

DOE answers to Congress as it officially kills Brookhaven CBA

The editorial in *Newsday* on 15 July was headed: BROOKHAVEN'S LOSS IS NOT THE NATION'S GAIN. It went on to rebuke the Department of Energy's High-Energy Physics Advisory Panel for recommending four days earlier that the government should kill the half-finished Colliding Beam Accelerator at Brookhaven National Laboratory and start work immediately on a collider with 50 times more energy—a colossus that, like the pyramids, could be built only in wide-open spaces, a desert, say, hence its nickname, "Desertron" (PHYSICS TODAY, September, page 17). The decision by HEPAP's subpanel of accelerator experts had not been reached easily. The vote against Brookhaven's proton-proton collider, which carried the winsome name of Isabelle from its birth in 1978 until it encountered troubles with its superconducting magnets in 1981, was by the narrowest majority—9 to 8 at first, then, after agonizing debate, 10 to 7. By contrast, HEPAP itself, strongly influenced by White House science adviser George A. Keyworth II, who called upon the high-energy physics community last April to abandon "pet projects" and work together to recapture US preeminence in the field, issued a unanimous endorsement, though its chairman, Jack Sandweiss of Yale, admits that the decision was "difficult, even painful."

It was equally difficult and possibly more painful for Brookhaven's 3200 scientists and staff to accept. Some sent letters and telegrams to their Congressman, William Carney (R-N.Y.). "Cancellation of Brookhaven's CBA is foolhardy, shortsighted and unwarranted," wrote a physicist. "I find it hard to believe the nation would fold up this project in favor of something so farfetched," said another writer. "Please tell President Reagan," another concluded intemperately, "to fire Keyworth."

As a minority member of the House Science and Technology Committee, Carney convinced its chairman, Don Fuqua (D-Fla.) to conduct a hearing on HEPAP's report and DOE's final decision. The hearing, actually before the

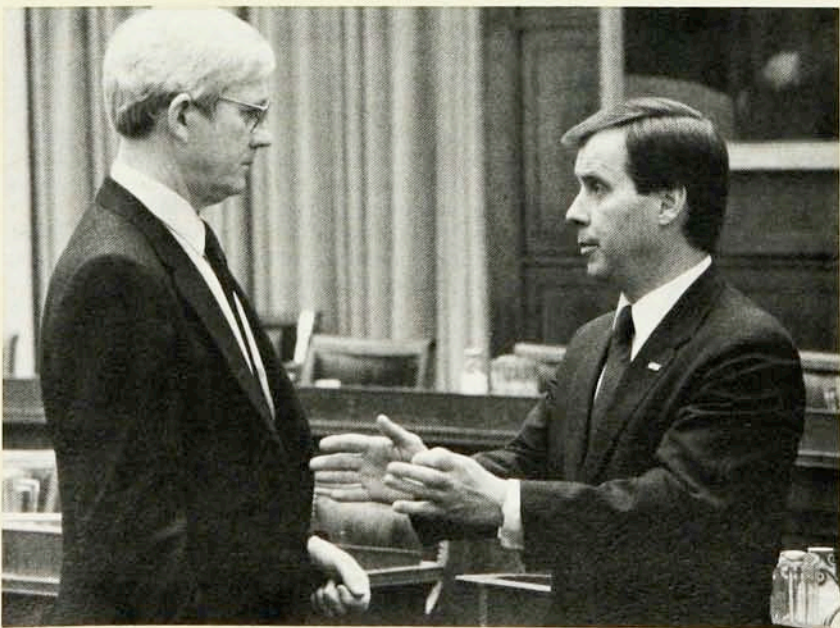
Subcommittee on Energy Development and Applications, was set for 19 October because of the clogged Congressional calendar, but the delay allowed DOE to shape its plans and enabled Carney to muster his colleagues. To Carney's aid came Herbert W. Bateman (R-Va.) and F. James Sensenbrenner Jr (R-Wis.), who has become the House champion of peer review since his futile campaign against Catholic and Columbia universities in their pork-barrel tactics to obtain Federal funds for science buildings (PHYSICS TODAY, August, page 45).

House drama. The case against Brookhaven's CBA and for going ahead with the Desertron or Superconducting Super Collider, which would have particle energies of up to 20 TeV in each of its two colliding proton beams, was presented confidently by Alvin W. Trivelpiece, director of DOE's Office of Energy Research, Stanley G. Wojcicki of Stanford, who led the HEPAP subpanel, and Sandweiss, HEPAP's chairman. But it was the spectacle of three Republican congressmen arguing with Republican

administration science policy that made for high drama.

