

## EDUCATING THE NEXT GENERATION

As part of its mission, Jefferson Lab offers dynamic science education programs for students of all ages.

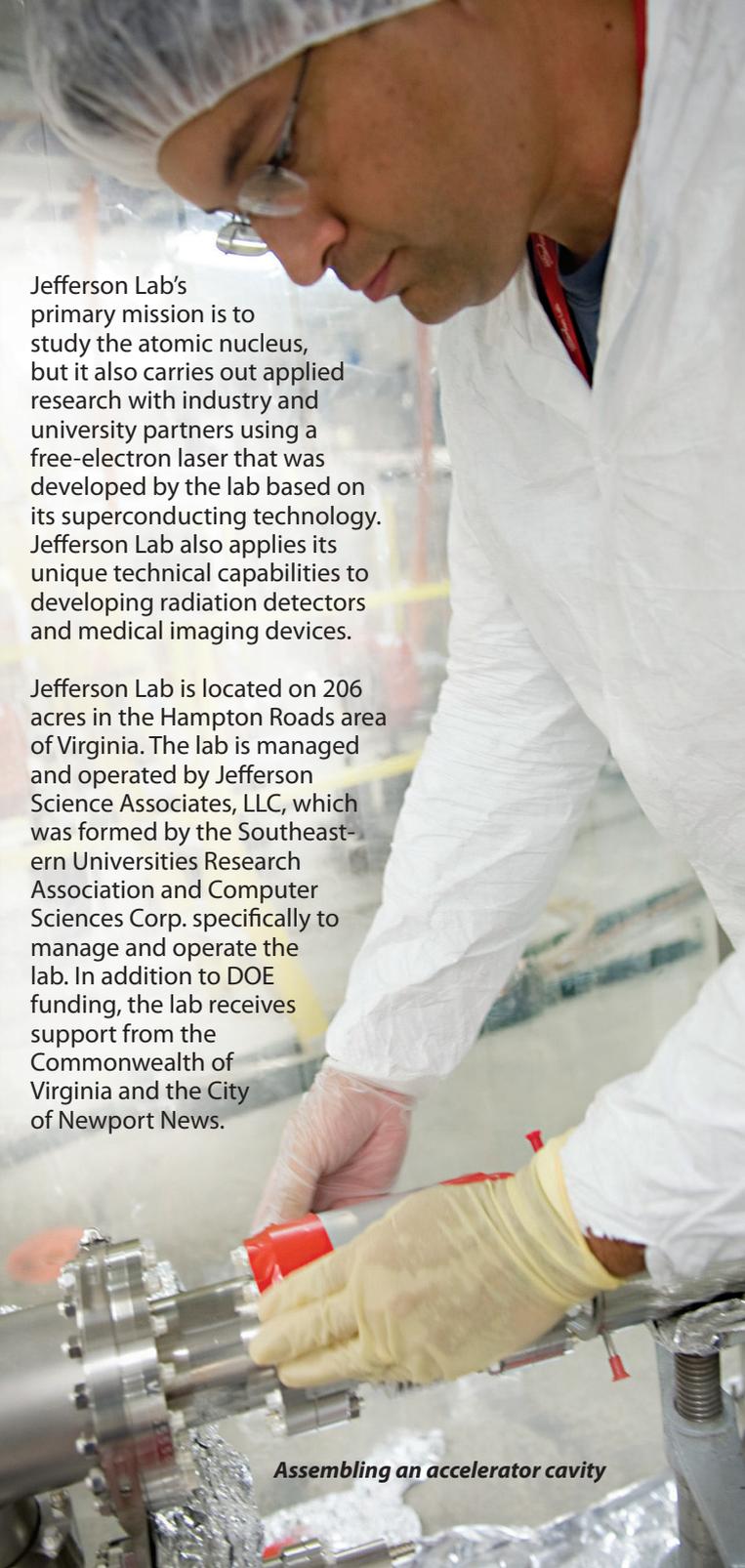
The Academies Creating Teacher Scientists is a summer enrichment experience for 5th–8th grade teachers. It builds teachers' content knowledge and skill base in the physical sciences and equips them with more engaging and advanced teaching methods. The JLab Science Activities for Teachers program extends these goals through the school year as an after-school program. Another highly recognized program, Becoming Enthusiastic About Math and Science, immerses middle school students and their teachers in lab-related science and math activities that are conducted with the help of volunteer scientists, engineers and technicians.

