About Fermi National Accelerator Laboratory

Fermilab is America’s premier laboratory for particle physics and accelerator research, funded by the U.S. Department of Energy. Thousands of scientists around the world collaborate with Fermilab on research at the frontiers of discovery.

Particle physicists aim to discover what the universe is made of and how it works. They study the smallest building blocks of matter using some of the largest and most complex machines in the world.

Fermilab supports discovery science experiments in Illinois and at locations around the world, including deep underground mines in South Dakota and Canada, mountaintops in Arizona and Chile, and the South Pole.

Fermilab expands humankind’s understanding of matter, energy, space and time, capturing imaginations and inspiring future generations.

Fermilab unites and inspires

More than 4,000 scientists from over 50 countries use Fermilab and its accelerators, detectors and computing facilities.

Almost 1,000 university students participate in our research and programs every year.

Fermilab reaches almost 50,000 K-12 students every year through its education, outreach and tour programs.

Fermilab’s two-mile-circumference proton accelerator sends powerful particle beams to the lab’s experiments.

Fermilab’s NOvA detector captures fleeting particles called neutrinos to learn more about their role in the universe.
How Fermilab transforms science and society

**Neutrinos**

Fermilab makes the world’s most intense beam of high-energy neutrinos, the least understood yet most ubiquitous matter particle in the universe.

For the NOβA experiment, Fermilab sends a neutrino beam to a 14,000-ton particle detector near Ash River, Minnesota.

Fermilab is bringing the world together to study neutrinos. More than 1,000 scientists from over 30 countries are advancing plans for the Deep Underground Neutrino Experiment. Fermilab’s Long-Baseline Neutrino Facility will send a neutrino beam from the lab through Earth to a giant detector at the Sanford Underground Research Facility in South Dakota for study.

**Fermilab and the Large Hadron Collider**

Scientists working at Fermilab played key roles in the Nobel Prize-winning discovery of the Higgs particle at CERN’s Large Hadron Collider in Switzerland. The Higgs particle causes subatomic particles to have mass.

Fermilab contributes critical components for upgrades of the LHC and its CMS experiment, which co-discovered the Higgs particle.

The Fermilab computing facility provides more computing power to CMS than any site outside of CERN.

**Dark matter and dark energy**

Using the cosmos as a laboratory, Fermilab scientists explore dark matter and dark energy, which constitute 96 percent of the universe.

The Dark Energy Camera, the heart of the Dark Energy Survey, was designed and built at Fermilab. It is mounted on a telescope in Chile.

Fermilab is a leader in experiments that seek to be the first in the world to observe particles of dark matter.

**Muons**

Muons, cousins of the electron, help scientists explore energy scales far beyond those accessible at the highest-energy colliders.

The Muon g-2 experiment looks for signs undiscovered particles predicted to be bubbling in and out of empty space.

The Mu2e experiment will help reveal how forces of nature unify at high energies, as happened in the early universe.

**Fermilab innovation**

From medical treatment to food packaging, innovative technologies from particle physics help transform the way we live.

Fermilab is a world-leading center for superconducting magnets and radio-frequency cavities, crucial technologies for accelerators that also have potential in nuclear energy and materials science.

Fermilab computer scientists developed some of the first collections of networked workstations for use in high-throughput computing, pioneering the management of big data.