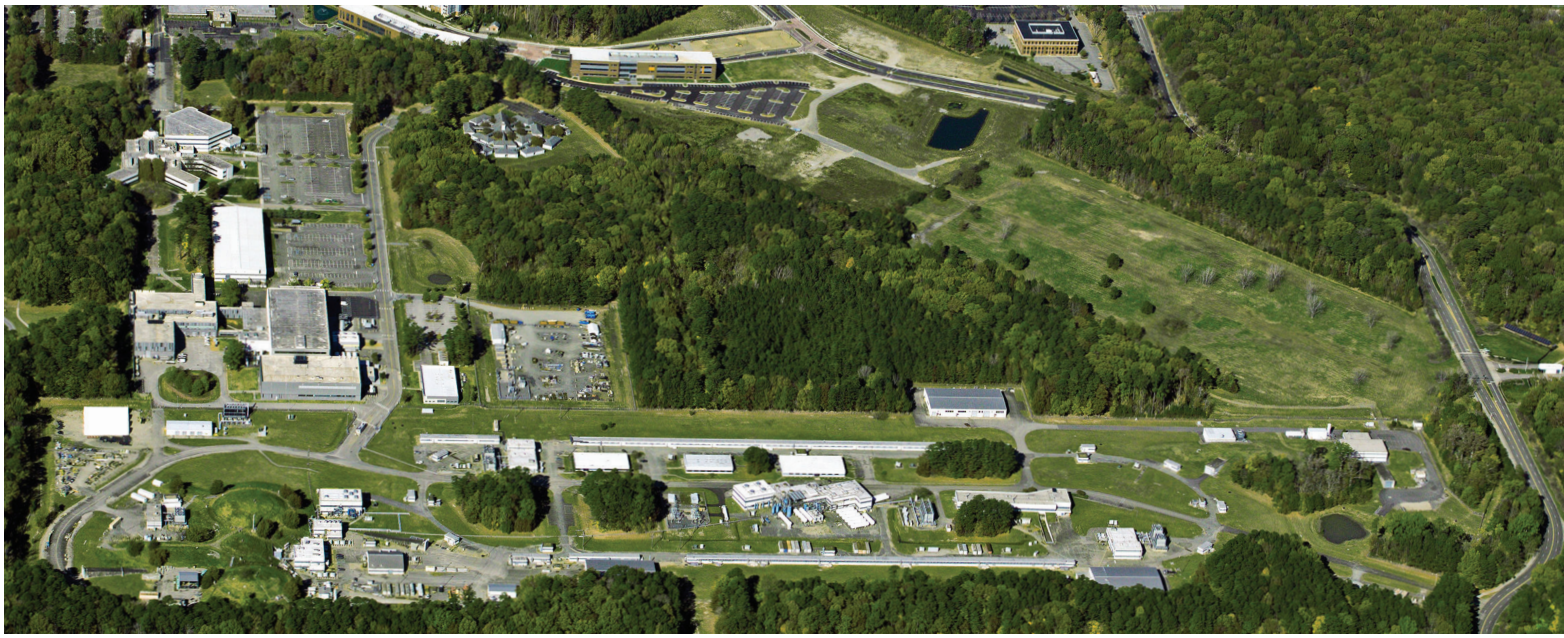
JEFFERSON LAB

Exploring the Nature of Matter



Jefferson Lab enables basic research into the heart of matter.

Thomas Jefferson National Accelerator Facility (Jefferson Lab) is a U.S. Department of Energy Office of Science national laboratory. Its primary mission is to enable basic research for building a comprehensive understanding of the atom's nucleus by scientists and students worldwide. In addition, the laboratory capitalizes on its unique technologies and expertise to perform advanced computing and applied research with industry and university partners.

SCIENTIFIC MISSION AND IMPACTS

The protons and neutrons within the atomic nucleus are assembled from more fundamental subatomic particles called quarks and gluons. Jefferson Lab is home to one of the most powerful microscopes in the world for studying these subatomic building blocks: the Continuous Electron Beam Accelerator Facility (CEBAF).