High school and college students also benefit from the lab's expertise and unique facilities. Each year, hundreds of students work and conduct research at the lab. About one-third of all nuclear physics Ph.D.s awarded in the United States and roughly 15 percent of those awarded worldwide are based on research done at Jefferson Lab.



*Student researchers*

## ABOUT JEFFERSON LAB



*Assembling an accelerator cavity*

Jefferson Lab's primary mission is to study the atomic nucleus, but it also carries out applied research with industry and university partners using a free-electron laser that was developed by the lab based on its superconducting technology. Jefferson Lab also applies its unique technical capabilities to developing radiation detectors and medical imaging devices.

Jefferson Lab is located on 206 acres in the Hampton Roads area of Virginia. The lab is managed and operated by Jefferson Science Associates, LLC, which was formed by the Southeastern Universities Research Association and Computer Sciences Corp. specifically to manage and operate the lab. In addition to DOE funding, the lab receives support from the Commonwealth of Virginia and the City of Newport News.

## WANT TO KNOW MORE?

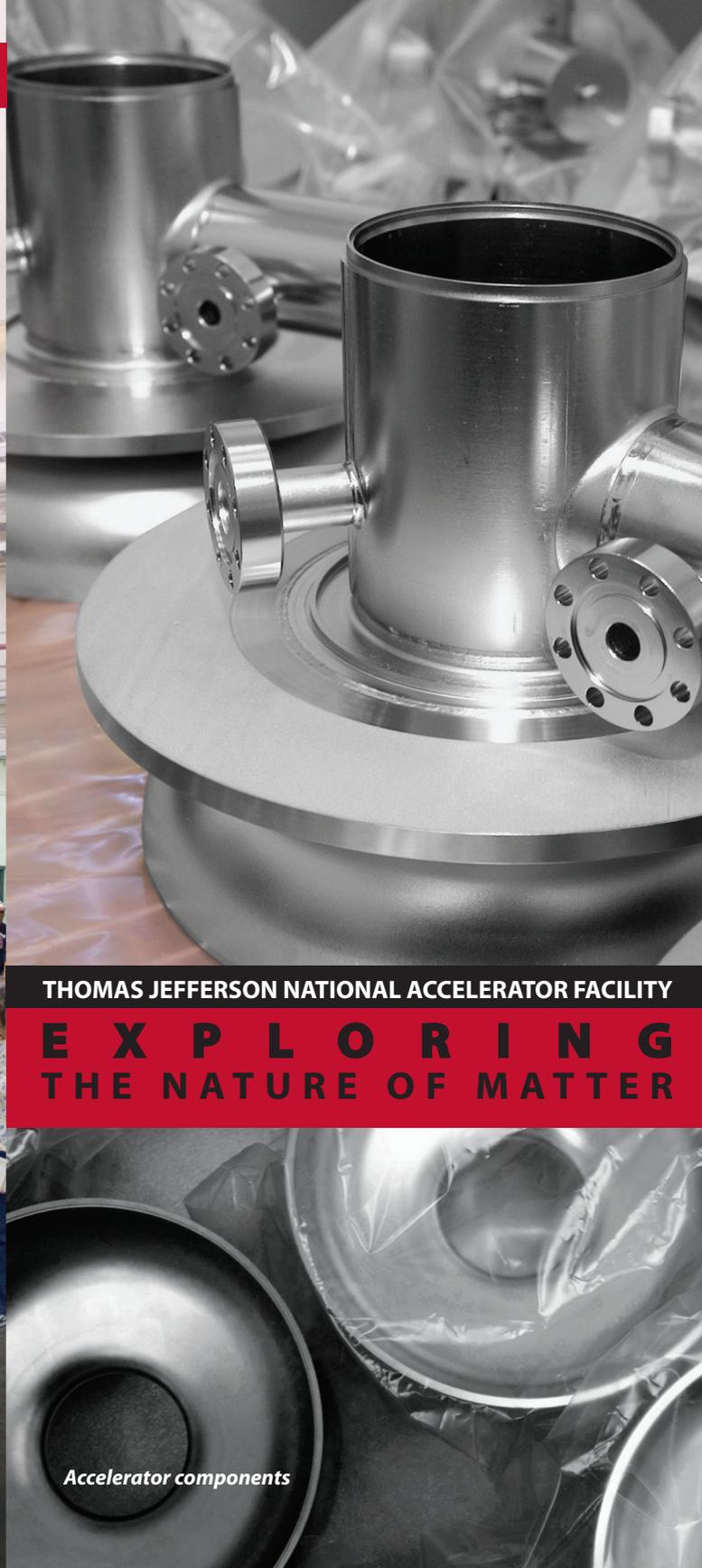
Learn more about Jefferson Lab by visiting [www.jlab.org](http://www.jlab.org), by sending an e-mail to [jlabinfo@jlab.org](mailto:jlabinfo@jlab.org) or by calling (757) 269-7100.



