort to develop a thermophilic bacterium that can ferment pentose and hexose sugars into ethanol.
- **Lignocellulosic biomass deconstruction.** Investigations of the structure and chemical composition of lignocellulosic biomass so that plant biomass can be broken down into fermentable sugars for ethanol conversion.



Sandia National Laboratories is a broad national-security laboratory that develops and advances a wide range of science-based technologies to address our nation's most pressing challenges. Our bioscience activities are focused on two strategic thrusts in national security: (1) biofuels and (2) biodefense and emerging infectious diseases (BEID).

For more information about Sandia's bioscience programs and activities, visit us online at www.bio.sandia.gov.



Partnerships

Sandia partners with industry, universities, and other national labs to build multidisciplinary teams for scientific breakthroughs. For example, Sandia has worked with Tenix, Waters, AM Biotechnologies, and InLight Solutions to develop marketable devices based on Sandia technologies.

Our academic partners in the BEID area include infectious-disease experts at the University of Texas Medical Branch at Galveston, the University of New Mexico, and the University of California (UC) at San Francisco. In the biofuels arena, Sandia joined Lawrence Berkeley and Lawrence Livermore national labs, the UC campuses of Berkeley and Davis, and the Carnegie Institution for Science to form the Joint BioEnergy Institute (JBEI), a U.S. Department of Energy (DOE) Bioenergy Research Center. Sandia is leading JBEI's effort to deconstruct lignocellulosic biomass into fermentable sugars, an essential step in JBEI's drive to develop next-generation biofuels.

Sandia is also a founding member of the Algal Biofuels Consortium and was asked by the DOE to develop a National Algal Biofuels Technology Roadmap with partners at the National Renewable Energy Laboratory and Pacific Northwest National Laboratory. In addition, Sandia researchers are working with algae and microbial photosynthesis experts at Arizona State University and New Mexico State University.



Research Tools at the Interface of the Physical, Computational, and Biological Sciences

Building on corporate strengths in nanoscience, high-performance computing, chemical imaging, microsystems, and the modeling of complex systems, Sandia has created powerful tools to tackle challenges in biological science and technology:

High-Throughput Biochemical Analysis

We have built a world-class capability in microfluidic biochemical analysis, primarily "lab-on-a-chip" and handheld chemical and biological detection and diagnostics platforms. We discover phenomena unique to the microscale for high-performance biochemical-analysis applications.

Biochemical Imaging

We have designed 2-D and 3-D hyperspectral fluorescence microscopes and have developed multivariate algorithms and software to extract quantitative image information from hyperspectral data. Our new technologies improve microarray analysis and enable live-cell imaging at diffraction-limited spatial resolution.

Computational Biology

Sandia's computational tools drive experimental work by enabling researchers to model and predict cell, network, pathway, and molecule behavior. Signature, our common descriptor for chemical compounds and biological entities (e.g., DNA), bridges cheminformatics and bioinformatics, while our cell simulator, ChemCell, uses particles to represent proteins and other biomolecules.

