



Training the next generation of STEM leaders

- ▶ **The high-tech global economy** benefits from students, scientists, engineers, and technicians trained in the cutting-edge science of particle physics.
- ▶ **Particle physics research inspires** young people to engage with science.
- ▶ **The U.S. Particle Accelerator School** fills a critical need for training highly skilled personnel to operate the world's 30,000 industrial and medical particle accelerators.
- ▶ **More than 100 U.S. universities and five national laboratories** give students hands-on learning experiences every year. Particle physics education programs teach students the principles of science, math, computing, and engineering.



For more examples of particle physics in society:
www.symmetrymagazine.org/applied

Images courtesy Fermilab, NASA, Shutterstock



Particle Physics Makes a Difference in Your Life

Global science, local impact

Particle physics is a global discovery science central to the modern innovation ecosystem. It drives national, regional, and local progress in science and industry. And it improves your quality of life.

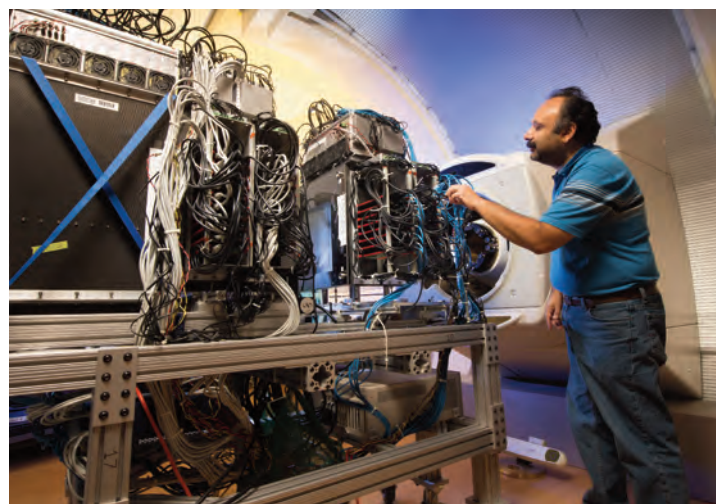


Here are just a few examples of the ways
particle physics works for you:



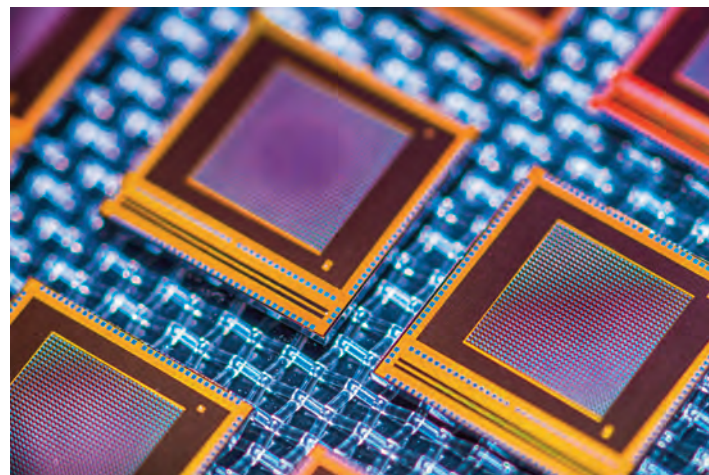
Medicine

- ▶ **The pharmaceutical industry** uses X-ray beams created by particle accelerators to develop more effective drugs to fight disease.
- ▶ Next-generation **medical imaging devices** are being powered by detectors developed for particle physics experiments.
- ▶ **Radiation treatment plans for cancer** are powered by software originally developed to model particle detectors, and treatments with gamma rays and protons are delivered using particle accelerator technology.



