

APS Launches Boost-Phase Missile Defense Study

As President George W. Bush renewed the call on 1 May for a national missile defense, pushing the controversial issue once again to the forefront of the news, a panel under the auspices of the American Physical Society was about to begin an unclassified study of the “boost-phase” option for such a system. The goal of the APS study is to look at the fundamental physics and engineering involved in using an interceptor missile or airborne laser to shoot down a threatening missile as it is rocketing into space.

The study, scheduled to be completed and ready for release by the end of February 2002, is the first APS public policy study since the influential, and somewhat infamous, DEW (Directed Energy Weapons) report in April 1987. That report relied on classified material and was highly regarded, but took years to complete and publish. By the time the report was published, the DEW system was no longer being considered for Ronald Reagan’s “Star Wars” system.

The boost-phase study will be conducted by a 14-member group of physicists and engineers, many with specific expertise in the technologies relevant to an anti-missile system. Unlike the DEW report, the boost-phase study will not depend on classified material, which means it can be done quickly and without the government classification reviews that often lead to delays, said University of Illinois physicist Frederick Lamb, who is cochairing the study with MIT’s Daniel Kleppner.

In June 2000, the APS council issued a statement on missile defense that said, in part, that the “United States should not make a deployment decision relative to the planned National Missile Defense (NMD) system unless that system is shown—through analysis and through intercept tests—to be effective against the types of offensive countermeasures that an attacker could reasonably be expected to deploy with its long-range missiles.”

The statement was fine, Lamb said, but there was sentiment among the APS leadership that more was needed. The physicists considered the studies being done by other organizations on the feasibility of a missile system based on “mid-course intercept,” that is, hitting the warheads after they have separated from their booster rockets and are in space. They felt

a study looking at other technical issues, such as the increasingly important boost-phase intercept possibility, would be more helpful to the national debate.

An advisory group that included Lamb, current APS president George Trilling, past president James Langer, and others, concluded that a boost-phase study done in less than a year would be more useful than a DEW-type study that would take much longer to complete. The group also recommended that the boost-phase study should be the first in a sequence of short-time-frame studies and that it could establish a “new model for how APS addresses large and complex technical issues with important political and policy implications.”

A scientific analysis of the boost-phase option in missile defense would be valuable, Lamb said, “because boost-phase systems are still at the conceptual stage. There is no program and there is no architecture. Many of the technological questions have not been answered, but it is a focus of intense interest because the new administration is pushing it.” The study won’t attempt to answer whether such a system could be built, Lamb said. “That is impossible to address until you have defined a system.”

Instead, he said, the study will look at such things as what kinds of missiles might pose a threat. The study group will then figure out what characteristics an interceptor missile or airborne laser would have to have to be able to destroy a hostile missile within the roughly 200 seconds of boost phase.

Other questions abound. If you destroy a hostile missile late in its boost phase, will the warhead hit Canada instead of the US? If you want to destroy the warhead directly, how much improved does the interceptor have to be? And given that the boost phase lasts only about 200 seconds, is there time to consult with the president before firing the interceptor or laser? Indeed, is there time for a human to be involved at all?

APS Executive Officer Judy Franz said that selection of the study group members is almost complete and the first meeting has been scheduled for mid-July. Proposals for funding of a few hundred thousand dollars have been submitted to several foundations, and APS has agreed to supplement that money, if needed.

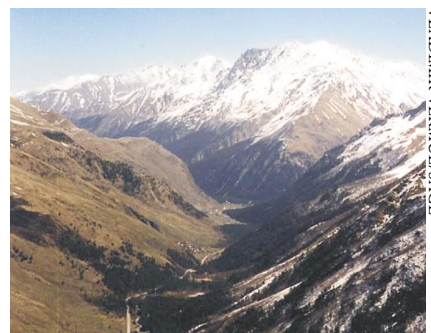
JIM DAWSON

SAGE Fends Off Gallium Raid

The Russian-American Gallium Experiment (SAGE) has survived yet another raid. Over the past few years, common thieves and government officials alike have repeatedly tried to grab some of SAGE’s 60 tons of gallium—which goes for about \$500 a kilogram on the world market (see PHYSICS TODAY, June 1997, page 73 and August 1998, page 55). Most recently, in February, policemen and chemists showed up unannounced at the SAGE site in Russia’s Caucasus Mountains; they implied that the scientists were illicitly selling off the state-owned gallium for personal gain and demanded to conduct an inventory.