At stake, said Carney, are two issues: "Do the HEPAP recommendations advance not only the interests of the scientific community but also those of US taxpayers?" And "What responsibility does the scientific community have to Congress for developing a consistent scientific policy?" Proceeding to answer his own questions, Carney cited Isabelle's history: HEPAP endorsed it in 1974 and 1975, then gave top priority to its construction in 1977, proposing then that its beam energies should be increased from 200 GeV each to 400 GeV each; in 1980 and 1981, concerned that magnet troubles and managerial problems were delaying its completion and increasing its cost, the panel called for getting on with it rapidly. "Congress has gone along with HEPAP in the past and spent \$200 million for R&D and construction of CBA," said Carney. "We've gone along with it because you asked us to."

Now the facility's 2¼-mile circular tunnel is completed; its central service



After House hearing, Carney (at right) confers with Trivelpiece on Brookhaven constituents.

unit is finished; eight production models of its superconducting magnets have met all performance requirements; the world's largest helium refrigeration system is operational; the laboratory has a top-ranking team of magnet and accelerator designers. Despite this, said Carney, the high-energy physics community has reversed the decision of previous panels, "probably for the first time," so that it can build what he called a "dream machine".

"How can I tell the American public that the high-energy physics community is right in spending tax dollars in a prudent way? How do I go back to the people in the first Congressional District of New York and tell them it's prudent to abandon a \$200 million concrete doughnut in their midst to move on with a machine I can't even describe?" As for the SSC, he said, "I don't know if its ring will be 20 miles or 120 miles wide; I don't know if it will cost \$2 billion or \$8 billion; I don't know its site or who heads its team of designers or operators or how long it will take to complete. How can I get a consensus from American taxpayers that this is a prudent step?"

Peers divided. Earlier, Congressman Bateman grilled the witnesses about the peer-review process. "I'm intrigued by the layers of recommendations. The subpanel in this instance was closely divided. HEPAP was unanimous. My experience in life would indicate to me that when one group is unanimous on a recommendation by experts who are significantly divided, it generally bespeaks the absence of an independent, in-depth, critical analysis and the acceptance of the majority wisdom of the subpanel," said Bateman. "Is that the case here?"

Wojcicki, in his testimony, had already answered Bateman's question. "Based on the letters from particle physicists to the subpanel, as well as many private conversations held with practicing high-energy physicists," he said, "I am personally convinced that this split vote reflected fairly well the divided opinion of the community on this very difficult issue. I also believe that the great majority in the community believes that a hard decision had to be made, a decision that could not satisfy everybody, and now that the subpanel recommendation is endorsed by HEPAP, the community is willing to support it."

Brookhaven's CBA is the victim of the success of the European Organization for Nuclear Research, or CERN, where the W and Z⁰ intermediate vector bosons have been recently discovered, as well as its own years of delays. In any case, the Large Electron-Positron machine under construction at CERN, and the Fermilab Tevatron and the SLAC Linear Collider,

which are further along to completion than the Brookhaven facility, leave the "discovery potential" of CBA far behind. Said Wojcicki: "CBA is not absolutely essential for the vitality and health of the US high-energy program either now or in the near future." What's more, he said, "there is a real danger that construction of CBA will interfere with the SSC project, which should be our top priority." As for HEPAP's current inconsistency with the conclusions of panels in previous years, he observed, "the physics discoveries and technical developments that have taken place in the last two years have cast a different light on those recommendations." In the end, said Wojcicki, HEPAP concluded that the opportunities for "forefront physics" would be running out by the 1990s unless the SSC is available—though the effort to design, build and operate the SSC cannot be dismissed lightly. Uncertainties about it abound, he observed, ranging from technical considerations and site selection to whether it can attract and retain Federal funding for a decade or more.

Rival claims. Thus, as Wojcicki and Sandweiss explained, considering the enormous scale of SSC, a full commitment is needed from the whole US high-energy community as well as Congress. SSC is attainable, said Wojcicki, "if maximum use is made of the capabilities of all the national laboratories, if there is large-scale involvement by university groups and if good use is made of industrial expertise." For its part, DOE already has taken steps toward SSC, said Trivelpiece. It directed HEPAP to name another subpanel to provide advice on an R&D program for the Brookhaven accelerator. The group, headed by Wolfgang Panofsky of SLAC, held its first meeting in early September, when it reviewed a preliminary R&D plan developed by a task force of accelerator specialists under Maury Tigner of Cornell and listened to representatives from national laboratories and universities who are staking rival claims to the SSC.

