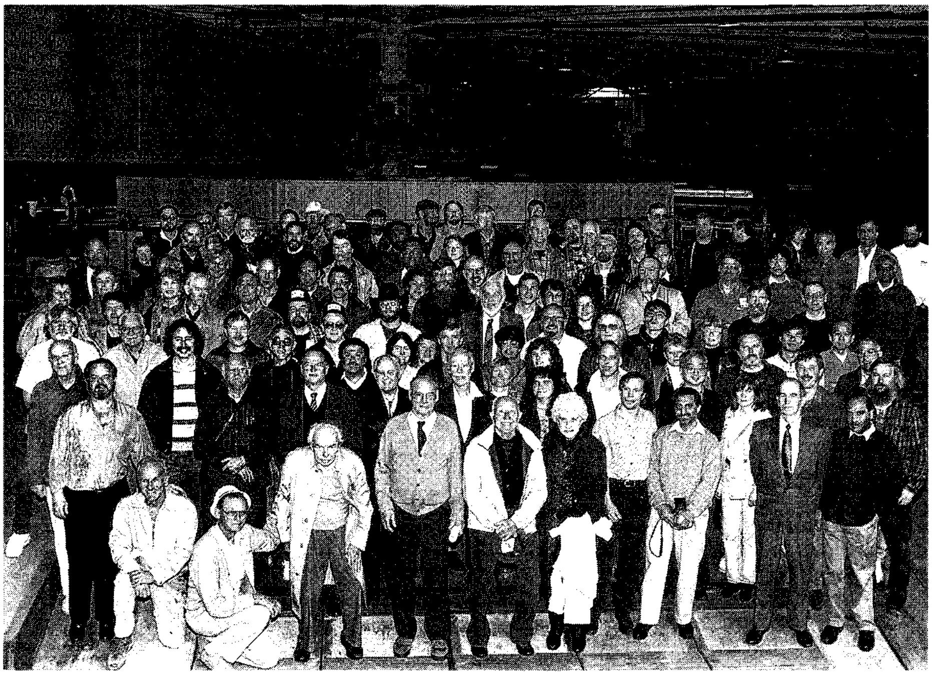
collaboration's goal of 90%). Trigger plus readout live time is 90% at luminosities of 7x10^{30}, as planned. The W and Z production rates in the older detector systems are comparable to 1989, while additional Ws and Zs are seen in the newly upgraded muon systems and in the gas calorimeters.

Detector thresholds have been lowered to give nearly five times the J/psi rate into muon pairs. Secondary vertices have been seen with the new silicon detector, opening up new measurements with b-quarks.

The top quark is being searched for in every conceivable channel, with the new secondary vertexing tool being heavily employed.



About 100 current and former Lawrence Berkeley Laboratory employees standing on top of the Bevatron shielding after the final Bevatron "turn off."

BERKELEY Farewell to the Bevatron/Bevalac

Nearly a hundred current and former Lawrence Berkeley Laboratory employees gathered at the Bevatron accelerator on 21 February to watch Ed Lofgren turn off the beam for the last time. Lofgren, in charge of the venerable machine from its completion in 1954 until his retirement in 1979, pushed a button that someone long ago labeled "atom smasher offer", bringing to an end four decades of accomplishment in high energy and heavy ion physics.

Owen Chamberlain, who shared the 1959 physics Nobel with Emilio Segré for the discovery of the antiproton at the Bevatron, was among those present at the closing ceremony. The shutdown came 39 years to the week after Bevatron beam first circulated, and a touching moment came just after Lofgren shut the machine down when the poignant strains of the "Taps" salute wafted out over the PA system.

The Bevatron - or Bevalac, as it was called after being linked to the SuperHILAC linear accelerator in the 1970s - made major contributions in four distinct areas of research: high energy physics, heavy ion physics, medical research and therapy, and space-related studies of radiation damage and heavy particles in space.

