

developed plan for access to supercomputers, but even the \$60 million allocated for the coming year, which represents an enormous jump over the \$6 million available this year, pales against the rough estimate made in the NSF staff report in 1983 that more than \$400 million would be needed over the next three years to deal adequately with the problem.

The staff report concluded that while there is an immediate need to make supercomputers more available to academic scientists and engineers, "the attitude toward computers for research marks a generation gap in the community. . . . Older scientists may use, or have their graduate students use, computers for a variety of measurement and analysis tasks but consider the role

and importance of computers to be limited. Younger scientists, who grew up with computers as part of their culture, view them differently. . . . Science has passed a watershed in using computers for research. Computers are no longer just tools for measurement and analysis, but large computers in particular have become the means for making new discoveries."

In sum, then, while there is no clear government scheme to coordinate a coherent national supercomputer program, which would embrace research, development and access, it is becoming clear that the acute rivalry with Japan and Europe will force the administration and Congress to become more responsive to developments here and abroad. —IG

SSC cost and size perplex Congress

Sometimes the history of physical science resembles nothing so much as political science. For instance, in the 1950s and 1960s particle physicists had learned enough about political methods to establish alliances with congressmen and governors in their vigorous and often acerbic battles against each other for large and expensive high-energy accelerators. Professional politicians, for their part, often expressed their vexation with the combat over "big science." Thus, early in 1964, soon after becoming president, Lyndon Johnson, weary of the internecine warfare among physicists over the site of the 200-BeV proton accelerator (built later at Fermilab), wrote to Hubert Humphrey, then a senatorial champion of one of the factions: "I devoted more personal time to this problem than to any nondefense question that came up during the budget process."

Members of the House Subcommittee on Energy Development and Applications voiced somewhat similar dismay on 22 February as they listened to physicists explaining the need for a Superconducting Super Collider—the proposed crown jewel of today's big science. In his testimony before the subcommittee, Alvin W. Trivelpiece, director of energy research at DOE, said \$20 million is requested in fiscal 1985, only \$1 million more than is appropriated this year, to carry out exploratory evaluations of various concepts of the powerful accelerator, its magnets and cryogenics.

The work in 1985 will be based largely on the findings of a reference design study involving some 40 scientists and engineers from seven universities and national laboratories under the leadership of Maury Tigner of Cornell. The Tigner group has been pondering the principal problems of

building and operating a high-luminosity proton-proton collider with 10 to 20 TeV in each beam—namely, the type and strength of superconducting magnets, the cryogenic requirements and conventional facilities, as well as the "credible" cost estimates for the project.

Skepticism. Representative William Carney (R-N.Y.) asked Tigner, "What is Congress to do?" Said Carney: "We're dealing with the largest scientific endeavor in our nation's history. . . . There is some skepticism by members of Congress as to whether we should go forward with the project." Claudine Schneider (D-R.I.), only ten minutes before, reminded Trivelpiece and the physicists who testified, including Tigner, Leon Lederman of Fermilab and Burton Richter of SLAC, that "when we are looking at a \$180 billion deficit in 1985, [the SSC] will require an enormous amount of justification."

Carney claimed Congress was receiving "mixed signals." Scientists are advising the government to proceed with the SSC as rapidly as possible to wrest the leadership in high-energy physics from Western Europe, said Carney, but DOE cautions against moving too far too fast lest the project "lock in" one approach that later proves to be too costly and unworkable. The Tigner study, which concludes with a report to the DOE in May, will compare three different concepts but not necessarily make a choice among them for the final design. The report will be discussed at a conference on particles and fields at Snowmass, Colorado, in late June, and used by Energy Secretary Donald P. Hodel to decide on the government's intentions for the SSC in preparing the DOE budget request for fiscal 1986. "Will \$20 million be enough in fiscal year 1985," asked Carney, "if the decision is to go forward with the project?"

"Well, I'm not terribly happy with it," replied Tigner. "We are trying very hard now to make a convincing and detailed argument about what is required to go forward, and we are very hopeful that we will be able to convince the DOE to support a somewhat broadened scope for the activities."

Direction? Though he is an advocate of the behemoth collider, Carney admitted, "I've become confused." Last October, he recalled, DOE's High Energy Physics Advisory Panel testified before the same subcommittee that Congress should support the SSC, though the HEPAP members allowed that the design, location and cost of the machine were still uncertain. "What decision do we make in Congress? Just wait another year, spend another \$20 million, with no direction? . . . We might be able to reduce the deficit," Carney continued, by not funding the project, "but that would be to the detriment of high-energy physics in our country."

Cost, of course, is only one consideration in congressional decisions. Almost as important is the location of a particular project or facility. Accordingly, Representative Schneider asked: "Are there any thoughts as to where the SSC would be placed?" "There are a lot of thoughts about where it might be located," Trivelpiece responded. "Hardly a week goes by in which I do not get an offer to have it in some particular location." Representative Paul Simon (D-Ill.) wanted Trivelpiece to know that he had considered a site "very carefully, very objectively" and concluded, not surprisingly, "that Illinois is a natural location for the proposed machine." Carney noted that the SSC "just would not fit" either in Schneider's Rhode Island or in his district on New York's Long Island, since preliminary plans suggest that the accelerator would be some 12 to 32 miles in diameter.

One of the most far-reaching suggestions for a site, Trivelpiece interjected, "was to arrange the SSC in such a way that its beams, which can be steered with magnets rather effectively, will be directed to pass through the physics departments of about 20 different universities on the eastern seaboard. In that way, a support base could be assured." To this, Carney said with a chuckle, "If that is the design plan, high-energy physics would be operating like the Pentagon. Put it in 218 districts of Congress and any program will be funded." More seriously, however, Carney added, "I am frightened that in the budget process, we will say yes to the funds asked for now and then not have money to go forward aggressively, pushing the SSC off another year. Delays cost money and also may cost us the support of Congress." —IG