

## FAS PUBLIC INTEREST REPORT

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Spring 2004, Volume 57, Number 2

ADDRESS SERVICE REQUESTED

### The FAS Public Interest Report

The FAS Public Interest Report  
(USPS 188-100) is published  
quarterly at:

1717 K St, NW  
Suite 209  
Washington DC 20036.

Annual subscription is \$50/year.  
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# FAS

FEDERATION of AMERICAN SCIENTISTS

Volume 57, Number 2  
Spring 2004

## Public Interest Report

### SCIENCE AND TECHNOLOGY IN THE 2005 BUDGET

by Henry Kelly

It seems churlish to complain about the research budgets contained in the administration's 2005 budget proposal since R&D does far better than many programs – low income housing for example, but you'd hope for more from a country whose future is inextricably tied to technical advances. Given the extraordinary mysteries revealed as we look deeper into space and probe deeper into the complexity of living cells, you would expect at least some enthusiasm for the simple thrill of anticipating discovery. What we get instead is a passionless reshuffling of programs, rhetoric about good management (more on this later), and creative use of statistics.

The federal R&D budget is introduced with the enthusiasm you'd expect from a 9 year old forced to write an essay on the benefits of eating spinach. While the introduction to the R&D presentation does mention that science is "still" important to the economy, it focuses on an inspirational quote from Aubrey Eden to the effect that "Science is not a sacred cow. Science is a horse. Don't worship it. Feed it."<sup>1</sup> In the next paragraph we learn that "the benefits of innovation and discovery are not limited to national security." Indeed.

The Office of Science and Technology Policy (OSTP) web site struggles to paint a happy face on a program that executes real cuts or freezes progress in critical research areas while lavishly funding politically favored defense research projects, such as the \$9 billion of research and development on the missile defense program.<sup>2</sup> The statistical wizards have come up with some gems – such as the observation that the budget "...commits 5.7% of total discretionary outlays to non-defense R&D. This is the third highest level in the last 25 years." It is interesting that the Office of Management and Budget (OMB) has argued for years that the research community shouldn't just approach the budget asking for percentage increases and has correctly demanded that the research community identify important research that justifies increased spending.

Questioning the validity of these stats, I couldn't help doing a quick analysis of my own. It is certainly true, as claimed, that R&D has reached record levels, but 88% of the increase between 2001 and 2005 resulted from

<sup>1</sup> Office of Management and Budget, FY 2005 Budget, Analytical Perspectives, p. 47.  
<sup>2</sup> [www.ostp.gov](http://www.ostp.gov)

### Journal of the Federation of American Scientists

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## About FAS

The Federation of American Scientists (FAS), founded October 31, 1945 as the Federation of Atomic Scientists by Manhattan Project scientists, works to ensure that advances in science are used to build a secure, rewarding, environmentally sustainable future for all people by conducting research and advocacy on science public policy issues. Current weapons nonproliferation issues range from nuclear disarmament to biological and chemical weapons control to monitoring conventional arms sales and space policy. FAS also promotes learning technologies and limits on government secrecy. FAS is a tax-exempt, tax-deductible 501(c)3 organization.

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increases in defense research and the completion of the NIH budget doubling that began in the late 1990s. Seventy-four percent of the proposed increases in 2005 over FY2004 levels result from increments in applied research in DoD — and the fraction grows a bit to 77% if we include new increases proposed for the new Department of Homeland Security. And while it's true, as claimed, that R&D reaches a record fraction of discretionary federal outlays, OSTP fails to point out that the FY2005 outlays used as the denominator of this calculation fail to include the supplemental appropriations that will certainly be needed to cover the war in Iraq — likely to be at least \$70 billion. It also took real courage to argue that the basic research budget has reached record highs when basic research spending in FY05 is 0.6% lower than FY04 spending, and actually represents more than 0.6% cut when adjusted for inflation.<sup>3</sup> One bottom line is that the total “science and technology” budget, using definitions developed by the National Academy of Sciences, is 1.6% lower, in constant dollars, than the 2004 investment.

## Rewards

There is some genuinely good news. NSF funding does increase by 3% (2.7% when adjusted for inflation), though this falls far short of the 15% increase needed to achieve the authorized goal of doubling NSF over five years. The Department of Homeland Security, which has been forced to focus almost exclusively on near term development projects, may actually be given enough money to carry out some of the basic research envisioned when this Department was created.

## A Mixed Bag

There is also some news that deserves a lukewarm review: great rhetoric, but poor delivery. First, OMB makes a noble attempt to try to establish some principles for judging research investment. This is a dangerous area, but it's entirely understandable that a budget office faced with tough decisions about priorities can get testy when the research community too simply says, “give us more money — trust us we're really smart people.” The criteria proposed by OMB are eminently reasonable: research should be relevant, of high quality, and deliver what was promised. This doesn't mean that research should be held to arbitrary standards, like make 3.2 discoveries per thousand dollars. It does mean finding some way to demonstrate that the funds were wisely used. The research community should be eager to meet these requirements since, if the rules are fair, the process should reveal that research investments are among the highest leverage uses of national funds. If the case can't be made, shame on the researchers.

