

TECH TRANSFER

Jefferson Lab's research yields technologies that are transferred to industry for societal and economic benefit. The lab has generated over 150 patents and licensed technologies to more than 20 companies.

- Jefferson Lab patents fall into four primary categories:
 - Detector technologies** yield biomedical and ecological research applications.
 - Cryogenics** processes deliver cost savings at other national labs and for NASA's James Webb Telescope.
 - Accelerator technologies** offer applications for energy, materials processing and isotope production.
 - Nanomaterials** have biomedical, materials science and shielding applications.

STEM OUTREACH

Jefferson Lab's outreach programs provide people of all ages with information about the laboratory, as well as how the lab's mission complements and supports research efforts at other Department of Energy national laboratories.

As the need for a highly skilled, high-tech workforce grows, Jefferson Lab is helping to inspire and prepare the next generation of scientists and engineers.

Laboratory programs include a variety of educational, informational and career-development opportunities.

R&D ADVANCES RESEARCH

Jefferson Lab is internationally renowned for particle acceleration technologies and capabilities, including superconducting radiofrequency (SRF), beam injectors and sources, accelerator science, cryogenics, and radiation imaging and particle detection systems.

Researchers from across the U.S. and around the world, who come to Jefferson Lab to conduct experiments, benefit from these advances and capabilities.



HIGH-PERFORMANCE COMPUTING

As nuclear physicists delve ever deeper into the heart of matter, they require ever more sophisticated tools to help them reveal nature's secrets. These include high-speed networks, huge compute farms and next-generation computational suites for data analysis and theoretical calculations. Here at Jefferson Lab, tens of petabytes of experimental nuclear physics data, from generation to analysis, are handled by our computing infrastructure.



The protons and neutrons within the atomic nucleus are assembled from more fundamental subatomic particles called quarks and gluons.

FUN FACTS

- Today, our Experimental Halls collect 45 terabytes of data per day, the equivalent of more than 150,000,000 books, and we expect to more than double this rate for Fall 2018 and beyond.
- Jefferson Lab's accelerator operates at temperatures colder than deep space!
- Nearly 2,500 magnets in 81 varieties focus and steer the electron beam in the CEBAF tunnel and range in size from a few inches to three yards and weigh as much as five tons.
- More than 10,000 cubic yards of concrete were used in the construction of the Hall D complex, enough to fill 1000 cement trucks.

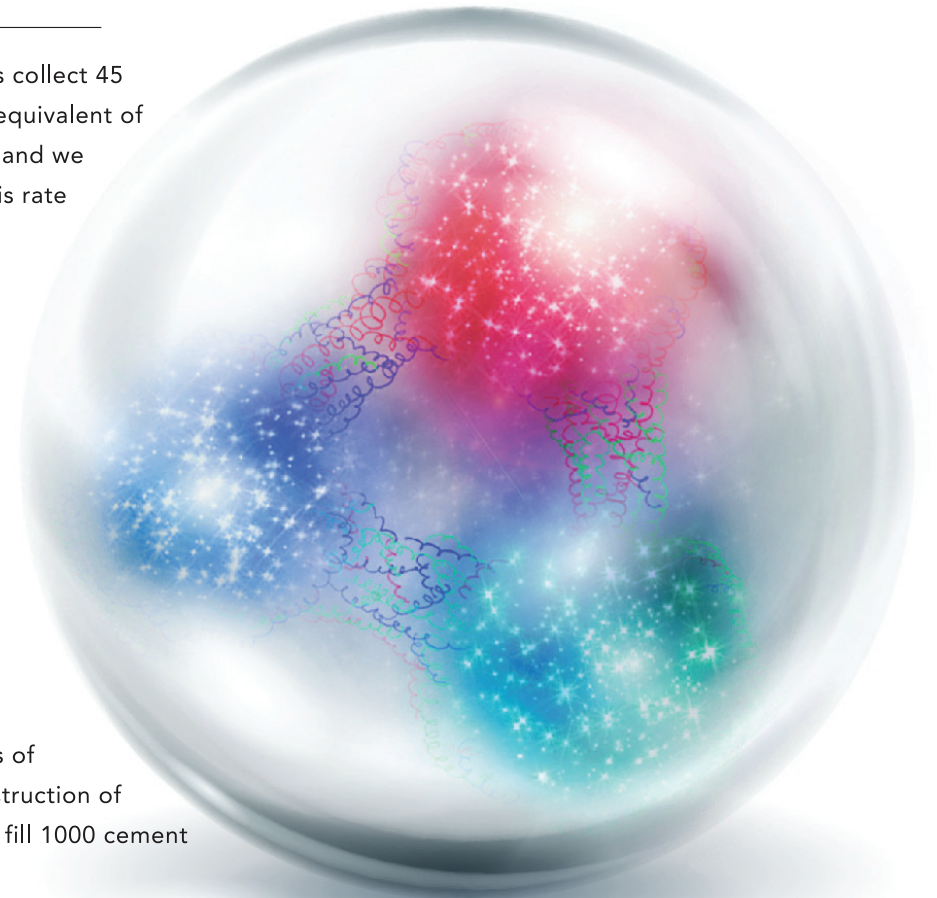
Thomas Jefferson National Accelerator Facility

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Jefferson Science Associates, LLC, a joint venture of the Southeastern Universities Research Association, Inc. and PAE manages and operates the Thomas Jefferson National Accelerator Facility for the U.S. Department of Energy's Office of Science.



