

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

were unable to defend themselves or strike back." Almost all of the teachers in the study had "some psychophysiological manifestations of long-term stress." And of the total group, 134 had documented "extensive medical histories representing two to 10 years of psychophysiological response to continued stress," Bloch reports.

"Factors predisposing to neurosis in military personnel were applicable to these teachers," he says. "Primarily, these centered around an impaired ability to deal effectively with fear or anger." Almost 80 percent of the teachers who succumbed to sustained stress were categorized as passive, rigid and moderately obsessive. Much of their low morale and feeling of helplessness, Bloch suggests,

came from lack of support from their school administrators.

"The teachers said they were usually discouraged [by administrators] from reporting incidents of violence," he says. "Thus, they were denied an important opportunity for obtaining support and reality testing." Many of the teachers were also denied requests to transfer to less stressful schools. "The added stress of no exit from what they viewed as an intolerable situation contributed to the development of symptoms," he says. "Psychophysiological complaints increased until many became disabled." He recommends measures to help teachers prepare for and deal with school violence. The measures include crisis intervention and psychological training for teachers. □

Energy bill passes, many others don't

The Senate and House chambers were a flurry of activity last weekend as legislative brokers worked well into the night settling last-minute deals in the closing hours of the 95th Congress. Debate-weary members frequently crossed party allegiances to strike the compromises that made passage of many important bills possible. Among the most impressive results was a break in the stalemate over President Carter's energy bill. Many other touch-and-go bills fared less well. In fact, of the more than 22,000 pieces of legislation introduced in this Congress, only a little more than four percent made it through both the House and Senate. And of those passing both houses, only about 55 percent became law (this number excludes any currently awaiting Carter's signature). Here's what happened to some of the more important bills that were pending last week.

Unquestionably, one of Carter's strongest victories was the final passage of an energy bill. Although it bears only a faint resemblance to the package that Carter proposed 18 months ago, it does represent the first national policy to come through Congress that accounts (or at least tries to) for the synergistic impacts that use of coal, gas and oil — the nation's three major fuels — has on both the economy and the availability of future energy supplies.

The President would have raised fuel prices with taxes to encourage energy conservation and to avoid energy-providers raking in windfall profits. Instead, Congress chose mainly to "encourage" conservation with regulation and tax subsidies. The only Carter tax that remains is for cars with poor fuel efficiency.

The most controversial part of the energy package — and the one largely responsible for the eight-month House-Senate conferencing — was natural-gas price decontrol. Congress voted to let gas prices increase gradually toward complete decontrol sometime in the mid to late 1980s. While Congress chose not to maintain arti-

ficially low oil prices, it also chose not to raise them; that is left to Carter. Earlier, he pledged to raise oil prices to world levels within two years.

Briefly, the bill also requires most electric power plants to switch to coal from oil or gas; where feasible, industry is asked to do the same. New energy-rate structures would also encourage conservation. And both consumers and industry would qualify for tax credits on insulation and energy-conservation investments. Finally, utilities would be required to provide information and some financing for "winterizing" homes.

On another front environmentalists won a small victory with resolution of whether and how much to continue protecting endangered species. Fearing that the Endangered Species Act endangered some public works projects, Congress wrote a compromise amendment into the Act (SN: 5/13/78, p. 310) and attached it to the Act's funding. Then a snag developed. Although money to fund the Interior Department's Office of Endangered Species was appropriated, it was not authorized. With the start of the new fiscal year on October 1, endangered-species protectors were left unfunded and forbidden to do any endangered-species-related work (SN: 10/7/78, p. 247). One Tennessee congressman had threatened to stall floor action on the Act's FY 1979 authorization bill last week by introducing 600 or more amendments to the Act. But in the end, an 18-month reauthorization passed.

Environmentalists scored another gain with passage of the Boundary Waters Canoe Area bill. It would declare a million acres in Minnesota (on the Canadian border) as a natural wilderness. Logging and mining would be banned; motorboats and snowmobiles would be restricted.

Environmentalists failed to win support, however, for passage of their major campaign this year, the Alaska Lands bill (SN: 5/27/78, p. 343). Called the greatest conservation issue of the century, it would

have set aside millions of acres of new national parks, wildlife refuges and wilderness areas. It would also have prohibited gas, oil and hard-rock mining on much of the land. Various environmental coalitions around the country have spent whatever they had — in time, money and physical labor — for an all-out lobbying campaign to counter mining-lobby interests. Some now feel that the next time around they will be unable to regain the momentum they strived so hard to develop.

Also dead, at least this time around, is the deep-sea mining bill. It would have specified which minerals (such as copper, manganese and nickel) could be mined on the ocean floor and would have set up a licensing procedure for staking claims. (Backers say they will reintroduce the same bill on the first day of the next Congress.)

Offering to take "compassionate responsibility," the Congress has approved a program to clean up the uranium mill-tailing wastes at 22 abandoned Manhattan-Project (World War II) sites. The cost is estimated to run between \$120 million and \$180 million. In addition, Congress voted to extend the Nuclear Regulatory Commission's licensing authority to cover mill tailings. Although NRC has jurisdiction over active mills, it has no direct authority for wastes at abandoned sites, particularly those abandoned decades before the agency was formed.

Finally, President Carter's dream of a separate, Cabinet-level Department of Education is just that — a dream — unless and until the next Congress approves the founding legislation. □

Skylab now watched full time

The Skylab stakeout was upgraded late last week to a round-the-clock affair. The nearly 100-ton earth-orbiting facility has been of concern ever since it was realized that it might reenter the atmosphere — with chunks perhaps reaching the ground — before a space shuttle mission could boost it to a higher orbit. NASA tracking stations have been monitoring Skylab for about 16 to 20 hours per day, but 24-hour coverage began late on Oct. 14 with the addition of the station at Santiago, Chile, and of new control-room shifts at Johnson Space Center in Houston.

The control-room crews have had not only to monitor Skylab's condition, but also to be ready in case some malfunction aboard required corrective commands to be transmitted up from the ground. The last such commands succeeded on July 25 at stabilizing the space station in a position of minimal atmospheric drag, sought in an effort to help keep Skylab aloft as long as possible. Only six days earlier, a problem cost Skylab much of its remaining