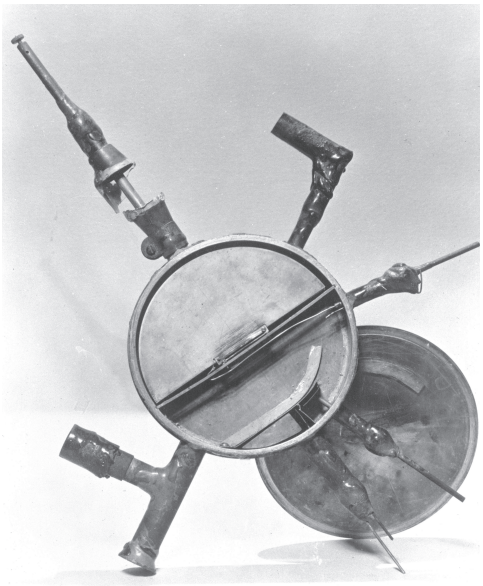
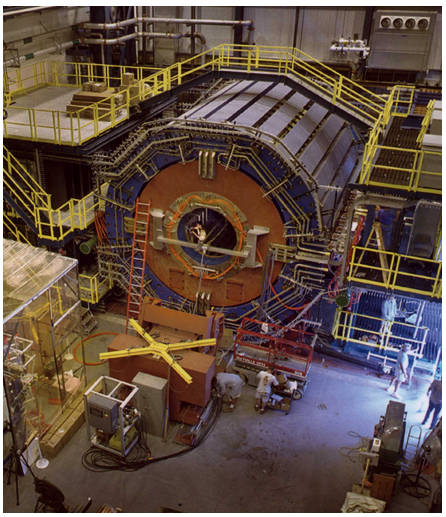
ABOUT THE COVER



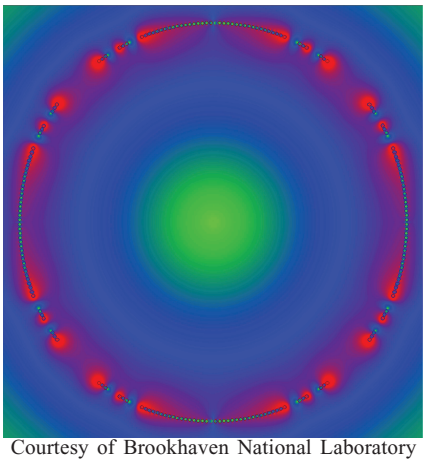
Courtesy of Lawrence Berkeley National Laboratory

The first successful cyclotron (left) built by E.O. Lawrence and his graduate student M. Stanley Livingston, accelerated a few hydrogen molecule ions to an energy of 80,000 electron volts. Since each ion received an accelerating kick twice in a circuit as it entered and left the single flat semicircular electrode or "dee," those that managed to reach full energy and fall into the collecting cup 4.50 cm from the center of the instrument had made no fewer than forty turns. The result, reported at the January 1931 American Physical Society meeting, earned Livingston his Ph.D. and Lawrence $500 from the National Research Council towards the construction of a machine that might be useful for nuclear physics. Who would have predicted that this machine that "might be useful" would grow eventually to the size of a small city, cost many millions of dollars, and allow scientists of all disciplines to study matter in forms ranging from the most basic of particles to complex life-systems. Arguably, Lawrence's cyclotron was the birth of the Department of Energy and the beginning of today's big science.



Courtesy of Brookhaven National Laboratory

Many of today's most advanced scientific tools, including particle accelerators and advanced light sources, have evolved from the cyclotron. The STAR (Solenoidal Tracker at RHIC) Detector (right), one of four detectors at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory, tracks and analyzes the thousands of particles that may be produced by each gold ion collision inside the detector. As big as a house, STAR will search for signatures of the form of matter that RHIC aims to create: the quark-gluon plasma. It will also investigate the behavior of matter at high energy densities by making measurements over a large area. Particle accelerators work in large part because of the advances in human ability to control electromagnetic forces. The image of the strength of a magnetic field (left), produced by a superconducting quadrupole magnet built by the Brookhaven National Laboratory (BNL) Superconducting Magnet Division for the Hadron-Electron Ring Accelerator (HERA) at the DESY Laboratory in Hamburg, Germany, was built using technology developed at BNL for manufacturing some of the specialized magnets for the RHIC facility.



Courtesy of Brookhaven National Laboratory