Two New Accelerators Proposed: Competition for 1976 Funds

High-energy physics research has been particularly hard hit by the funding reductions suffered by many fields of science. Three large U.S. accelerators have been closed down and a fourth phased out of elementary particle research, while most of the remaining ones have been forced to operate far less than full time. Real support for U.S. high-energy research, corrected for inflation, has declined by almost 50 percent since 1970, and no new accelerators have been approved since the Fermi National Accelerator Laboratory (NAL) was authorized in fiscal 1968. While the funding for NAL has increased, the support for other laboratories has necessarily declined. Among Washington officials, there seems to be a growing recognition that something must be done to reverse the trend of recent years, and with the construction phase of NAL completed, scientists interested in particle physics hope that the time for some relaxation of the stringent budget restrictions has finally arrived.

This month two machines that will produce colliding beams significantly more energetic than any available in the United States or Europe are being formally proposed for the fiscal 1976 budget. On the East Coast, Brookhaven National Laboratory hopes to build two large rings of superconducting magnets, one on top of the other, that would store beams of protons with energies of 200 billion electron volts (Gev) each. Head-on collisions of the two beams would produce 400 Gev of available energy, and a dramatic advantage over the largest accelerator with a single beam. Because of the peculiarities of the laws of motion at relativistic velocities, 400 Gev particles from the NAL accelerator produce only 28 Gev of available energy when they strike a stationary target. On the West Coast, Stanford University and the University of California at Berkeley are jointly proposing to build a storage ring for electron and anti-electron (positron) beams with 15 Gev of energy each. The West Coast proposal, called PEP for positron-electron-project—a proton ring may be added later—is expected to cost $53 million; the East Coast proposal, called ISABELLE for Intersecting Storage and Acceleration is expected to cost $127 million.

The two proposals, plus any others submitted at the last minute, will inevitably have to compete with each other, and few observers expect more than one to be approved. In addition to ISABELLE, high-energy physicists are planning even larger storage rings for protons, such as the 1000 Gev facility called POPAE now being studied at NAL. The point of view of many high-energy physicists is that a coordinated program for new facilities spaced evenly over the next 5 years would be far better than one bloody competition after another. In a move that seems to encourage such a resolution, the Atomic Energy Commission has asked Victor Weisskopf at the Massachusetts Institute of Technology to chair a panel that will make recommendations for new facilities by the end of July—just in time to affect the fiscal 1976 budget.

Two major proposals seem to have been submitted at the same time because they were held back until the last NAL construction funds were appropriated in fiscal 1974. Because new directions in particle physics research require expensive new facilities, 25 percent of the total funding over the last 15 years has been spent on new construction. Whether the budget goes up or down, physicists argue that the fraction spent for new facilities must be kept at about one-quarter in order to keep the science intellectually healthy. In any case, they would like to see at least $25 million per year go toward construction, out of a total budget that stands at $172 million in fiscal 1975.

Apart from the view that new construction is needed to keep particle physics viable, there are good reasons based on research accomplishments for building the new facilities. Experiments at the Intersecting Storage Rings (ISR) at CERN established unexpected aspects of proton-proton interactions at very high energies, and experiments at the electron-positron storage ring (SPEAR) at Stanford are contradicting important models of the basic structure of the elementary particles. Above all, the success of the ISR and SPEAR facilities has proved beyond doubt that the colliding beam technique is a powerful one quite suitable for sophisticated experiments. The PEP machine, at least in its initial configuration, will be a much larger version of SPEAR. The ISABELLE storage rings will have superconducting magnets, whereas ISR does not.

The use of superconducting magnets in the Brookhaven design necessarily makes it more of a gamble than PEP, and the total energy proposed is far beyond anything reached before. Superconducting magnets were considered for the design of the 300 Gev accelerator now under construction at CERN but were vetoed. Sooner or later, however, the job of building the first superconducting accelerator must be tackled, and when the problem is finally faced "you will just have to batter it down," says one physicist. Although prototype magnets have been built at Brookhaven, they have not been full-size, and the concept of storing a beam and boosting its energy in the same ring, incorporated in the Brookhaven design, has not been thoroughly tested.

Neither the hardware nor the energy goal for PEP seems particularly futuristic. In fact, three European proposals similar to PEP are reportedly ready to go, though no one expects all three to be funded. Furthermore, the excitement physicists have shown over recent results from SPEAR (*Science*, 17 May 1974) cannot hurt the chances that the PEP proposal will be approved. But some physicists fear that PEP would not truly be a national facility because in the past both Stanford and Berkeley have eschewed outside control of their accelerator facilities. The Stanford Linear Accelerator Center has an advisory consortium of universities, but it does not have as much power as at most national laboratories, and Berkeley reportedly lost its chance to be the site for the NAL accelerator by resisting such control. But the two universities have recently signed an explicit agreement codifying their roles in the administration of the proposed facility. Perhaps such an arrangement for shared responsibility will reassure outsiders.

An attractive national program would be to fund PEP in fiscal 1976, followed by ISABELLE and perhaps the 1000 Gev storage ring further in the future. But even without such a long-range plan, PEP's chances seem good. Congress has already approved $900,000 for preliminary design of PEP, and as SLAC director Wolfgang Panofsky says, "We're optimistic."

—WILLIAM D. METZ