

to discuss preliminary planning and cost sharing of the machine. So far, no commitments have been forthcoming. Given the bleak realities of government balance-sheets these days, Europe and Japan may be overextended already in Big Science facilities. CERN is committed to completing its Large Electron-Positron Project in 1989, and West Germany is scheduled to finish another large accelerator, HERA, at Hamburg in 1990, by which time construction of the SSC would be well under way, according to current plans. Japan, however, is another story. The Japanese will be paying for TRISTAN through 1986. Moreover, they have extensive experience with superconducting magnets and an abiding commitment to upgrading their high-energy physics. Keyworth and Trivelpiece consider Japan the most likely collaborator in the SSC.

CERN alternative. When CERN director Herwig Schopper argued the case for a proton-proton Large Hadron Collider as a more "cost-effective alternative" to the SSC before the International Committee on Future Accelerators, which met in Japan last May, the idea, though not new, was recognized as a direct threat to the SSC. Schopper, backed by CERN's Carlo Rubbia and Giorgio Brianti, claimed the world would be better off going their way, using still-to-be-developed magnets of 9 or 10 tesla in a collider ring to be placed atop the still-to-be-completed LEP beam ring (PHYSICS TODAY, June, page 17). But CERN hadn't reckoned on a European political movement toward greater cooperation in international scientific R&D. After France's President François Mitterand strongly urged the other six heads of state at the Versailles Summit Conference in 1982 to collaborate in scientific research and technological development for the "revitalization and growth of the world economy," the idea of joining forces grew. It acquired additional cachet at the Williamsburg Summit in 1983 when a Working Group on Technology, Growth and Employment was formed. The group identified high-energy physics as one of 18 subjects, from aquaculture to solar system exploration, that would benefit from collaboration.

In a paper that Working Group leaders, who call themselves "sherpas," carried to the London Summit last May, there was a telling statement: "It is neither sensible nor necessary for science R&D to be developed purely on a national basis. Science itself is, and always has been, international in nature.... Science is now inextricably linked to technology and hence to economic and social progress.... To meet the needs for international cooperation in science and technology, governments should... seek cooperation

Keyworth sees SSC 'a magnet for talent and creativity'

The Superconducting Super Collider was one of the main topics for President Reagan's science adviser, George A. Keyworth II, in his defense of the proposed budget for science research in fiscal 1986 before the House Committee on Science and Technology on 5 February. By turns he was confident, forceful and unyielding in his remarks.

"I won't conceal my opinion," he said, reading from a prepared statement, "that it would be a serious blow to US scientific leadership" if the SSC were built anywhere but this country. The facility would be "a magnet for talent and creativity," he observed. "Such an accelerator 'involves far, far more than the relatively small number of people who can work directly with it, because it stimulates interest in science and excellence far across society and because it inevitably spins off new ideas and technologies.'"

For the next several years, Fermilab's Tevatron and the Stanford Linear Accelerator place the US "in a strong position to maintain our leadership in fundamental particle physics," said Keyworth. "But we're on notice that over the long haul, leadership in high-energy physics is up for grabs. The recent, stunning success of a European team working at CERN in Switzerland in detecting the Z^0 particle was the most important advance in a decade, and it quickly brought the Nobel prize to the team's leaders. That's a very real reminder that our many years of leadership in that field are, right now, being aggressively challenged."

Opening the question period, Representative Don Fuqua of Florida, the committee chairman, asked if Keyworth thought the entire science community could be brought around to rally behind the SSC. Commitment to the SSC by scientists "and the nation as a whole" is "essential," Keyworth replied. He estimated the total cost of the project when built and operational by 1993 or 1994 at some \$5 billion to \$6 billion—"an unprecedented large sum for an experimental facility in a single area of science."

The SSC, he continued, "presents a unique challenge, and I think the biologists, the chemists, as well as the public have got to join with us in making the decision: Do we want to give up clear leadership and resign ourselves to... second place in a field where we have long been unquestioned leaders?" Deciding to proceed with the machine "is a measure of the importance we place on excellence, on attracting our top young minds to the most creative endeavors we can pursue," he said, "because I think traditionally no field has been more attractive in the sense of pure creativity than elementary-particle physics. I also think the field has never been more exciting. I think we stand toward the end of this century to make the same kinds of contribution that James Clerk Maxwell made at the end of the 19th century in developing the law combining the electric and magnetic fields. I think it is monumentally important.... I think the other communities in science not only can but must be brought on board in support of the SSC for its symbolism of excellence and creativity."

The high cost of the SSC in these fiscal hard times, Fuqua wondered aloud, might mean some kind of international collaboration. "It is essential," Keyworth asserted, "because we must realize there will not be two of these machines. We've reached a point in time and sophistication where we can no longer continue to explore parallel paths with Europe or Japan or even the Soviet Union... duplicating these massive facilities.... This should be a truly international project."

Representative George E. Brown Jr. of California reminded Keyworth that particle physics and the biotechnology revolution would be competing simultaneously for government funds in the next decade. The issue of Federal support has been joined by the increasing competitiveness in science, said Keyworth. As the chief spokesman for the Administration's R&D policies, Keyworth admitted he will have to allay anxieties about the machine. Accordingly, he planned a campaign of public persuasion through the news media to win support for the SSC and for scientific research in general. The message, according to Keyworth, is that science research is basic to maintaining economic growth and strengthening military security.

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in, and in certain cases joint operation of, large scientific research installations, the cost of which is prohibitive for a single government but which are nonetheless indispensable for the advancement of science."

Regional facilities. In preparation for the Bonn Summit this May, Trivelpiece, as leader of the high-energy-physics working group, appointed a subpanel to identify the most important major research facilities anywhere. Meeting in Abington, England, last November, the panel, headed by Harry Atkinson of Britain's Science and Engineering Research Council, concluded a lively debate on new facilities by calling for regional machines, and refused to accept the concept of a single world machine.

The panel said it seemed possible to build and operate a new generation of high-energy physics facilities "within broadly constant budgets... provided that there is no duplication of major facilities. This implies that we plan on an inter-regional basis to ensure complementarity and cost-effective decision-making. Further concentration is probably inevitable; however, we are convinced that more than one region working effectively in high-energy physics is essential to the health of the science...." Later in the report, the panel listed various proposed machines, including the SSC and the options for the LEP tunnel, but claimed "it is too early to select a strategy which will satisfy scientific needs in the most cost-effective manner." The US