

Colliding beams — Colliding politics

If physicists collide two subatomic particles of equal rest mass and energy going in opposite directions, they get a good deal. They get all of the energy and mass brought by both particles for the production of new particles and forces they may wish to study. Most of the new discoveries in particle physics in recent years have been made in colliding beams. If the colliding beams consist of a particle and its antiparticle (electron and positron, or now proton and antiproton), an annihilation reaction occurs, which provides an especially clean way of studying subtle effects, one that is free of the background debris produced by the traditional method of striking high-energy particles against fixed targets (SN: 9/30/78, p. 234). It's no wonder that particle physicists have a growing affection for colliding beam apparatus.

Like some love affairs this one arouses a certain amount of jealousy, infighting and bruised feelings. Take Western Europe's project for an electron-positron colliding beam setup that would provide a total energy of 70 billion electron-volts (70 GeV) or maybe 100 GeV, which is called LEP (Large Electron-Proton). At the moment the most energetic such installation in the world is the PETRA ring at the Deutsches Elektronen-Synchrotron laboratory (DESY) in Hamburg, which can provide 38 GeV. The LEP range seems the next reasonable step.

The first question is LEP's highest energy. The people from the West European international laboratory, CERN, in Geneva seem to favor 70 GeV as the limit that proven technology can supply. (Many physicists would like to see 100 GeV because it might enable them to find theoretically important particles, certain intermediate vector bosons that need 85 GeV for their mass.) The people in charge of DESY seem to feel that the 70-GeV limit is premature, but they are regarded as more than a little pushy.

They have some reason. Recently it seems everything has been coming up DESY's. In this context especially noteworthy is their pushing PETRA to completion six months ahead of schedule, and jacking PETRA's little sister DORIS from 7 to 10 GeV in order to make upsilons, the heaviest particles yet known (SN: 9/16/78, p. 196). DESY's triumphs gain attention through what one American physicist calls a high-powered publicity machine, and that rubs nerves on both sides of the ocean. When DESY therefore proposes a site for LEP about 40 kilometers south of the present DESY site and implies that it should more or less be built by DESY, but as a completely international laboratory, this is not taken in Geneva as something predestined.

CERN points out that it has most of Europe's other high-energy physics equipment and could use LEP in conjunction with it to do things like electron-proton collisions. DESY responds that the CERN site for LEP is hemmed in by the Jura Mountains, but the land around Hamburg is all flat. CERN says LEP at a new location would require a new laboratory infrastructure, something CERN already has. Critics say a CERN-built LEP would take too long, because of pressure to trim CERN's budget. (CERN's budget is figured in Swiss francs, probably the world's hardest currency except Saudi Arabian oil barrels, and a nation with a soft currency, pounds sterling for example, can see its contribution double without having the number of Swiss francs rise perceptibly.)

Meanwhile, the first experiment to be set up at PETRA will be devised by an American, Samuel C. C. Ting, who won the Nobel Prize for joint discovery of the psi particle. This kind of thing may exacerbate dismay on the west side of the Atlantic. DESY's publicity machine has pointed out that DESY now offers the world's finest facilities in an area where the United States was once first.

And the United States could come in first again. Burton K. Richter, who shared that Nobel Prize with Ting and who directs America's only operating storage ring, is trying to interest the Department of Energy in funding an American LEP, and there are hints that the Japanese may be interested in making such a thing a joint project. This appears to some to be a breach of a gentlemen's agreement: The

United States was supposed to build the 400-GeV ISABELLE proton-proton colliding beams and leave LEP to Europe while the Soviets built a giant fixed-target accelerator of 3 teravolts (3×10^{12}), but the dismay in American laboratories at the lack of high-energy electron-positron facilities in the country is almost palpable.

Meanwhile, if CERN loses LEP, it has another string to its bow: proton-antiproton collisions. Recently the CERN physicists completed an experiment that showed that antiprotons could be controlled and kept in a small storage ring (SN: 8/26/78, p. 132). Now they are going ahead with a project to have colliding beams of protons and antiprotons in their Super Proton Synchrotron by 1981. It involves building an Antiproton Accumulator (AA) which will collect antiprotons made by striking protons against fixed targets in the CERN Proton Synchrotron. When the antiprotons have been built up into properly sized and usefully dense bunches they will be fed to the PS's booster and then the PS for preacceleration.

A new transfer tunnel from the PS will take them to the SPS for acceleration to 270 GeV. The antiprotons will go counterclockwise; the protons already go clockwise in the SPS. This project puts CERN one up on everybody in Europe. No other laboratory on the continent can do this. In the United States the Fermi National Accelerator Laboratory has the capability, and they are starting on the preliminary antiproton gathering and management now. □

'Combat neurosis' in the battered teacher

Schoolrooms have been viewed metaphorically as "the battleground of society," but during the last few years that description has become more literal than educators might ever have feared possible. According to some national statistics since 1972, classroom murders have increased 18 percent, rapes 40 percent, robberies 37 percent and physical assaults on teachers 77 percent. In 1975, school property destruction surpassed \$600 million and serious injury from physical assaults by students were reported by 70,000 teachers.

What is the toll on teachers? A study of 253 Los Angeles inner-city classroom teachers reveals that many of them have developed conditions similar to the "combat neuroses" found in soldiers at war. The teachers—158 women and 95 men—were referred for psychiatric evaluation between 1971 and 1976 "because of varying degrees of psychological stress and physical trauma," according to Alfred M. Bloch, assistant clinical professor of psychiatry at the University of California at Los Angeles.

More than one of every four teachers had sustained physical assaults at school, Bloch reports in the October AMERICAN

JOURNAL OF PSYCHIATRY. Many of the injuries were minor, but others included lacerations, bruises, head injuries, seizures and deafness. In addition to psychiatric evaluations, each person was tested on a variety of psychological measures. In addition, "I used studies of combat neurosis as guidelines in assessing the results of the psychiatric evaluations of these patients and in testing the patients," Bloch says.

The evaluations "revealed an evolving pattern dramatically similar to that seen in early studies of combat neurosis," he says. "The teachers themselves referred to the schools they worked in as the combat zone." Like many military combatants, the teachers had a tendency to focus on a relatively minor physical symptom and become anxious and depressed. Their complaints included fatigue, weakness, blurred vision, tinnitus, irritability, sensitivity to weather, dizziness, malaise and a variety of depressive symptoms.

"Psychological testing generally indicated obsessional, passive, idealistic, dedicated individuals who were unable to cope with or understand the violence directed toward them," Bloch says. "They