One of the first came from Texas, never shy when it comes to thinking big or spending big. Peter McIntyre at Texas A&M has enlisted the support of four universities (the University of Texas at Austin, Rice and the University of Houston, besides his own), along with the state's governor, Mark White. In a letter to DOE, White expressed his interest in locating SSC in Texas. Physicists at the University of Utah have approached their members of Congress and state politicians to lobby for the machine, proposing the bed of the Great Salt Lake as a possible site. Arizona, California and Colorado are also considering bids, with offers of large open regions. Another potential

contender is Fermilab, where the Tevatron could be used to inject protons into SSC, thus cutting costs. For its part, Los Alamos has suggested SSC could be located in the picturesque caldera of an ancient volcano just a few miles southeast of the laboratory. Not surprisingly, Brookhaven also would like to get the new machine. But the likelihood of scaling down SSC to fit Long Island, while avoiding its congested residential, commercial and industrial areas, let alone its transportation network, appears impossible.

For Brookhaven's CBA, however, its fate is now sealed. In letters dated 18 October to the chairmen of four Senate and House committees dealing with science and energy research, including Fuqua, Energy Secretary Donald P. Hodel announced the decision to drop CBA. Funds for it, he wrote, will be redirected to advanced accelerator R&D at Brookhaven and elsewhere. Hodel's letter avoided mentioning the SSC, however, because DOE has not yet brought it up to Congress. Even so, DOE intends to divert \$18 million of \$23 million in Brookhaven's FY 1984 budget for CBA R&D and construction to studies of the new machine and other projects. The Panofsky panel has recommended that accelerator teams at Brookhaven, Berkeley and Fermilab should be funded to study how best to construct SSC while keeping down its size and costs. It is likely, according to Trivelpiece, that these labs, along with some other institutions, including universities perhaps will share in the money diverted from CBA.

Another prospect is that Brookhaven's Alternating Gradient Synchrotron can be used with Isabelle's abandoned tunnel to create a relativistic heavy-ion collider for nuclear physics research—a project that would cost \$7 million to \$8 million. To do this, the AGS would have to be improved and linked to the lab's existing tandem Van de Graaff accelerator. The first step toward this goal, now under consideration at DOE, calls for Brookhaven to spend some \$5 million appropriated in its current budget for CBA to R&D for the project.

If this comes about, it is bound to please Carney and his constituents. "Any plan to terminate CBA and squander \$200 million would be politically risky," he said after the subcommittee hearing. "It would make it impossible for the administration to get the support of 218 of my colleagues in the House to approve the dream machine. It would be a formula for legislative paralysis."

Indeed, Fuqua and other members of the House subcommittee voiced concern about the enormous cost of a super collider. Asked whether DOE had explored the idea of multinational spon-

shorship of SSC, patterned on the CERN experience, Trivelpiece observed that high-energy physics was one of 18 scientific and technological matters that were identified for international cooperation at the economic summit of Western European countries, Japan,

Canada and the US at Versailles in 1982 and Williamsburg, Virginia, last June. "It would seem prudent to proceed on an international basis," he said. There are some sticky questions, however. "While the concept makes good common sense," said Trivelpiece, "it's