JEFFERSON LAB



Exploring the Nature of Matter

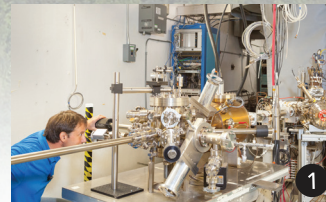
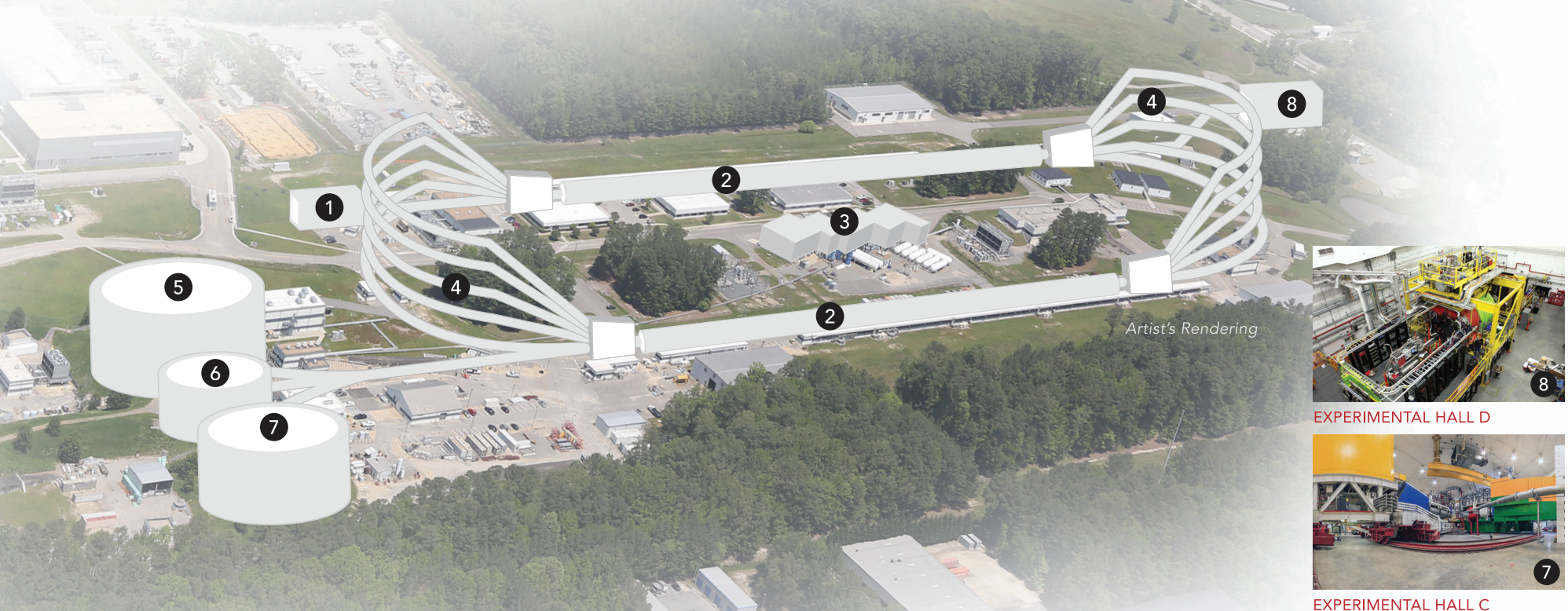
NUCLEAR PHYSICS

Thomas Jefferson National Accelerator Facility is a U.S. Department of Energy Office of Science national laboratory. Jefferson Lab's unique and exciting mission is to expand our knowledge of the universe by studying the basic building blocks of matter within the nucleus: subatomic particles known as quarks and gluons.

Jefferson Lab's Continuous Electron Beam Accelerator Facility (CEBAF) enables world-class fundamental research of the atom's nucleus. The facility works like a giant microscope, using a highly focused beam of electrons to probe matter. It's unprecedented electron beams and unique detector systems allow scientists to "see" things a million times smaller than an atom.

The recently completed \$338M 12 GeV Upgrade project has 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.

CEBAF AT JEFFERSON LAB



INJECTOR



LINEAR ACCELERATOR



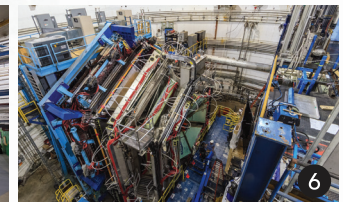
CENTRAL HELIUM LIQUEFIER



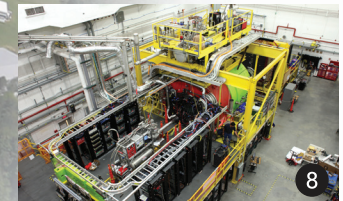
RECIRCULATION MAGNETS



EXPERIMENTAL HALL A



EXPERIMENTAL HALL B



EXPERIMENTAL HALL D



EXPERIMENTAL HALL C

Beyond its basic science mission, Jefferson Lab capitalizes on its unique technologies and expertise to perform advanced computing and applied research with industry and university partners. The laboratory is also an asset to our community and nation, providing student and teacher programs to strengthen student motivation and preparation.

FOUR FUNDAMENTAL AREAS OF CEBAF RESEARCH

Quark Confinement – Addressing one of the great mysteries of modern physics – why quarks only exist together and never alone.

The Physics of Nuclei – Illuminating the role of quarks in the structure and properties of atomic nuclei, and how these quarks interact with a dense nuclear medium.

Tests of the Standard Model – Studying the limits of the Standard Model, a theory that describes the fundamental particles and their interactions.

The Fundamental Structure of Protons and Neutrons – Mapping in detail the distributions of quarks in space and momentum, culminating in a picture of the internal structures of protons and neutrons.