*Open House at Jefferson Lab*

## Jefferson Lab

Thomas Jefferson National Accelerator Facility is managed by Jefferson Science Associates, LLC for the U.S. Department of Energy's Office of Science



THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY

**E X P L O R I N G  
T H E N A T U R E O F M A T T E R**

*Accelerator components*

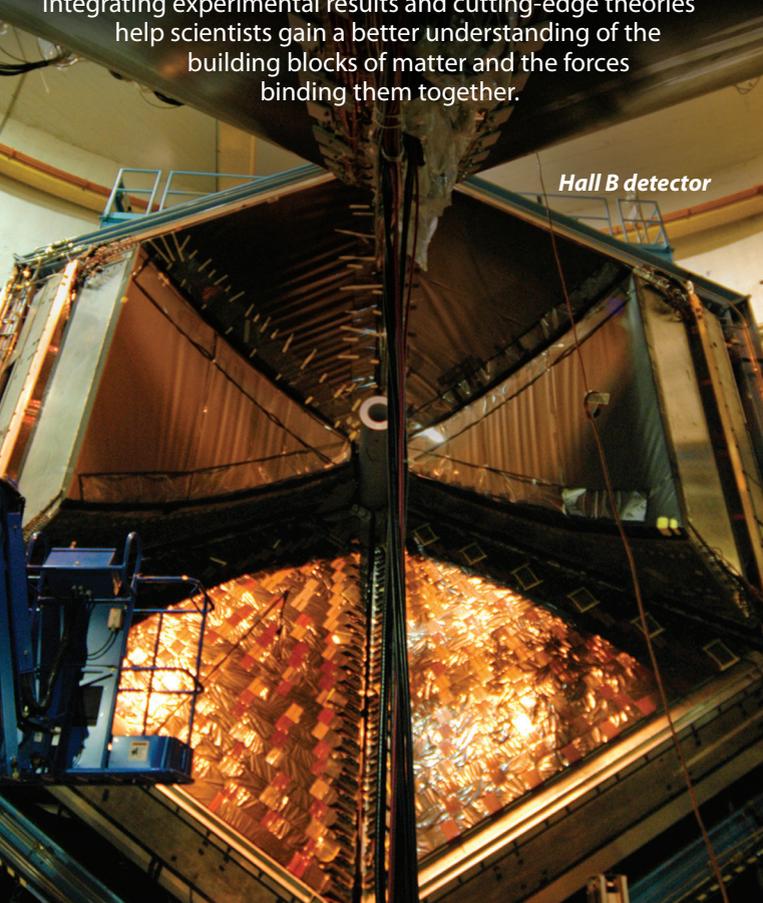
## GROUNDBREAKING RESEARCH

The Thomas Jefferson National Accelerator Facility is a world-leading nuclear physics research facility funded by the U.S. Department of Energy's Office of Science.

Jefferson Lab's unique and exciting mission is to expand our knowledge of the universe by studying sub-atomic particles known as quarks and gluons. Scientists know that these building blocks of matter combine to form the protons and neutrons found in the nucleus of the atom. But they don't fully understand how these particles build our world and universe.

To learn more, scientists conduct experiments using Jefferson Lab's Continuous Electron Beam Accelerator Facility. CEBAF acts like a giant microscope, providing an unprecedented view that enables scientists to "see" things a million times smaller than an atom. CEBAF does this by propelling an electron beam at nearly the speed of light into targets located in the lab's three experimental halls. When the beam strikes a target, the interactions are recorded and studied.

