Star Wars Grants Attract Universities

The increasingly genial relationship between universities and the Pentagon was exemplified by a recent forum on research grants available from the office established to manage the Strategic Defense Initiative (SDI) or "Star Wars" program. Unlike many previous forums for academic scientists on the ballistic missile defense initiative, the daylong seminar on 5 April on the outskirts of Washington was notably free of any public controversy.

For the 250 scientists who attended, the drawing card was the potential availability of $70 million earmarked by SDI officials for university research. The stated purpose of the grants is to encourage "highly innovative, high-risk concepts that could have a revolutionary impact" on the program, in such fields as atmospheric science, physics, computer science, mathematics, and chemistry.

None of the relevant funds have been appropriated by Congress as yet, a factor that would inhibit most agencies from soliciting specific research proposals. But the managers of SDI's Innovative Science and Technology Office are determined to move swiftly, and so will begin to review applications and announce recipients even while Congress deliberates. "It's probably something that's never been done," says the director, James Ionson, an ebullient astrophysicist on leave from the Goddard Space Flight Center, "but this office is trying to sell something to Congress. If we can say that this fellow at MIT will get money to do such and such research, it's something real to sell. That in and of itself is innovative."

The recent seminar consisted largely of a series of presentations on the daunting technical problems that confront the program. New and vastly more powerful lasers will be needed for target sensing and attack, for example, requiring orders of magnitude improvements in beam generation and focusing. Successful laser propagation will require a better understanding of arctic cloud formations and atmospheric aerosols. New optical sensors must be designed and hardened with novel protective materials against intense electromagnetic and laser radiation. And novel nonlinear optics may be needed to combine various laser beams into a single destructive ray.

The size, weight, and power requirements of particle accelerators must also be dramatically reduced. "We have neither the money nor the expertise to put Fermilab in orbit," says Dwight Dustin, a program official. Compact, lightweight power sources must be capable of generating tens of megajoules in nanoseconds. New composite materials, rocket fuels, bearings, and seals must be created. As many as 100 million lines of error-free software code must be written for a network of computers capable of up to 1 trillion operations per second. "We don't want to have a few lines of bad code mistakenly set off a nuclear weapon or cause something to miss a target," says Edward Wegman, chief of the mathematical sciences divisions at the Office of Naval Research and one of the program's primary research reviewers, only partly in jest.

The atmosphere at the meeting was convivial, and many participants spoke enthusiastically of these research opportunities. "I was very impressed," says James Duderstadt, dean of the college of engineering at the University of Michigan. "This will be one of the few sources of new money for basic research in the physical sciences in coming years." Similarly, Richard Kaplan, associate dean of the USC school of engineering, says that "the presentations were very good, and very effective in allaying fears as to whether it would be appropriate to become involved."

Many of those attending the seminar said that they previously had three major concerns about the work: that the government might seek to "classify" it for national security reasons; that it would involve or somehow be regarded as offensive weapons research; and that it would be too limited to be of academic interest. On the first concern, different views were expressed by representatives of the Pentagon and the Energy Department. Ionson, for example, said although principal investigators will be expected to obtain a "secret" clearance so that they can "steer their students," the research itself will mostly be unclassified, and the program will respect the guidelines for open publication agreed to by the Defense Department last year (*Science*, 26 October 1984, p. 418). However, Robert Hughey of DOE predicted that "classification is going to be a problem," and that any research begun openly might eventually be classified as it progressed.

Responding to widespread concern about using the technology to defend weapons, presidential science adviser George Keyworth, II delivered a rousing speech in which he insisted that the program's true goal is to develop a defense of populations, not weapons, no matter what others say. "Now please don't misunderstand me," he said. "Terminal defenses [primarily suited for weapons] can be considered as one option in the search for a survivable basing mode for ICBM's. . . . Terminal defenses within the SDI can also play a very real part in an overall 'layered' defense. But attempts to make terminal defense our *first* move, within the SDI, do not start us in the direction of the President's objective."

With regard to the third concern about the program's scope, most of those attending seemed satisfied that even though the funds are technically for "advanced development," the research itself is general enough to be interesting. Martin Hoffert, chairman of the Department of Applied Science at NYU, says, for example, that he may seek grants for work on power sources and hydrogen-fluoride chemical lasers. George Mueller, the dean for research affairs at Princeton, said that his school may seek grants for research on lasers, space propulsion, and novel materials. A consortium composed of Rice, Texas A&M, the University of Houston, and the University of Texas may seek grants for work on particle beams, sensors, and kinetic energy weapons. Many others, such as MIT, Tufts, Cornell, Johns Hopkins, Columbia, Virginia, Maryland, Wisconsin, Syracuse, and Northwestern, were represented by research deans or department chairmen who may submit proposals.

No one seemed inhibited by the fact that the overall SDI program is politically controversial. "There are some basic scientific issues to be addressed, which can be separated and judged on their own merits," says Kenneth Torrance, associate dean of Cornell's College of Engineering. Others, such as Robert Haymes, chairman of Rice University's Department of Space Physics and Astronomy, say that in all probability, the research would eventually be done anyway. And virtually everyone notes that useful scientific spin-offs are likely to result.—**R. JEFFREY SMITH**