

SOME THOUGHTS ON THE SSC AND THE MANAGEMENT OF SCIENCE

Sidney D. Drell

I'd like to review some of my biggest concerns about what's going on in Washington and the way the government is now handling matters of science, as well as the challenges we as scientists face to survive in this new world.

Many issues are perennial, of course, such as inadequate support for research or achieving a healthy balance among different fields of science and also between exploiting the facilities at hand and building newer, larger and more expensive ones. Such issues always require our vigilant attention, and the advisory mechanisms that have been developed have at times even contributed to how well we do in addressing those issues. For example, the High-Energy Physics Advisory Panel and other national advisory panels modeled after it have a good record overall. What is very sad, however, is that the process of setting priorities and making choices in science has become increasingly politicized with the passage of years. Perhaps it is inevitable, à la the second law of thermodynamics. I'd like to think we might reverse the trend, but I suspect that to do so would require more money so we could avoid making choices, or a change in human nature, or both.

Getting to the SSC

Because neither more money nor a change in human nature is likely in the near term, I will go on to two issues that maybe we can do something about as we look at the problems in science and government. One is the saga of the Superconducting Super Collider. We love it, or many of us do anyway, for its scientific potential. Many of the SSC's supporters in Washington, however, covet it largely for different reasons. To them it is judged in terms of jobs, the local economy and even the impact on local elections. Somewhere

the quark and the pork get confused with one another.

After almost ten years of solid effort, the major achievement of the SSC thus far resulted from its hoped-for contribution to last year's Presidential election—although in fact its contribution to winning the election proved to be inadequate. I am speaking of President Bush's signing of a law in September 1992 that contained support for the SSC to help his reelection campaign by holding the Texas vote, in spite of the fact that the same law also contained an amendment he actively opposed that mandated a curb on nuclear weapons tests. This is the Hatfield-Exon-Mitchell Amendment, which restricts nuclear tests in both number and kind over the next three years, and in addition mandates a ban on all testing after 30 September 1996, if the other nuclear and nonnuclear countries join us in a worldwide comprehensive test ban. In the meantime, the legislation limits US tests in Nevada to a total of four per year, plus one test for the UK, for the 3-year period between 1 July of this year and 30 September 1996. It furthermore restricts them almost exclusively to resolving lingering issues of safety that have been identified for those warheads that we expect to remain in our nuclear arsenal after the implementation of the recently negotiated START I and II reductions, prospectively around the turn of the century. Indeed, with this legislation we are now on a well-defined and logical path to a comprehensive test ban.

On 12 February, three weeks after his inauguration, President Clinton publicly affirmed his commitment, in a letter to the Senate majority leader, to work toward negotiation of a comprehensive test ban and to carry out the limited safety-oriented test program to be completed by 1 October 1996 in accord with the legislation. If this goal is achieved, it will indeed be an historic accomplishment after a half century of tests. Perhaps the world now is indeed ready both technically and politically to take this important step of nuclear restraint, which may prove to be a politically

useful boost to our worldwide efforts to stop proliferation and to reduce nuclear danger. Good for the SSC!

The path to SSC *physics*, however, seems to me still to be much more uncertain and volatile. Its fate is in the hands of budget deficits, jobs and, still, regional elections. And now it is paired in the public consciousness with the space station as a tempting target for deficit reduction. The SSC deserves a much better fate. Three years ago I chaired a study for the Department of Energy that affirmed the compelling physics arguments for the SSC—that is, for a full-scale SSC with a 54-mile circumference, unshrunk by budget squeezes. We convinced then Secretary of Energy James Watkins to proceed with the SSC even when its projected budget had climbed above \$8 billion; he became fascinated with the science. However, with the recently announced annual limit on the SSC budget of \$640 million for fiscal year 1994 and somewhat less for fiscal 1995 set by the Clinton Administration, and the resulting prolongation of the construction schedule, we seem to be no closer to completion of this instrument than we were three years ago, despite excellent technical progress since then. What are we to do now in this saga of the SSC, which is consuming precious dollars at the rate of some \$500 to \$600 million a year? I offer three options:

1. Proceed with a date certain of completion within 10 years from now, and without robbing funds from other intellectually rich and important components of our national program in science. This requires a political commitment, which was originally promised by President Reagan but which now may be difficult to get. If we cannot gain a commitment to such support, there is a second option.

2. Continue progress for this year while trying with strong political leadership at the highest levels—a full-court press—to convert the SSC into a truly international project. It's late in the game for this change but perhaps not too late, and after all, isn't that really the scientifically ap-