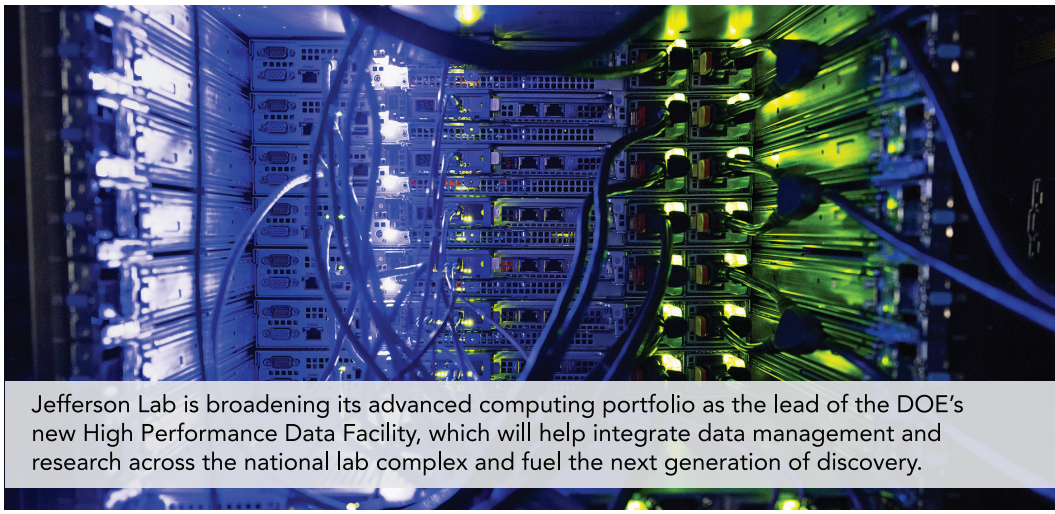
More than 1,900 scientists from more than 315 institutions and 43 countries flock to Jefferson Lab to conduct their research with CEBAF's unique and state-of-the-art facilities. Since 1995, nearly 250 experiments have been completed, with more than 60 approved for future running and many more still being proposed. In fact, one-third of U.S. Ph.D.s in nuclear physics are based on research carried out at Jefferson Lab, with more than 800 Ph.D.s granted and 196 more in progress, helping to ensure continued U.S. leadership in this critical field.

Scientists from 146 U.S. institutions across 33 of our nation's states call Jefferson Lab their scientific home. Here, they carry out their research and educate their students with the goal of improving our understanding of the building blocks of matter and identifying the forces that transform it.

ENTERING A NEW ERA OF SCIENCE

As the first large-scale application of superconducting radiofrequency technology, CEBAF opened up new avenues for exploration of the atom's nucleus near the end of the 20th century.

It soon became clear that even more scientific advances would be made possible by an upgrade to higher energies. Dedicated in 2018, the $338 million 12 GeV Upgrade project tripled the energy of the electron beams that enable research with CEBAF, from its initial 4 billion electron-volts (GeV) to 12 GeV. Jefferson Lab can now pursue its mission with even greater precision and reach, opening critical new directions for cutting-edge research in nuclear physics.



Jefferson Lab is broadening its advanced computing portfolio as the lead of the DOE's new High Performance Data Facility, which will help integrate data management and research across the national lab complex and fuel the next generation of discovery.

AN ASSET TO OUR COMMUNITY

Jefferson Lab also provides teacher and student programs designed to increase the number of teachers with a substantial background in math and science and strengthen student motivation and preparation, particularly among minorities and women. These programs are widely recognized for benefiting at-risk students and populations underrepresented in the science, technology, engineering and math fields. More than 13,000 students and 1,200 teachers participate in K-12 STEM programs each year at Jefferson Lab.

TECHNOLOGIES BENEFITING OUR NATION

In the pursuit of its science program, Jefferson Lab has developed a remarkable suite of technologies with value and impact that reach far beyond fundamental research. Jefferson Lab's accelerator expertise has been central to the construction of major DOE scientific user facilities nationwide, and its advanced accelerator technology has applications for isotope production, the life sciences and materials science. Jefferson Lab scientists and engineers have been awarded more than 185 patents, primarily in the areas of accelerator technology, medical imaging, cryogenics and nanomaterials.

The lab will continue to push the boundaries of computing and data science as the host site of the DOE's new High Performance Data Facility, a first-of-its-kind resource for data-intensive science and research. HPDF will add world-class capabilities to the nation's computing ecosystem.

Jefferson Lab opens critical new directions for cutting-edge research in nuclear physics.

HIGHLIGHTS:

- Since 1995, nearly 250 experiments have been completed at the lab, with more than 60 approved for future running and many more still being proposed.
- One-third of all nuclear physics Ph.D.s awarded in the U.S. are based on Jefferson Lab research.
- Jefferson Lab research has received more than 185 patents.
- Jefferson Lab will be home to the HPDF. The new facility will become a global resource for data science and research.
- Jefferson Lab K-12 STEM programs reach more than 13,000 students and 1,200 teachers annually.

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Jefferson Science Associates, LLC, manages and operates the Thomas Jefferson National Accelerator Facility, or Jefferson Lab, for the U.S. Department of Energy's Office of Science. JSA is a wholly owned subsidiary of the Southeastern Universities Research Association, Inc. (SURA). *April 2024*

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