Most of the SAGE gallium is in seven-ton vats, forming a target for low-energy solar neutrinos, which are recorded by extracting and counting radioactive germanium atoms produced by neutrino interactions. In taking stock of the gallium, “[the auditors said] maybe your calibration [of the vat volume] is wrong. They put water into an empty tank, did the calibrations again, and the curves lay on top of each other,” says Jeff Nico, a physicist at NIST who was there during the surprise audit. The police and chemists went so far as to suggest that the vats had false bottoms to cover for missing gallium. But after making spot measurements for about 10 days, they left without any evidence that gallium was missing.

Such attacks have their roots in greed and in a murky deal: About four years ago the government issued a decree to sell the gallium, says SAGE director Vladimir Gavrin. Thanks to protests by scientists in Russia and abroad, the SAGE gallium remains intact, but seven tons of it—for which a private chemical plant paid only a third of the market value—are still in dispute. The chemical plant keeps try-



VLADIMIR VERMUL/SAGE

THE SAGE SOLAR NEUTRINO detector is nestled underground in the Caucasus Mountains in southern Russia.

ing to get it, says Gavrin. "The most surprising thing is that any declaration by this company immediately results in checks, while declarations of academicians and very well-known scientists are not taken into account."

Although no lasting harm was done by the latest raid, the constant threat is unnerving, and interruptions can interfere with the experiment. The SAGE team plans to take data for a full solar cycle, through 2006. Gavrin and other scientists have been campaigning for the government to give the gallium outright to the Russian Academy of Science, so far without results. The scientific uses for the gallium include a gallium arsenide detector that Gavrin and colleagues are developing that would, for the first time, record not only the passage of neutrinos but their energies.

In the meantime, says Gavrin, "I am sure that this is not the last attack on us, but we are ready to defend our neutrino telescope." **TONI FEDER**

NEWS NOTES

Armenian synchrotron. Having lost to Jordan its bid to host SESAME, a synchrotron light source intended to foster science and peace in the Middle East, Armenia now hopes to build a synchrotron source of its own. Thanks

to lobbying led by US businessman Jirair Hovnanian, the project, called CANDLE (Center for the Advancement of Natural Discoveries Using Light Emission), stands to get up to \$15 million in US aid to Armenia. An additional \$35 million in construction costs must still be drummed up.

In late March, Armenian president Robert Kocharian pledged to provide a site for the synchrotron in the capital city of Yerevan. The facility, however, would be owned by a private, nonprofit US-based organization headed by Hovnanian. ■

Correction: May 2001, page 26—We regret that, due to an editorial mix-up, a quotation was misattributed. The paragraph in question was:

Bleak job prospects continue to be a major reason for students leaving physics early in their careers. While some PRC students may use physics as a means to get to a US university, Cornell University graduate student Nai Gong Zhang says he doesn't believe it's "a giant conspiracy. Young people [from China] were shocked to find it's hard to get a job as a physicist."

In fact, Nai-Gong Zhang was not interviewed for the story and we are unable to identify the actual source of the quote.

The Editors of PHYSICS TODAY.



Web Watch

<http://www.artsci.wustl.edu/~philos/MindDict>

Chris Eliasmith, a philosopher who studies cognitive science at Washington University in St. Louis, Missouri, edits the online reference encyclopedia **Dictionary of Philosophy of Mind**. The site's ever-growing list of entries, which number over 200, currently runs from "abduction" (a kind of deductive reasoning) to "zombie" (a being that behaves like us but lacks conscious experiences).



<http://www.aaas.org/spp/cstc/golden>

In his capacity as special scientific consultant to President Harry S. Truman, William T. Golden met many of the leading scientific and technology policy-makers of the time. Thanks to the American Association for the Advancement of Science, Golden's memoranda from 1950 to 1951 are available on the Web under the title **Impacts of the Early Cold War on the Formulation of US Science Policy**. NSF's William Blanpied edited the volume.



<http://www.crdf.org/Welcome.html>

Created by the US government in 1995, the **Civilian Research & Development Foundation** promotes scientific and technological collaborations between the US and the countries of the former Soviet Union. The latest addition to the CRDF Web site is *E-Update*, an online newsletter whose inaugural issue includes an article about the future innovation and commercialization of science and technology in Russia.



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Compiled by **CHARLES DAY**