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appropriate decision to make? What would be more foolish than to build both the SSC and the Large Hadron Collider at CERN? And as for Europe's optimism about constructing the LHC, they too are facing increasing economic pressures. Most notably Germany faces the daunting task of integrating the former East Germany and rebuilding a viable economy there at an estimated cost of \$80 billion per year. It also faces a political threat—with haunting memories from the 1930s—posed by 40 to 50% unemployment figures in the large East German cities. As a result, Germany has already cut its annual contribution to the CERN budget by 10%, or 20 million Swiss francs, with no inflationary offsets in the near future. Other countries are also struggling financially, and it seems to me that an early completion of the LHC is becoming less likely. I'm told the CERN council faces a critical decision this December, and Carlo Rubbia is now talking about a 1999 target date for completion of the machine. With the CERN leadership passing to Chris Llewellyn-Smith at the end of 1993, this may be an opportune time for the international high-energy physics community to seriously make the move to full international collaboration in building our large instruments. If the US, the European nations in CERN plus Russia, and Japan were to join together into what we might call a new CIRN, the Center for International Nuclear Research, would it be out of the question for us to restructure the SSC into a truly international project with international leadership? It would of course be very difficult because a site has already been staked out in Texas, but it would be worth a major effort, particularly when you consider the alternatives. With Europe providing \$2 billion or so, which is currently its planned contribution for the LHC accelerator, and an anticipated \$1 to \$1.5 billion from Japan, the SSC could get back on a healthy, technology-paced construction schedule. But to achieve this would require at the least that all the major players are truly equals in a new management organization for the scientific leadership. Scientifically, I strongly prefer the SSC with 20-TeV beams to an LHC with 7-8 TeV. Although this path to partnership may be tough to accomplish, there may be no alternative. We should also take note of the fact that the space station is now on the road to becoming an international project in collaboration with Russia. What we can do in space, we may also accomplish on Earth.

3. Short of getting a commitment from Washington to a date certain for completion of the SSC or forming a true international collaboration to build the SSC, we are left spending \$500 million a year on an open-ended construction. This is the path we seem to have initiated this year. To me that is no longer acceptable—scientifically or financially. Perhaps we will have to face up to a *third* option: to terminate the project. It pains me greatly to say that. My hopes and dreams for the physics from the SSC have not changed at all since I helped convince Secretary Watkins that he too should fall passionately in love with the physics that machine may help us understand. And I will make every effort to convince Secretary of Energy Hazel O'Leary to get passionate about it, in spite of her expression of diffidence in her first press conference in March. However, as scientists we have to seriously face this alternative of termination if we can have neither of the other two choices. The LHC could be a consolation prize as a cooperative venture but I believe the scientific arguments strongly favor the SSC.

Micromanaging research

Another issue of science and government in Washington is the increasing burden of government regulations and audits. As government efforts to micromanage scientific activities grow more intrusive, we pay two prices: The sense of mutuality and the spirit of partnership between government and the science community erode, and the productivity and efficiency of the scientific endeavors diminish.

The effect is real at all levels from small science to big science, though it is most clearly visible at the large national labs. I wonder at times

which political system has prevailed following the Cold War, as we seem to have adopted a bureaucratic system that alarmingly begins to resemble the one we frequently disparaged, and indeed caricatured, in the former Soviet Union. Ours does have one clear difference in that the word "communism" is dutifully expunged.

Consider the following circumstances at the DOE's national labs—and I refer to both the energy research and defense program labs:

- ▷ Increasingly prescriptive directives now exceed 200 in number and at least until very recently were arriving at a pace of better than one per day.

- ▷ Audits at each lab have increased to 150 to 200 a year.

- ▷ Conduct-of-operations requirements have become more and more generalized rather than based on risk; to cite one recent example, radiation control requirements treat accelerators the same as nuclear reactors.

This makes no technical sense. The increasing effort of the DOE and Congress to micromanage the labs, with directives whose number has more than doubled in the last four to five years, is straining the government-industry-university partnership that was forged during World War II and that has served the nation so well for more than 40 years.

The DOE labs are managed under the GOCO—government-owned, contractor-operated—concept, in which DOE is to provide mission definition, program evaluation and oversight, and the contractor provides management, program execution and accountability. The increasing effort by DOE to micromanage the labs threatens over time to turn the relationship into a GOGO—government-owned, government-operated—scheme. DOE, especially under Secretary Wat-



"If we get the funding, there will be superstrings attached."

kins, has faced the need to compensate for past neglect on matters of environmental remediation and waste management and environmental safety and health, and it has fostered a new culture throughout the department and the national labs that pays adequate attention to safe and environmentally sound operations. (Environmentally hazardous places like Rocky Flats and Hanford are no longer allowed.) The result of calling for improved conduct of operations and higher emphasis on such issues has been to create an important and healthy new culture, but we have now reached the point to call for a time-out in the interest of maintaining program quality and productivity. Needed is a better understanding of where and how the lines of authority, responsibility and accountability are being established to meet legal requirements, accommodate political pressure and enhance scientific productivity. Another measure of the bureaucratic overburden of recent years—or why Wolfgang Panofsky said recently at a SLAC function that it was, relatively speaking, a “piece of cake” to build SLAC 30 years ago—is illustrated by the following: Whereas only nine Atomic Energy Commission personnel were on site during SLAC’s construction, the SSC now has 110 DOE personnel, and over the past few years the General Accounting Office has devoted 90 man-years to auditing SSC contracts and work!

But what can we do about it? I am encouraged that Secretary O’Leary, whom I have gotten to know and found to be a most impressive person, has indicated her full intent to address this problem. In her initial testimony before Congressman (and physicist) George Brown’s Committee on Science, Space and Technology of the House of Representatives, she spoke out forthrightly. Referring to the major achievements and outstanding qualities of the DOE labs, she said, “I plan to establish a new partnership with the labs without any loss of accountability to the taxpayer and Congress.” To which I say, “Amen,” for the whole spectrum of scientific activities supported by government—little as well as big science.

With each change of government, with each election, we look for a new beginning to fix our problems and do better. As in our science, hope springs eternal. I do think that the Secretary by publicly and privately acknowledging the problem gives real reason for hope. For our part, this is the time for strong efforts to restore responsible partnership between science and government. ■



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