

SDI: Paper pile grows on APS study

The American Physical Society (APS) recently added another stack of papers to the growing pile of opinions on the Strategic Defense Initiative (SDI) when it sent letters to 39 U.S. legislators defending its study on the feasibility of directed-energy weapons.

Included in the letters was a technical summary countering criticisms of the results and methodology of the APS study. The study, led by 15 physicists nationwide (SN: 5/2/87, p.276), first received criticism directly following its release in April for being outdated and failing to include kinetic-energy weapons, which the administration had decided to use after the report was written.

More recent criticisms, however, have focused on specific details in the April study, which concluded it will be at least a decade before enough progress can be made in science and technology to reach an informed decision on the feasibility of directed-energy weapons. Directed-energy weapons are beam devices, such as lasers, designed to intercept and destroy incoming missiles by beaming energy into them (SN: 2/15/86, p.106). Kinetic-energy weapons destroy an object by actually intercepting it with another projectile, such as a missile.

SDI proponents Lowell Wood of the Lawrence Livermore (Calif.) National Laboratory and Gregory Canavan of the Los Alamos (N.M.) National Laboratory recently presented their criticisms of the study to the House Republican Research Committee. Primarily, they take APS to task for its predictions of energy requirements for certain proposed weapons and for its estimates of the feasibility of countermeasures available to the Soviets. The documents also fault the APS study committee for not following proper review procedures.

Some of the major technical criticisms of the APS study:

- **Chemical lasers:** This type of laser produces a steady stream of reacting gases when two types of gases are mixed. Wood and Canavan charge that the summary of the APS study states chemical lasers have only been tested at about 200,000 watts and need to reach 20 million watts to be effective, while the body of the report cites that the lasers have been tested in the multimillion-watt level. APS admits to the inconsistency, blaming it on a clerical error stemming from security requirements that regulated and then changed which power levels could be published. APS plans to correct the error before the study is run in the July supplement edition of its journal, *REVIEWS OF MODERN PHYSICS*.

- **Excimer lasers:** This short-wavelength laser uses chemical reactions to deliver energy in intense pulses. Wood and Canavan say APS estimates that place a

billion-watt power requirement on this laser for effectiveness are wrong and that when the report's own formulas are used, the figure decreases to 6 million watts. APS says the billion-watt estimate is for excimer lasers in a continuous-wave state and not for pulsed-laser operation. Calculating power levels for a pulsed laser, APS estimates that a 1-pulse-per-second laser would need 100 million watts, which still is 16 times greater than the 6 million watt estimate arrived at by Wood and Canavan. The remaining discrepancy exists, APS says, from varying target-spot size estimates. Explaining why the two groups would differ so much in their estimates, Nicolaas Bloembergen, co-chairman of the APS study, says, "There is never any disagreement of what equations to use; it is just a disagreement on what numbers to put in."

- **Neutral-particle beam:** Designed to penetrate deep into a missile or warhead, this weapon works by generating a beam of fast-moving atoms. The APS report is criticized on this point for saying the beam needs 1 billion watts of power to be effective, while Wood and Canavan estimate that only 30 million watts are needed. APS says its study was referring

to a certain particle-beam accelerator, such as the space-based electron-beam accelerator, and not the power needed for the neutral-particle beam. APS says it will rework that section for clarity.

- **Free-electron lasers:** Known as FELs, these convert energy from accelerated electrons into laser radiation. The APS report says FELs will need 1 billion watts to be effective, while Wood and Canavan assert that they need only 10 million watts operating at 40 percent efficiency. APS argues that no such efficiency has been proven.

Frederick Seitz of the Science and Engineering Committee for a Secure World, a pro-SDI group based in Washington, D.C., that circulated about 100 copies of the Wood and Canavan report to legislators and others, says APS committee members "really haven't responded to the Wood and Canavan criticism."

Seitz faults the APS response for not being detailed enough. Possible acceptable responses, he says, would involve spending another year rewriting the report or putting Wood and Canavan on a committee that reviews directed-energy weapons.

APS, which eventually hopes to circulate its reply to all legislators, says it has no other plans to defend its study.

— K. Hartley

Kids' leukemia from parents' exposures?

A parent's workplace exposure to any of several classes of chemicals — particularly chlorinated solvents — or use of incense or pesticides around the home may increase children's risk of developing leukemia, according to a new study by researchers at the University of Southern California in Los Angeles. In fact, the study suggests, the leukemia risks posed by parental exposure to or use of some of these chemicals may be greater for young children than for developing fetuses.

While this is not the first study to suggest a tie between parental chemical exposures and childhood cancer, it is the first to link a child's leukemia with a parent's reported exposure — both before and after birth — to particular chemicals. Moreover, says John M. Peters, an occupational epidemiologist and one of the study's authors, though carbon tetrachloride, tetrachloroethylene and trichloroethylene are known animal carcinogens, this is only the second major published epidemiologic study to suggest strongly that these chlorinated hydrocarbon solvents are also human carcinogens. (The previous study, reported by Peters a few years ago, linked parental exposure to such solvents with childhood brain cancer.)

The new study, reported in the July *JOURNAL OF THE NATIONAL CANCER INSTITUTE*, surveyed 123 pairs of Los Angeles County families. Each pair con-

tained one family with a leukemic child under 10 years old and one family with a healthy child (matched for age, race or ethnicity, socioeconomic status and sex).

A father's workplace exposure to chlorinated solvents increased his child's risk of developing leukemia, and the risk increased with frequency of exposure — to eight times the expected rate when fathers encountered the solvents at least weekly (levels of parental exposure were not measured). Peters surmises that fathers exposed their children, who may have ingested or inhaled traces of the chemical brought home on the fathers' clothes or breath. Similar exposures to spray paint, cutting oil, methyl ethyl ketone and dyes or pigments also showed signs of increasing a child's risk of developing leukemia — again in a pattern that increased with dose — although the study's sample size was too small to be statistically significant.

More surprising were the notably increased risks, during nursing and pregnancy, associated with a parent's use of either incense or household and garden pesticides. The pesticide finding "is certainly consistent" with scores of studies linking these chemicals to cancer, says Shelia Hoar Zahm of the National Cancer Institute in Bethesda, Md., and an author of a study (SN: 9/13/86, p.167) linking a major pesticide to lymphomas, a class of tumors related to leukemias. What's rela-