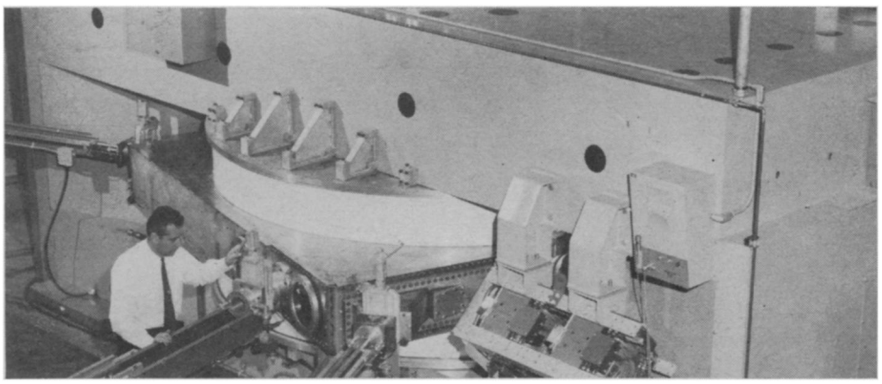

Lawrence Radiation Laboratory, Berkeley

Smaller cyclotrons have a research role to play: 50 Mev at Berkeley.

Low-Power Accelerators

Super machines won't outdate them.

The super high power accelerator being planned for Weston, Ill., far from making lower power atom smashers obsolete, will probably increase their usefulness, according to research physicists, who are now complaining that budget restrictions will stunt research on the lower energy levels.

In fact, one machine, the 3-Bev Cosmotron at Brookhaven, has been shut down. Technically in the high energy range, the Cosmotron was being abandoned by high energy physicists as more powerful machines were built, but researchers in the medium range found it useful in their experiments with larger atoms. Since the operating expenses for the machine came from the Atomic Energy Commission's high energy budget, however, its usefulness was judged in that context, and found wanting. Despite objections from medium-energy-level physicists, the Cosmotron was shut down last December.

As T. Keith Glennan, head of Associated Universities, said: trying to save it is "like trying to sell a second-hand article." Glennan's attempt to save the Cosmotron has so far failed.

In their attempts to describe the forces which hold the atomic nucleus together, physicists need experimental tools that will give them a wide variety of energies. They range from small Van de Graaff generators, which may develop less than half a million electron-volts, to monstrous accelerators such as the Brookhaven Alternating Gradient Synchrotron, currently the world's largest with 33 billion electron volts of energy at its disposal, and the Weston machine, planned for 200 Bev.

Accelerators are divided into three classes, depending on their energy levels. Those with less than 50 Mev are low energy machines; intermediate range accelerators are those from 50 Mev to one Bev. High energy machines accelerate particles to over one Bev.

Experiments on the high energy accelerators are concerned with individual elementary particles. By bombarding the hydrogen atom, whose nucleus consists of a single proton, with other protons accelerated to extremely high energies, physicists have created a whole catalogue of short-lived elementary particles whose characteristics may give some clue to the composition of protons themselves, and hence to a theory of what holds them together in a nucleus.

Another approach to the riddle of the nucleus is to use larger atoms as targets for the bombarding protons, instead of the simple hydrogen atoms. For these experiments, low and medium range accelerators are necessary.

When a proton in the low or medium energy range collides with a target atom, it does not cause the destruction or creation of particles as it does at high energies. The projectile particle is either absorbed into the nucleus, forming a new element, or deflected from the target at a measurable angle.

From such reactions, at varying energies, experimenters can map the shape of the nucleus, and measure the nuclear forces within the atom.

While medium and low energy accelerators cost nowhere near the quarter-billion-dollar figure estimated for the high-energy Weston machine, they can still cost in the millions of dollars. The latest one to be started, a 100 Mev cyclotron at the University of Maryland, will cost about $6 million when it is completed in 1968. But no further construction of accelerators in the medium range is being planned at present. Nor is there any present prospect that the Cosmotron will be started up again.