

# APS on SDI: Too Soon to Decide

"Star Wars," the somewhat derisive name given to President Reagan's vision of a high-technology defense against ballistic missiles, evokes a picture of something like light sticks delivering beams of energy that travel at the speed of light to encounter whatever the adversary has launched, and zap! they're disintegrated. The picture is not far from the publicity that has been made in support of the Strategic Defense Initiative (SDI), featuring laser beams, which travel at the speed of light, and beams of atomic particles, which travel at nearly that speed.

Almost two years ago, the American Physical Society (APS) drew together a study group of 15 distinguished physicists, some of whom are associated with laboratories that do significant amounts of defense-related research, to study the scientific and technological feasibility of these directed-energy weapons (DEW). The panel's report, released April 23 during a meeting of the APS in Crystal City, Va., concludes that it will be about a decade before science and technology have progressed to the point where an informed decision can be made on the feasibility of DEW. To this one must add five to seven years for development to reach the time when the first elements of the system would be deployed, according to C. Kumar N. Patel of AT&T Bell Laboratories in Murray Hill, N.J., a cochairman of the study group.

States the report: "Although substantial progress has been made in many technologies of DEW over the last two decades, the Study Group finds significant gaps in the scientific and engineering understanding of many issues associated with the development of these technologies. . . . Most crucial elements required for a DEW system need improvements of several orders of magnitude. [Each order of magnitude means a multiplication by 10.] Because the elements are interrelated, the improvements must be achieved in a mutually consistent manner. We estimate that even in the best of circumstances, a decade or more of intensive research would be required to provide the technical knowledge needed for an informed decision about the potential effectiveness and survivability of directed-energy weapon systems."

The report does not say such technologies are impossible, and it does not oppose continuing research on them. Nevertheless, opponents of SDI have been calling the conclusions a significant addition to their ammunition in arguing against the program as it now stands.

For example, Peter D. Zimmerman, senior associate at the Carnegie Endowment for International Peace, calls it "an ice-

cold flensing knife that has just taken the Star Wars mythology off any skeleton it had inside it." Zimmerman says he expects the report to be useful in his lobbying of members of Congress. He says he also does not oppose research in these technologies but is opposed to chucking out a pre-SDI strategic posture "that has served us so well for an excursion to unknown weapons and weapons that may be unknowable."

An announcement by the pro-SDI Science and Engineering Committee for a Secure World, chaired by physicist Frederick Seitz, president emeritus of Rockefeller University in New York City, says the APS report was written before the administration decided to use a present-day technology called kinetic-energy weapons (KEW) as a starter in an evolutionary SDI scheme. Seitz and other SDI supporters refer to another report, this one prepared under the aegis of the George C. Marshall Institute of Washington, D.C., which emphasizes KEW as an SDI option for the 1990s. Kinetic-energy weapons move at more or less ordinary rocket speeds and deliver explosive charges to

their targets.

Questioned about the Marshall Institute report and KEW, Patel replied that KEW must rely on laser and other DEW techniques for finding targets and discriminating between real targets and decoys with which the enemy will salt its launchings. Therefore, he says, the APS report's rather pessimistic evaluations of current capabilities in target acquisition and discrimination as well as system survivability in space also apply to KEW.

Another member of the APS study group, Jeremiah Sullivan of the University of Illinois at Urbana-Champaign, says the group did not study kinetic-energy weapons and had no comments on the merits of their early deployment. However, he adds that if early deployment of KEW is part of a plan that intends long-range use of DEW, "One just doesn't know. One shouldn't gamble now that the answer will be yes."

The Defense Department's SDI Office may have KEW uppermost in its mind nowadays, but it nevertheless issued a statement that called the APS report "unduly pessimistic" and a "snapshot in time" that is seven months out of date. In that period, the SDI Office statement claims, significant improvements have occurred in two DEW technologies: free-electron lasers and neutral particle beams.

Members of the APS study group acknowledge that these advances are indeed important but say they were done in different laboratories and need to be integrated with one another. And in any case, according to the APS group, they do not fulfill the "orders of magnitude improvement" that the study group deems desirable. Zimmerman adds that with a program with nearly three times the total budget of the National Science Foundation, SDI officials ought to be able to come up with more demonstrable improvement than this.

Though the report was ready for publication seven months ago, the intervening time was taken up by classification review, according to Patel. Because the study group had access to classified material, it had to submit the report to Defense Department officials for determination that secrets were not given away. Patel says the deletions did not affect the report's conclusions. He praises the cooperation of both the SDI Office and the Defense Department generally. However, the report was repeatedly subjected to new questions about classified material. Patel says he doesn't know how long such reviews usually take, but he thinks seven months was "too long."

— D. E. Thomsen

## Study group members

The APS DEW study group included: Nicolaas Bloembergen, Harvard University (cochairman); C. Kumar N. Patel, AT&T Bell Laboratories (cochairman); Petras Avizonis, Air Force Weapons Laboratory; Robert Clem, Sandia National Laboratories; Abraham Hertzberg, University of Washington; Thomas H. Johnson, U.S. Military Academy; Thomas Marshall, Columbia University; Bruce Miller, Sandia National Laboratories; Walter Morrow, Lincoln Laboratories, MIT; Edwin Salpeter, Cornell University; Andrew Sessler, Lawrence Berkeley Laboratory; Jeremiah Sullivan, University of Illinois, Urbana-Champaign; James C. Wyant, University of Arizona; Amnon Yariv, California Institute of Technology; Richard N. Zare, Stanford University.

The principal consultant was A.J. Glass of KMS Fusion, Inc.; L. Charles Hebel of the Xerox Palo Alto Research Center served as executive secretary. The report was reviewed by a committee consisting of: George E. Pake, Xerox Corp.; Michael A. May, Lawrence Livermore Laboratory; Wolfgang K.F. Panofsky, Stanford University; Arthur L. Schawlow, Stanford University; Charles H. Townes, University of California at Berkeley; Herbert F. York, University of California at San Diego. □