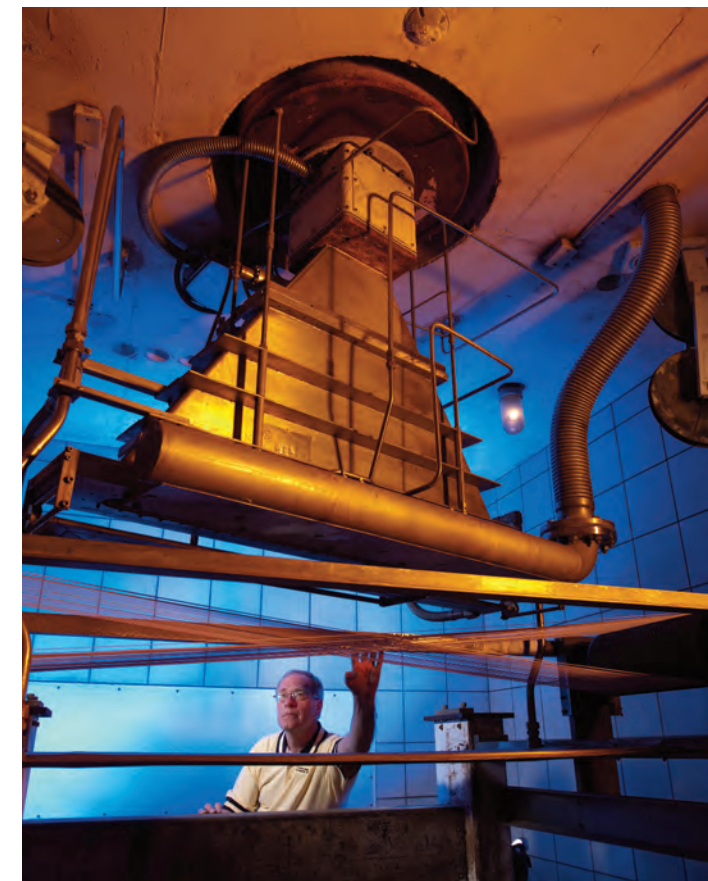
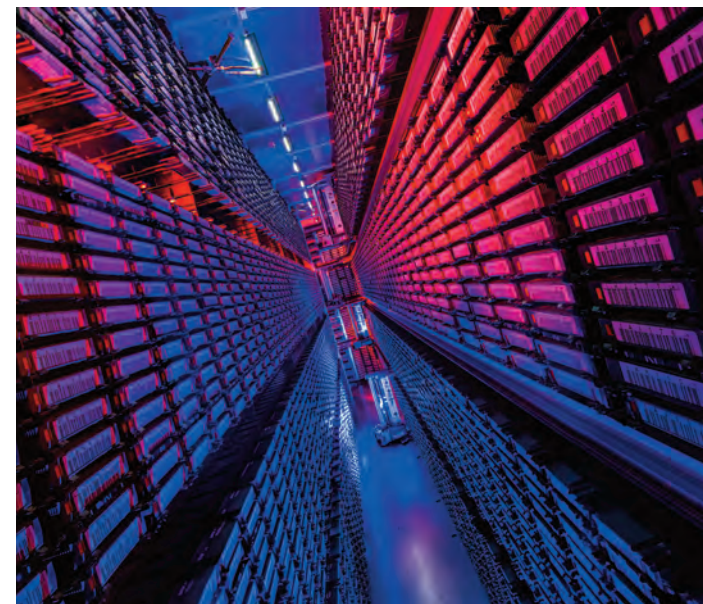
Sensors and security

- ▶ Custom silicon sensors developed for Large Hadron Collider experiments **drive industrial applications** including X-ray and medical imaging, testing of new materials, and radiation dosimetry aboard the International Space Station.
- ▶ Particle physics detector technology **improves homeland security** by enabling advanced cargo screening and new techniques for monitoring the contents of nuclear reactor cores.
- ▶ **Chemistry, biology, and materials science** researchers use sensors developed for particle physics in cameras that collect signals from visible and infrared light and from X-rays.



Computing and simulation

- ▶ **Tomorrow's computers** will be built from materials now being characterized using intense beams of X-rays and neutrons from particle accelerators.
- ▶ **The World Wide Web** was first developed by particle physicists to share information quickly and effectively around the world. Particle physicists continue to push the frontiers of big data analysis with global grids and cloud computing.
- ▶ **Radiation exposure for spacecraft** is simulated using software originally developed to model particle detectors.
- ▶ **Atomic and nuclear physics advances** benefit from precise mathematical techniques developed by particle physicists, now used to predict new materials and molecules.



Manufacturing

- ▶ **Precise, customized medical implants** are manufactured using electron beams from particle accelerators.
- ▶ **The food industry** has used particle accelerators for decades to produce the sturdy, heat-shrinkable film that turkeys, fruits, vegetables, and baked goods come wrapped in.
- ▶ **Ink curing companies** use particle accelerators as an environmentally friendly way to produce the colorful packaging on many grocery store items, including cereal boxes.

