SCIENCE

Published by the **American Association for the Advancement of Science (AAAS),** *Science* serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

Membership/Circulation

Director: Michael Spinella
Fulfillment: Marlene Zendell, *Manager*; Gwen Huddle, *Assistant Manager*; Mary Curry, *Member Service Supervisor*; Pat Butler, Helen Williams, Laurie Baker, *Member Service Representatives*
Promotions: Dee Valencia, *Manager*; Hilary Baar, Angela Mumeka, *Coordinators*
Research: Kathleen Markey, *Manager*; Robert Smariga, *Assistant*
Financial Analyst: Jacquelyn Roberts
Administrative Assistant: Nina Araujo de Kobes
***Science* Member Services**
Marion, Ohio: 800-347-6969;
Washington, DC: 202-326-6417

Advertising and Finance

Associate Publisher: Beth Rosner
Advertising Sales Manager: Susan A. Meredith
Recruitment Advertising Manager: Janis Crowley
Advertising Business Manager: Deborah Rivera-Wienhold
Financial Manager: Leslie Gelder
Marketing Manager: Laurie Hallowell
Traffic Manager: Tina Turano
Recruitment: Michele Pearl, *Operations Manager*; Dan Moran, *Traffic Manager*; Debbie Cummings, Millie Muñoz-Cumming, Angela Wheeler, *Sales*
Marketing Associate: Allison Pritchard
Reprints Manager: Corrine Harris
Permissions Manager: Arlene Ennis
Sales Associate: Carol Maddox

ADVERTISING SALES: East Coast/E. Canada: Richard Teeling, 201-904-9774, FAX 201-904-9701 • **Southeast:** Mark Anderson, 305-856-8567, FAX 305-856-1056 • **Midwest:** Donald Holbrook, 708-516-8882, FAX 708-516-8883 • **West Coast/W. Canada:** Neil Boylan, 415-673-9265, FAX 415-673-9267 • **UK, Scandinavia, France, Italy, Belgium, the Netherlands:** Andrew Davies, (44) 457-838-519, FAX (44) 457-838-898 • **Germany/Switzerland/Austria:** Tracey Peers, (44) 270-760-108, FAX (44) 270-759-597 • **Japan:** Mashy Yoshikawa, (3) 3235-5961, FAX (3) 3235-5852
Recruitment: 202-326-6555, FAX 202-682-0816
European Recruitment: AnneMarie Vis, (44) 0223-302067, FAX (44) 0223-302068
Send materials to *Science* Advertising, 1333 H Street, NW, Washington, DC 20005.

■

Information for Contributors appears on pages 40–42 of the 1 January 1993 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. ***Science* Telephone:** 202-326-6500, TDD 202-408-7770. **Other AAAS Programs:** 202-326-6400.

LETTERS

Support for the SSC

T. H. Geballe and J. M. Rowell (Letters, 26 Feb., p. 1237) complain that the 1992 discussion about whether to fund the Superconducting Super Collider (SSC) was not a model of clarity and accuracy and take issue with five arguments that they ascribe to SSC supporters.

1) *The argument was made that it is necessary for the United States to fund the SSC for the sake of national pride.*

At present, the energy frontier in particle physics (which is the principal frontier) is pursued by colliding-beam experiments involving electron-positron collisions, electron-proton collisions, and proton-antiproton or proton-proton collisions. The leadership in the first two areas is in Europe and in the third area it is at Fermilab. Abandoning the SSC would move the leadership in the third area also to Europe by the early 2000s. This is not so much an issue of national pride as one of whether the field of high-energy physics, to which the United States has contributed so much, is to have a future here.

2) *Arguments were made to imply that the high-energy experiments of the SSC are uniquely important.*

Research in high-energy physics has, over the last 40 years, led to the synthesis known as the "standard model," which stands as one of the great intellectual achievements of this century. One-third of all physics Nobel Prizes awarded in this period were for work done in elementary particle physics. The SSC represents the tool of choice for the continuation of this progress, and we know of no feasible alternative technique to answer the principal questions raised by the standard model. Does that make SSC experiments important? I would say so, without implying that there are not experiments in other fields that are also important.