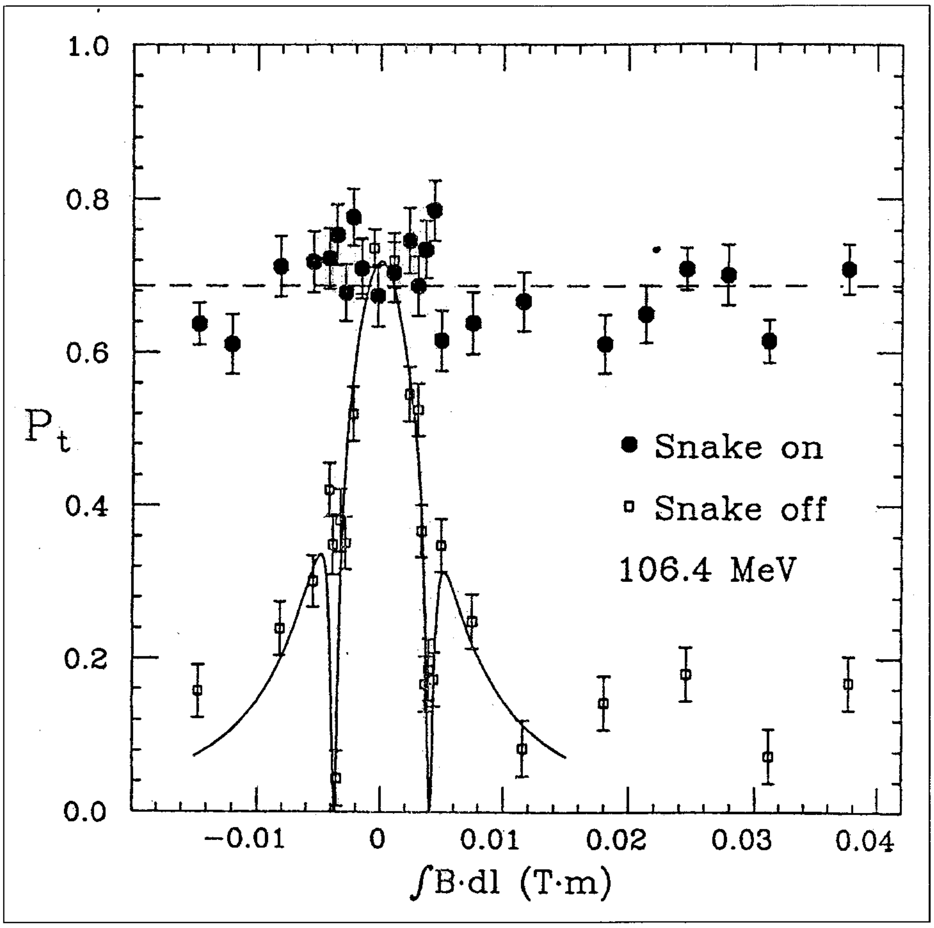
As well as the discovery of the antiproton, the early years of the Bevatron saw classic studies of the kaon, leading to a deeper understanding of both strong and weak interaction physics. With Luis Alvarez' development of Donald Glaser's original bubble chamber idea into a prolific physics technique, the Bevatron was a major focus of the heady days of resonance hunting in the late 1950s and early 1960s.

Most recently the Bevalac (Bevatron-SuperHILAC combination) pioneered relativistic heavy ion physics. The central focus of this research programme was the production and study of extreme conditions in nuclear matter. Highlights include the first definitive evidence of collective flow of nuclear matter at high temperatures and densities, studies of the nuclear matter equation of state and multifragmentation, a systematic study of dilepton production, and measurements using secondary beams of light radioactive nuclei, culminating in the observation of the "neutron halo" of lithium-11. (This nucleus consists of nine central nucleons surrounded by a relatively distant and weakly bound neutron pair.)

After the pioneering work at LBL, the relativistic heavy ion baton was taken up at still higher energies by Brookhaven and CERN, while Brookhaven's RHIC collider, now under construction, will provide the next energy step.

During the past year, the impending

'Siberian Snakes' save spin. The total transverse proton beam polarization at the Indiana Cooler Ring plotted against the imperfection magnetic field integral with the Siberian snake device on (circles) and off (squares). The solid line is a fit to the imperfection depolarizing resonance peak and radiofrequency resonance dips; the dashed line is a constant fit to the snake-on data.



shutdown of the Bevalac concentrated research on the properties of nuclear matter, especially dilepton production and studies of reaction dynamics using the new Equation Of State (EOS) Time Projection Chamber. The last experiment to be run was led by a collaboration from Japan, headed by Isao Tanihata, measuring the properties of radioactive beams near the proton drip line. Physics analysis of the large volume of data accumulated during this intensive year of running is now in full swing.

MICHIGAN/INDIANA Siberian Snakes strike again

Siberian snakes are showing themselves to be even more deadly than expected in killing their prey, the depolarizing resonances which would make it very difficult to accelerate polarized protons to TeV energies at accelerators such as the Tevatron, UNK, LHC, and SSC.

The snake concept was proposed in the mid-1970s by Siberians Yaroslav Derbenev and Anatoly Kondratenko at Novosibirsk, but the snakes lay almost dormant until Owen Chamberlain, Ernest Courant, Alan Krisch, and the late Kent Terwilliger organized the 1985 Superconducting Supercollider (SSC) polarized beam workshop in Ann Arbor, which highlighted the need to test the concept.

The idea is to rotate the spin through 180° on each turn in the ring. With such successive spin flips, the depolarizing effects seen in one turn should be cancelled by an equal and opposite perturbation on the subsequent turn.

The new Cooler Ring at the Indiana University Cyclotron Facility then seemed an excellent test site for these eager but untested serpents. The Michigan/Indiana/Brookhaven team led by Krisch constructed the world's first snake and found that it could easily overcome its initial enemy, the imperfection depolarizing resonances caused by ring magnet imperfections (January/February 1990, page 20). In the next few years the growing team of "herpetologists" showed that Siberian snakes could overcome all kinds of depolarizing resonances, including the intrinsic kind (caused by the vertical betatron oscillations which keep the beam focused) and the synchrotron resonances (caused by synchrotron oscillations in energy).

The team also discovered a new type of snake that was inadvertently built into the cooling section. This so-called type-3 snake rotates the spin around the vertical direction. A full type-1 snake (such as the team's superconducting solenoid magnet) rotates the spin by 180° around the beam direction; a type-2 snake rotates the spin around the radial direction.

Despite this display of serpentine power, the snake experts still questioned the ability of a Siberian snake to overcome all depolarization problems at TeV energies. At very high energies, the depolarizing resonances may become so strong that they are even wider than their normal 523 MeV separation, and