

Fermilab Facts: A quick look at the Fermi National Accelerator Laboratory in Batavia, Illinois

Research

- Much of what we know about matter and energy and even how the universe began was discovered over the last four decades at Fermilab, a national laboratory funded by the Office of Science of the U.S. Department of Energy.
- Fermilab's broad scientific program pushes forward on three interrelated frontiers of particle physics: the Energy Frontier, the Intensity Frontier and the Cosmic Frontier.
- Fermilab experiments at the Energy Frontier use sophisticated detectors to study collisions of protons and antiprotons in the Tevatron, a particle collider four miles in circumference, to better understand the fundamental constituents and architecture of the universe.
- Fermilab experiments at the Intensity Frontier explore fundamental particles and forces of nature using highly sensitive detectors and intense particle beams, including the most intense beam of neutrinos in the world.
- Fermilab experiments at the Cosmic Frontier use the cosmos as a laboratory to investigate the fundamental laws of physics and to search for dark matter and dark energy.

People

- Fermilab's 1,960 employees include about 960 physicists, engineers and computer professionals. Another 2,090 scientists and students from across the United States and around the world spend time at Fermilab to carry out research.
- Research at Fermilab provides training for the next generation of physicists, engineers and computer scientists. In 2009, 34 students received their doctorate degrees based on work carried out at Fermilab. About 1,000 college students took part in onsite programs or internships.



Community

- Fermilab is open to visitors daily and offers guided tours and many educational and recreational opportunities, including bike paths and walking trails through the prairie.
- The Lederman Science Center provides online and hands-on opportunities for students and teachers to explore how Fermilab physicists discover nature's secrets.
- Fermilab regularly hosts concerts, art exhibits, films, lectures and folk dancing events for the public.
- Approximately 19,000 students from local schools visited Fermilab in 2009 to learn about science and nature. In 2009, about 3,400 teachers participated in trainings provided by Fermilab.
- Fermilab scientists volunteer their time and visit schools. In 2009, they met with almost 13,000 students in classrooms throughout the Chicago area.

Environment

- The 6,800-acre Fermilab site contains wetlands, woodlands, grasslands and more than 1,100 acres of reconstructed tall-grass prairie.
- Scientists have observed 10 species of frogs, 55 species of butterflies, 90 species of moths and 280 species of birds at Fermilab.

- The lab's standing herd of American bison, established by founding director Robert Wilson, is a popular attraction for local residents. The herd symbolizes the lab's prairie heritage and its presence at the frontier of high-energy physics. The first bison was a gift from the State of Illinois.
- In 1989, Fermilab was designated a National Environmental Research Park.

Discoveries

- Experiments at Fermilab advanced the understanding of matter with the discovery of the bottom quark (1977), the top quark (1995) and the tau neutrino (2000).
- Right now, scientists are using Fermilab's Tevatron to look for evidence of an entirely new class of subatomic particles, as well as the first signs of new dimensions of space-time.
- Other Fermilab scientists are using ultrasensitive detectors and telescopes to unravel the mysteries of dark matter and dark energy, two components that dominate the universe.
- Fermilab participates in the Sloan Digital Sky Survey, which identified more than 100 million stars, galaxies and quasars in mapping one quarter of the nighttime sky between 1998 and 2005.
- In 2007, the Pierre Auger Observatory, which Fermilab manages, identified supermassive black holes as the most likely source of the highest-energy cosmic rays.



Benefits to society

- Scientists estimate that more than 17,000 accelerators are in operation around the world—in industry, in hospitals and at research institutions.
- Fermilab is well known for pioneering superconducting magnet technology, powerful electromagnets that conduct electricity without resistance. The technology, now at the heart of MRI scanners, came directly from Fermilab's Tevatron.
- When it comes to treating certain kinds of cancer, the best tool may be a particle beam. Hospitals use particle accelerator technology to treat thousands of patients per year, with fewer side effects than traditional treatments. In 1990, Fermilab built a proton accelerator for the Medical Center at Loma Linda University in California. Fermilab's Neutron Therapy Facility, in operation since 1976, has treated more than 3,000 cancer patients.
- Superconducting radio-frequency cavities, an innovative technology that Fermilab scientists are developing for future accelerators, may also have the potential to treat nuclear waste and enable the use of an alternative fuel, thorium, for the production of nuclear energy.
- From shrink wrap to radial tires, industry uses particle accelerators to manufacture a multitude of everyday and household objects.

Budget

- In 2009, Fermilab's overall budget was about \$350 million, provided by the Office of Science of the U.S. Department of Energy. Fermilab spent about \$151 million in payroll and about \$70 million for goods and services provided by businesses located across Illinois.