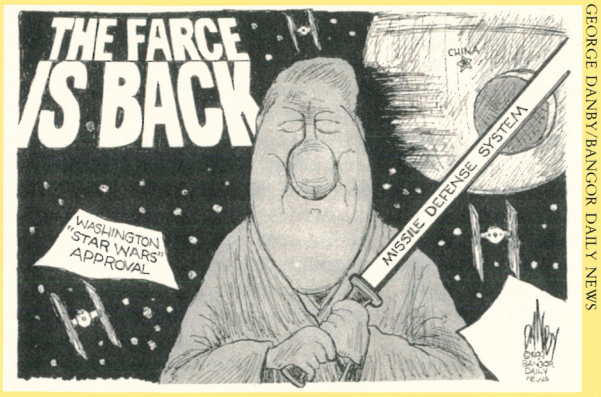
sized "the critical connection between US national security and scientific research activities"and the damage that could result "if the underlying science suffers as a result of government practices that indiscriminately discourage or limit the open exchange of ideas." The APS then said: "Over the course of many years, immigrant scientists as well as foreign visitors and students have contributed enormously to the American scientific enterprise. They have enriched our knowledge and culture, promoted the growth of our economy, and improved the quality of our lives. Any negative characterization of scientists on the basis of ethnic or national origins is destructive to science and American values." **IRWIN GOODWIN**

WASHINGTON BRIEFINGS

Missile Defense a Hit, a Palpable Hit On 20 May, the day after the new Star Wars film, *The Phantom Menace*, opened to throngs of ardent fans across the US, the House of Representatives, by a lopsided vote of 348 to 71, adopted a bill (H.R. 4) that calls for a deploying a defense against ballistic missiles as soon as it is "technically feasible." Two months before, on 17 March, the Senate passed its own legislation (S. 257), 97 to 3. The impetus for both measures came from two related events: the Rumsfeld Commission report, which concluded that North Korea and Iran could have real (though most likely unreliable and inaccurate) long-range missiles capable of striking US troops stationed in the Far East and of reaching America's allies as well as targets in Hawaii, Alaska, and the West Coast within five years after making a decision to go ahead (see PHYSICS TODAY, September 1998, page 43); and North Korea's test on 31 August of a three-stage Taepodong missile (though the final stage of which malfunctioned and plunged into the Pacific).

The bills received a boost on 10 June when an Army missile succeeded in doing what similar missiles had failed to do with depressing regularity—that is, hit another missile in flight. Six previous attempts to destroy a missile with another missile, fired from the ground, had failed. Congressional backers of the



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$3.8 billion Theater High Altitude Area Defense System, or THAAD, seized on the successful test as proof that the "hit to kill" concept will lead to a more ambitious antimissile system.

Once opposed to a missile defense for the US, President Clinton has approved adding $6.6 billion in the Defense Department's budget for research and deployment to the $3.9 billion already allocated for National Missile Defense in the next five years. In the current plan, the system would not be ready to deploy until at least 2008 and is nothing at all like Ronald Reagan's vision of the Strategic Defense Initiative, which was intended to shield the entire US against a barrage of thousands of ICBM's hurled by the Soviet Union. SDI was laden with a phantasmagoria of far-out technologies, from pop-up x-ray lasers to space-based particle accelerators, which earned the pejorative title of Star Wars.

The current version would rely on existing technologies such as ring lasers for inertial guidance, infrared sensors on satellites, and tiny processors for computing trajectories. Still to be addressed is the matter of countermeasures, which could include the use of a mylar balloon around the incoming warhead or of ten or more balloons as decoys. Then there's the cost of such a system. The US has already spent some $60 billion on the program since Reagan's SDI message in 1983.

Protecting Russia's Nukes In his State of the Union speech last January, President Clinton implored Congress to substantially increase US technical and financial aid to Russia to make sure that its nuclear materials for bombs and warheads are safeguarded and fully accounted for at all times. He proposed that the part of the Department of Energy's antiproliferation program that helps Russia protect its weapons-usable plutonium and highly enriched uranium from theft and diversion by terrorist groups and "rogue" countries should go up by a modest $5 million in fiscal 2000 above the $140 million already allocated for the current fiscal year.

The sum seems inadequate to deal with the size and scope of the situation. Still, it's a hefty increase on the $3 million that Congress provided for that activity in 1993, the first year of the Clinton administration.

With the collapse of the Soviet Union, its cold-war system of controls over nuclear facilities and materials has become dysfunctional. During the Soviet era, security depended on the discipline and loyalty of managers, workers, and guards in the nuclear weapons complex. They were all well paid and well respected within Soviet society, and, like all Soviet citizens, they were subject to surveillance by the KGB and other police-state agencies. But the breakdown of society and the meltdown of the economy have changed all that. US officials recently confirmed periodic rumors and press accounts of at least seven smuggling incidents in the early 1990s involving small amounts of weapons-usable materials, which they suspected were stolen from sites in Russia and the former Soviet Union.

According to US government estimates, Russia now has about 150 metric tons of plutonium and 1200 metric tons of highly enriched uranium. About half of each of the inventories is in weapons and the other half in such forms as metals, oxides, solutions, and scrap at hundreds of institutes, warehouses, and various enterprises throughout the country.

Since 1997, when the National Academies' National Research Council examined the condition of Russia's storage and safety of nuclear materials, the situation has worsened. A report by another research council panel, led by Richard A. Meserve, a partner at Covington and Burling, a prestigious Washington law firm, revisited the problems. The four-member panel concluded that the US should continue funding the program, in partnership with Russia, for the next decade, putting up at least $145 million for each of the next five years. The panel also recommended that the program train more Russians to manage and guard nuclear materials and set up better accounting systems to keep track of the materials, consolidate hundreds of kilograms of material at fewer sites, and step up to protecting radioactive cores in nuclear submarines. "Although joint efforts by Russia and the United States have strengthened security at many sites, we believe that terrorist groups or rogue nations have more opportunity to gain access to Russian plutonium and highly enriched uranium than previously estimated," said Meserve. "Given the current situation in Russia, reducing the risk of illicit transfer of nuclear material will require years of steady work. Controlling the spread of these materials should be a high priority of US national security." **IRWIN GOODWIN** ■