The Washington Post

Circ: 810,000

APR 11 1994

SCIENCE 42
NOTEBOOK

Physics: Plan to Supplant the Super Collider

The huge Superconducting Super Collider may be dead, but all is not lost in high-energy physics. Comes now the "bench-top accelerator." Using a new technique, physicists say they can accelerate subatomic particles to high energies in just half an inch—rather less than the 53-mile circumference of the defunct SSC.

Though perhaps decades from being able to do the kind of experiments that conventional accelerators do, the novel devices do promise practical payoffs in medicine and chemistry.

Writing in the April 7 Nature, Robert Bingham of the Rutherford Appleton Laboratory in England said that one-trillionth-of-a-second pulses from the new devices could be used to make slow-motion movies of chemical reactions or biological processes that have never been seen before. Also possible, he said, could be a new kind of X-ray device that makes biological and medical images at a fraction of the radiation dose now required.

In the same issue of Nature, Chan Joshi and colleagues at the University of California at Los Angeles report building and operating such an accelerator—within a laboratory if not exactly on one bench top. They report that it works as predicted.

The device is called a "plasma beat-wave accelerator." Inside a small chamber, hydrogen gas is heated until it sheds its electrons and becomes a plasma—a gas of charged particles. Into this Joshi and his team aimed two superimposed laser beams with different wavelengths. Like two different sound tones that produce a beat when heard together, the two laser beams make their own beat. This can be thought of as large waves traveling down the short length of the chamber.

Next, the UCLA researchers injected free electrons into the chamber. Some became trapped on the crests of waves and—like surfers—were propelled forward. In less than an inch, the electrons' speeds approached that of light.

The energy levels achieved in Joshi's first machine are less than 1/1,000th the levels attained in conventional accelerators. The UCLA group said it is already at work on a more powerful device. And it will still be small.

—Boyce Rensberger