The problem, of course, comes in applying these criteria to actual budget decisions. There's no evidence, for example, that anyone has asked the question “what technologies are most critical for the nation's security and how do these translate into priorities for research?” What possible criteria could justify spending 13% of the total DOD research budget on missile defense, while cutting basic research in the Department by 5%? What conceivable process led to a decision to increase the already bloated share that manned space flight plays in NASA's budget while strangling projects that probe the deepest questions of astrophysics? It is increasingly difficult for any outside group to review these decisions, of course, since virtually all information that could be used to measure the quality of the research or its progress is unavailable.

*Continued on page 3*

In recent years, a number of thoughtful groups have reviewed the nation's energy research programs trying to align research investment with needs and opportunities. It is difficult to reconcile this work with the administration's energy research priorities. A glaring example comes in the research in energy efficiency, a field where the National Academy of Sciences and many other groups find that federal investments have been particularly productive. Yet, the FY05 Science and Technology budget proposes to reduce energy conservation research by 10% (11.6% when adjusted for inflation).<sup>4</sup> It is difficult to understand how the much vaunted management reviews would result in such a drastic single year reduction. Some clue can be found on the OMB performance review site which shows that programs get quality points for being consistent with the administration's energy plan.

There was certainly good reason to eliminate many of the programs that were cut by the administration in the Department of Energy and elsewhere. The administration is entirely right in complaining about the egregious growth of earmarks in the research budget and cutting them out of the budget whenever possible. What is not reasonable is cutting funding for poor programs and earmarks and not replacing them with competitive, high-priority projects in critical areas like energy conservation. The poor performers were already squeezing out funding needed for critical new areas.

A second, and more subtle, problem comes in the pernicious insertion of national security and homeland security priorities into research programs throughout the government. The NIH, for example, is now spending \$1.8 billion on measures to prevent bioterrorism. Since the budget increase proposed for NIH is \$729 million over 2004 levels, this obviously takes a significant chunk out of funds available for other research. The good news is that almost all the research work supported by the NIH in bioterrorism will produce knowledge directly useful in treating naturally occurring infections. While the NIH example is the most extreme, other agencies clearly believe that they can win friends by including security in their research portfolio. The NSF call for proposals on information technology research, for example, lists security issues as just one of the three “focus areas” that would be funded.

## Areas for Real Concern

Finally, there are some genuine disasters. The budget gives the strong impression that the hydrogen research program can substitute for a balanced energy research program. Touting hydrogen as a solution to our energy

problems is a bit like saying that electricity is a solution. Most, if not all, of the projects funded in the hydrogen program are important and deserve to be a part of a coherent energy policy, but the hydrogen research is funded by drastic cuts in other research that has equal if not greater merit. Funding for using waste materials and other biomass, for example, is cut by an amount equal to the increase for hydrogen even though biomass offers what may be the most cost effective source of renewable energy. In addition, funding for many of the critical areas highlighted in the NIH roadmap released last year may not be available without cutting deeply into other research areas. This may make it difficult to pursue the multi-disciplinary projects needed to bring the tools of information science, materials, nanotechnology, and other disciplines to bear on biomedical problems. The breathtaking discoveries of astrophysics made possible by the NASA science budget are threatened by new manned projects about which even the administration seems ambivalent. Critical applied research needed for advances in manufacturing, construction, transportation, and other areas will be starved by the cuts in the Department of Commerce. The search for technologies that can combine productivity with an improved environment will be badly damaged by these cuts and the 12% cut in the (constant dollar) EPA research budget. And there is no room for expanding research in improving the productivity and accessibility of learning in the face of repeated studies showing shocking underinvestment in the area.

The real tragedy of the 2005 research budget is, of course, that funding for things that will actually undermine our security, like new nuclear weapons, has crippled the opportunity to pursue other, more beneficial research. Critical areas of research in NSF and NIH are overwhelmed by superb proposals, and reviewers are often forced to make selections when 5-10 times more funding is needed. These ideas are a nation's most important assets and we squander them at our peril.

The sad fact is that most of the damage seems to result from lack of interest and attention rather than out of malice. The limp discussions seem only dimly aware that research lies at the core of our hopes for a prosperous and secure future, and never suggests that pushing back the shadows to learn more about the world we live in might be an exciting process. It's another horse to feed and easy place to extract some money.

## Author's Note:

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## USE OUR NUCLEAR WEAPONS, TO CUT A DEAL

by Ivan Oelrich

President Bush, at the National Defense University last February 11, missed a golden opportunity. Instead of building on justifiable concern over the growing danger of nuclear proliferation by attempting to reduce nuclear risks, the world got another “do as I say not as I do” lecture from the United States. Instead of offering to reduce US reliance on nuclear weapons, we instead cling to a nuclear arsenal that we cannot conceivably use while pressing ahead with the development of new classes of nuclear weapons.