To understand the information collected in these experiments, Jefferson Lab theorists develop theoretical models and carry out sophisticated computerized simulations of the interactions. Integrating experimental results and cutting-edge theories help scientists gain a better understanding of the building blocks of matter and the forces binding them together.



*Hall B detector*



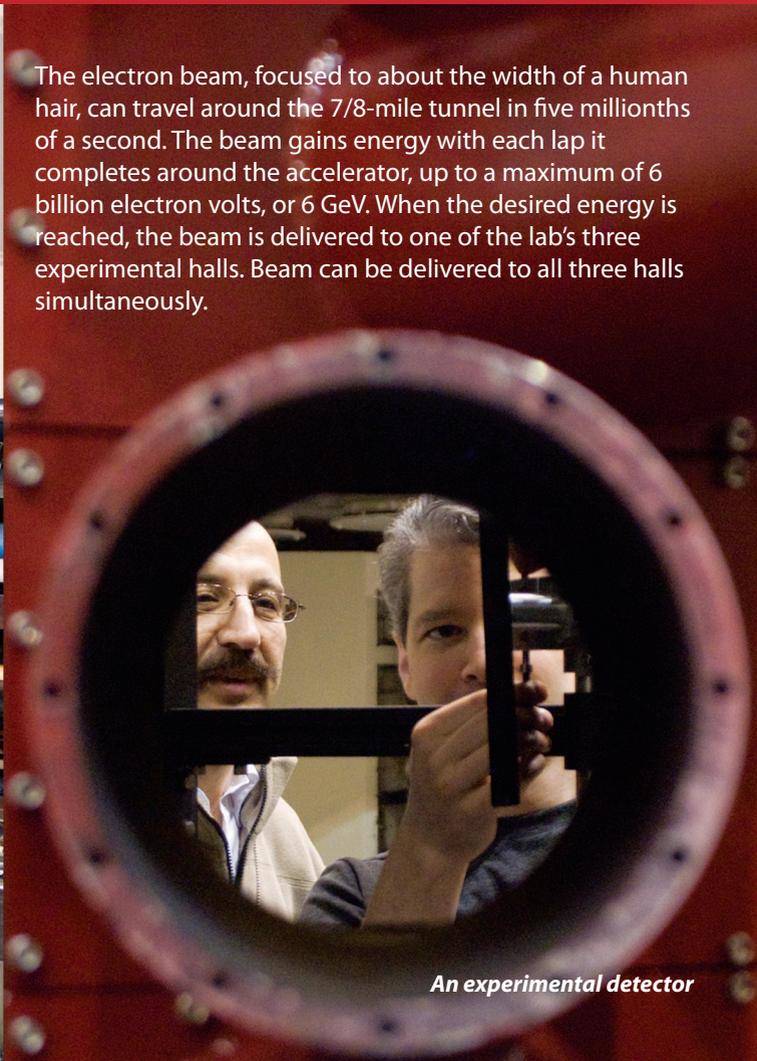
*Jefferson Lab Accelerator Site*

## A UNIQUE RESEARCH FACILITY



*A research physicist at work*

Jefferson Lab's CEBAF is shaped like a racetrack and located in a tunnel 25 feet below ground. Magnets focus and steer the electron beam, while superconducting technology allows the beam to be accelerated through specially designed components that are cooled to about  $-456^{\circ}\text{F}$  or 2 kelvin (K).



*An experimental detector*

The electron beam, focused to about the width of a human hair, can travel around the 7/8-mile tunnel in five millionths of a second. The beam gains energy with each lap it completes around the accelerator, up to a maximum of 6 billion electron volts, or 6 GeV. When the desired energy is reached, the beam is delivered to one of the lab's three experimental halls. Beam can be delivered to all three halls simultaneously.

## MAKING AN IMPACT

More than 1,300 scientists from the U.S. and abroad use Jefferson Lab's world-class facilities to conduct basic and applied research. The lab also provides many high-tech employment opportunities and ranks among the top 30 employers in the Hampton Roads region. The lab employs about 700 people, most with advanced college degrees and specialized skills.

The lab's annual budget of about \$200 million provides substantial economic benefits regionally and across the nation.



*Advanced computing at JLab*