SCIENCE NEWS of the week

Is Reagan's 'Vision' of Missile Defense Possible?

"Let me share with you a vision of the future which offers hope," President Reagan proclaimed in a nationally televised speech March 23: "After careful consultation with my advisers, including the Joint Chiefs of Staff, I believe there is a way [to] counter the awesome Soviet missile threat with measures that are defensive." The President suggested that if "we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies," then the security of the free world would depend no longer upon the threat of instant U.S. nuclear retaliation to deter a Soviet attack.

Reagan acknowledged "this is a formidable technical task, one that may not be accomplished before the end of this century. Yet current technology has attained a level of sophistication where it is reasonable for us to begin this effort." With this introduction, Reagan unveiled his plans for initiating a "comprehensive and intensive effort" to define the long-term research-and-development needs of an ambitious program aimed at "eliminating the threat posed by strategic nuclear missiles." Specifically, he said: "I call upon the scientific community who gave us nuclear weapons to turn their great talents to the cause of world peace: to give us the means of rendering these nuclear weapons obsolete."

While the President didn't elaborate on what he had in mind, administration officials let it be known Reagan was referring to such exotic and futuristic concepts as lasers and "directed-beam" weapons — such as might be based in space.

With a few notable exceptions—among them Nobel laureate Edward Teller and George Keyworth, the President's science adviser — responses from the science community have thus far been lukewarm.

"Absurd," is how Jeremy Stone characterizes the President's plan. According to Stone, who directs the Federation of American Scientists, a nonprofit lobby representing 5,000 scientists and engineers (and which counts 47 Nobel laureates among its sponsors): "The President and secretary of defense are talking about this [defense from Soviet ballistic missiles] as if it were a challenge to scientists to put a man on the moon," says Stone. "But it's not like that. It's like trying to put a man on the moon while the Russians are trying to shoot the man down. If that had been the problem, we never would have succeeded in putting a man on the moon."

Ballistic-missile defense does not involve merely pitting scientists against nature, Stone contends. "This is a problem of scientists against scientists. And in this contest, their scientists are as good as ours. Furthermore, we are giving them the easy task," he says. Through its defense posture, the United States assumes the Soviets will strike first at U.S. cities, he posits, while "we take the difficult task of trying to protect, against all methods, having those cities destroyed." But, he says, "It's easier to destroy than to protect."

Arthur Schawlow, a Nobel Prize winner and co-inventor of the laser, agrees: "It's much easier for the attackers." Military planners have considered placing laser weapons in space to avoid the problem of beam absorption by the atmosphere. However, the Stanford University scientist contends, "A laser battle station out in space would be a sitting duck." The first thing the enemy will target, he says, is its opponent's laser space stations. What's more, he points out, space-based lasers would only have an unobstructed path to the missile they are targeting for the few minutes missiles are outside the atmosphere. And simple smoke screens or vapor clouds accompanying missiles could foil lasers during these vulnerable periods. Alternatively, he suggests, missiles could be equipped with multiple mirrors to deflect laser beams directed at them.

Richard Garwin, a defense-technology analyst at IBM's Thomas J. Watson Research Center in Yorktown Heights, N.Y., also believes the ballistic-missile defense schemes Reagan seems to be envisioning "won't work. I've worked on these things for many years," he told SCIENCE NEWS. "And if [the system] is to be based in space, satellites which carry it will be accompanied by Soviet space mines which will be exploded at the first outbreak of war." In contrast, land-based laser systems would be plagued by the fact that "it's technically unfeasible to get up to high enough altitude to be over the bulge of the earth — one-quarter way round the earth — to strike [missiles] while they are still in their boost phase." If you don't hit them then, you've got multiple, independently targeted re-entry vehicles (MIRVs) — each with its own warhead — to hit. As a result, Garwin says, "We're just better off sticking with what the President says has successfully prevented war for 30 years — namely deterrence by the threat of retaliation."

But at a press conference this past Tuesday, Defense Secretary Caspar Weinberger scoffed at the technical naysayers. Developing a secure ballistic-missile defense, he said, is one problem "I'm confident American ingenuity can solve."

— J. Raloff

Superconductivity: Experts disagree

Chemical compounds that are organic but have many of the properties of metals (and therefore often known as organometals) have long offered a theoretical hope of finding superconductivity at relatively high temperatures. Superconductivity, the ability to pass electric currents without resistance, had been found only in metals and only at temperatures very near absolute zero.

As long ago as the 1950s and 1960s William Little of Stanford University was theorizing the structures of organic compounds that could be superconductors and displaying models of them (SN: 9/20/69, p. 251). In 1980 superconductivity in an organic compound was experimentally demonstrated by Denis Jerome of the University of Paris-South at Orsay, France, and collaborators (SN: 4/5/80, p. 212). Now several such compounds are known.

In his studies of these substances Jerome found "precursors" of superconductivity, localized fluctuations in the properties of the substance that occur at a temperature around 20 kelvin, and these precursors led him to think that a properly engineered compound could show bulk superconductivity at such a temperature. At the meeting in Los Angeles last week of the American Physical Society, Jerome got into a spirited exchange of views with Richard L. Greene of the IBM Research Laboratory in San Jose, Calif., who said, "I don't think data support the precursor regime." Jerome remarked, "Dr. Greene, who passed through our lab, was the first to see the precursors [but did not recognize them as such]. Dr. Greene missed this opportunity." (Both sides agree that the transition to all-over superconductivity in currently known organics occurs only within two kelvin of absolute zero.)

Greene believes the Bardeen-Cooper-Schrieffer theory, which applies to metals, will apply equally well to organics. Jerome thinks the BCS theory will be shown to be a special case of a more general formulation. He says that if these organic superconductors can be made more three-dimensional in conductivity, they may exhibit all-over superconductivity in the temperature regime where the precursors appear. (Metals are three-dimensional, conducting equally well in all directions; present organics are one-dimensional, conducting well in one direction and badly in all others.) Chemists can now design such compounds to specifications—Klaus Bechgaard of the University of Copenhagen does it for Jerome's group. It remains to be seen whether what Jerome wants can be made, and whether it will show the properties he expects. *—D.E. Thomsen*