3) *It has been said that, "[i]n the SSC we will gain experience with the first large-scale use of superconductivity. The SSC will transform superconductivity from a craft to an industrial capability" (1).*

Given that two 50-mile rings of superconducting magnets are to be built by industry, I find it hard to quibble with this statement. Geballe and Rowell point out that there will not be a permanent market for SSC-type magnets, but that does not invalidate the statement. As they note, there is a substantial market for other kinds of superconducting magnets.

4) *The impression has been created that support from the scientific community for the SSC was "overwhelming."*

Geballe and Rowell point out that there is opposition from some scientists, including condensed-matter physicists such as themselves. Unfortunately, this is true, and it almost seems surprising, given the fact that no serious scientific arguments (that I am aware of) have been made to suggest that the physics prospects of the SSC are not outstanding, or that there is a different, simpler technique for arriving at the answers to the same problems. There is no way that our present deep understanding of the subatomic world could have been achieved without the large accelerator facilities that were built in the 1960s and 1970s. These projects were also criticized by small-science advocates.

5) *The impact of SSC expenditures (about $10 billion to construct and $1 billion a year for interest and operation) on other high-energy experiments and on other fields of science should have been more carefully evaluated.*

The impact of the SSC on other high-energy physics experiments has been much considered by the affected community, which has nevertheless reiterated many times over the last 10 years that the SSC was its top priority. Geballe and Rowell double count by suggesting that after paying $10 billion for this machine, the taxpayers will still have to pay interest on it. In quoting operating costs for existing machines, they do *not* include interest costs therein—only the SSC gets this special treatment. The SSC laboratory operating costs are actually estimated to be about $350 million (in 1992 dollars) per year. Even this smaller number will have an impact on the level of operation of the present facilities, although not nearly as large as that implied by Geballe and Rowell. Many people would call that progress: the high-energy physics community will move from the facilities that have already been exploited to new facilities that will provide outstanding new opportunities. Only in this way can this field, or any field, retain its vitality.

There are two major detector efforts, well under way, whose goals are to design and build ambitious and sophisticated instruments to exploit the physics opportunities provided by the SSC. The hundreds of scientists working on these projects include many of the most outstanding physicists in

the field of high-energy physics from all over the world. They have been working intensively for about 3 years, strongly motivated by scientific payoffs still 10 years away. They, and the dedicated staff working at the site to build the SSC, have staked their careers on what they consider to be a truly important scientific effort. They have assumed that, as in the past, once the nation initiates a major scientific project, it regards its completion as a commitment, to be broken only in the event that the scientific justification disappears, that unexpectedly large technical obstacles occur, or that major cost overruns are incurred. No credible case has been made that any of these factors apply, yet the project is each year threatened with annihilation.

The cost of the SSC is indeed high, but when it is viewed as an expense of about a penny per day per citizen, it can hardly be the sink of resources that some make it out to be. This year must be one of decision. The country must decide once and for all whether it is serious about having a future in high-energy physics; if the answer is yes, it needs to move in a manner that best ensures the success of the SSC project and the full exploitation of the science.

G. H. Trilling
Department of Physics, and
Lawrence Berkeley Laboratory,
University of California,
Berkeley, CA 94720

References

1. J. Watkins, *Washington Post*, 21 July 1992, p. A19.

■

DOE, Taiwan, and SSC Support

A 26 March ScienceScope item, "SSC fans launch direct-mail campaign" (p. 1815), states that "DOE [the U.S. Department of Energy] asked several eminent U.S. scientists of Chinese descent, including Nobel laureate physicists T. D. Lee and Samuel Ting, to write letters supporting the SSC [Superconducting Super Collider] to the Taiwanese science council."

I and many other members of the Overseas Chinese Physics Association believe that the Taiwan/SSC-GEM (Gamma Electron Muon) collaboration would be beneficial to both Taiwan and the United States, and we have written supporting letters to the National Science Council. No effort has been made by DOE to persuade us to write these letters.

T. D. Lee
Department of Physics,
Columbia University,
New York, NY 10027