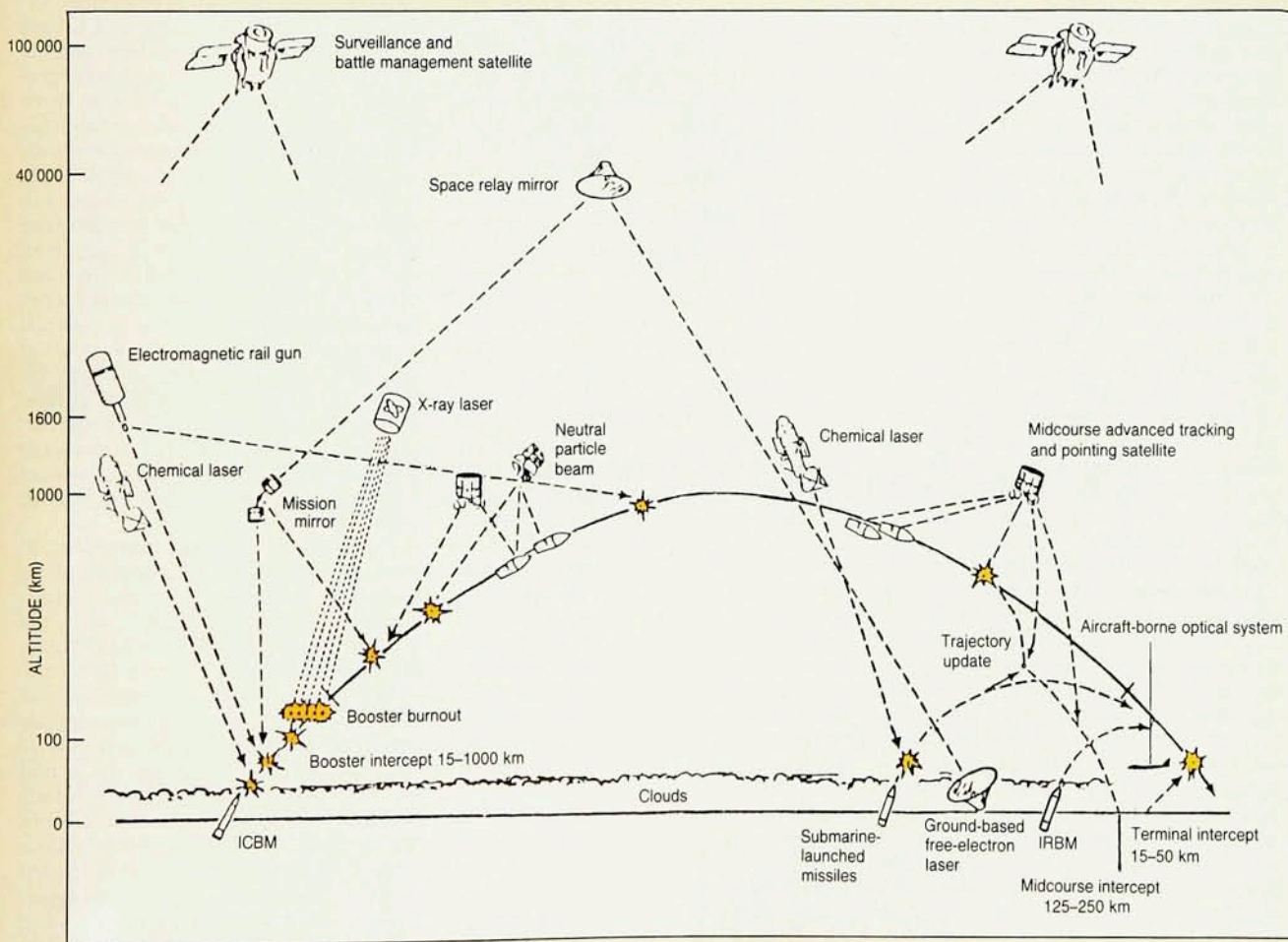
somewhat unprecedented. It's not clear that we can build real property on an international site and that we can transfer funds to it." Nobody at the hearing mentioned that similar questions came up when the US decided to join the United Nations. —IG

Panel urges \$28 billion missile defense R&D for next 5 years

Near the end of his press conference on 20 October, President Reagan corrected a questioner who asked if he favored a recommendation by members of his Cabinet on developing and demonstrating missile defenses for outer space. "Nothing has actually been presented to me as yet," said the President. "I'm fascinated with reading all about it, but I haven't seen [the report itself]." The report had been sent to the Oval Office a week earlier by Defense Secretary Caspar W. Weinberger and the President's (then) national security adviser, William P. Clark. Then, on 17 October, *Aviation Week & Space Technology*,

often favored with leaks from the Department of Defense, spilled out details of the classified report. Citing a formidable array of chemical, excimer, x-ray and free-electron lasers, particle beams and kinetic-energy "hit-and-kill" devices, the magazine quotes the report as saying: "With vigorous technology development (of such systems, with their associated acquisition, tracking and pointing components), the potential for ballistic missile defense can be demonstrated by the early 1990s"—apparently without violating the 1972 antiballistic missile treaty with the USSR. The report, based largely on a

study led by James C. Fletcher, former director of NASA, does not recommend a crash program but calls for R&D in four time frames, each with its own funding level. The most expensive calls for spending \$2.6 billion in FY 1985 and \$25 billion more through FY 1989—though full deployment of a multilayered defense system by the year 2000 would cost about \$95 billion (in today's dollar value). Cheaper options that do not shoot for deployment in this century would require between \$18 billion and \$26 billion between FY 1985 and FY 1989 to demonstrate promising technologies.



Multilayered space defense system in artist's drawing shows two surveillance, tracking and communications satellites in geostationary orbit and high-altitude aircraft with optical sensors relaying battle management data for deploying various types of particle and laser

beams to intercept incoming ballistic missiles at three stages—during launch, in flight and re-entry. According to the Defense Technologies Study, the system is designed to destroy all but 1% of attacking missiles. (Based on a drawing in *Aviation Week & Space Technology*.)