While the Non-Proliferation Treaty (NPT) has some disastrous weaknesses, one of its greatest strengths is the grand bargain struck between the nuclear and non-nuclear states. The non-nuclear nations agreed to forego nuclear weapons and, in exchange, the nuclear powers agreed to work toward major reductions in their nuclear arsenals. The United States and Russia have failed utterly to hold up their end of the bargain. Almost two decades after the end of the Cold War, the United States has nearly ten thousand (yes, ten thousand) nuclear warheads deployed, almost all of them many times more powerful than the bomb that destroyed Hiroshima. The Russians have another eight thousand. The Strategic Offense Reduction Treaty (SORT), sometimes called the “Moscow Treaty,” is essentially a gentlemen’s agreement between Russia and the United States which does little that makes a difference, and certainly does not go beyond the limits outlined years ago by Presidents Clinton and Yeltsin for START III. While some weapons will be redefined as “non-deployed,” there are no plans for dismantling large numbers of our nuclear weapons. We will still have thousands.

What possible reason is there for such a massive arsenal? No conceivable enemy has anywhere near enough military or industrial targets to justify so many nuclear weapons. The only motivation for keeping a nuclear stockpile of that size is to shoot at Russian nuclear weapons. And why do the Russians have so many? You guessed it, to shoot at ours. The United States and Russia are locked in a time warp that makes it impossible for either country to abandon its Cold War approach to nuclear weapons.

But the Administration argues that even this obscene excess is inadequate for today’s threats. At a time when it has overwhelming conventional superiority around the

world, the United States wants to aggressively pursue new developments in nuclear weapons, including “bunker busters,” earth-penetrating weapons, and smaller, more “usable” nuclear weapons.

The clear message we are sending the world is that nuclear weapons are not merely legitimate weapons of war, they are, in fact, the key to a nation’s security. And if we hold nuclear weapons in such esteem, of course other nations will want to share their magic. When the President says “America will not permit terrorists and dangerous regimes to threaten us with the world’s most deadly weapons” he obviously thinks it is the regimes, not the weapons that are the problem. But recent history shows that this approach is bankrupt. Some regimes, like Iraq’s, were once friends, then became enemies, while our “friend” Pakistan turns out to be the Wal-Mart of proliferators. Friends and regimes come and go, but the weapons remain.

The irony of the administration’s position is that US security would be greatly enhanced if nuclear weapons suddenly disappeared. We may never see a world free from nuclear weapons, but a world with far fewer would be a much safer place.

This excess inventory is valuable in one respect. Instead of expending it in an atomic salvo launched against some enemy, we can use it to make a dramatic gesture in an effort to strike a new grand bargain: major reductions by us and Russia, a halt to new weapon development, caps on Chinese deployment, and a world committed to aggressively fighting proliferation. If we lead by example, these proposals could actually get international acceptance. If we simply urge other nations to “do as we say,” they may remain pipe dreams.

If we want other countries to stop reaching for nuclear weapons, we have to work toward a world where they, like chemical and biological weapons, are no longer considered legitimate instruments of military power. Together with Russia, we can begin by dismantling ninety percent of our existing arsenals, turning their nuclear material into civilian fuel. We can ratify the Comprehensive Test Ban Treaty. And we can stop efforts to develop even more nuclear weapons. Finally, we have a use for our excess nuclear weapons: getting rid of them is just the grand act that can mobilize the world to end proliferation.

### Author’s Note:

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## RAISING THE BAR: THE CAMPAIGN FOR AN INTERNATIONAL ARMS TRADE TREATY

by Matt Schroeder

In February, a group of 15 non-governmental organizations, including the Federation of American Scientists, assembled in San José, Costa Rica for the annual meeting of the Arms Trade Treaty (ATT) Steering Committee. The campaign to establish an ATT is an ambitious, but critically important, effort to curtail the flow of weapons to regimes that would use them to oppress their own people or attack their neighbors. Restraining the global arms trade is an extraordinarily difficult undertaking, even when the proposed restraints are based upon broadly supported and firmly established principles. With this in mind, the Steering Committee wrestled with several difficult strategic and organizational questions. The following article provides an overview of the ATT campaign and explores some of the challenges that confront its advocates.

### The Problem

Over the past 50 years, arms transfers to abusive and aggressive regimes have contributed to the incalculable suffering of millions of people caught up in the brutality of postmodern warfare, or caught under the boot of tyrants. During Indonesia’s bloody and illegitimate occupation of East Timor, arms exporters sold the Suharto regime over \$4 billion worth of weapons,<sup>1</sup> including counter insurgency aircraft and assault rifles that were used in operations that killed thousands of East Timorese.<sup>2</sup>

In other cases, the international community, and occasionally the arms exporter itself, has suffered ‘blowback’ from weapons sold to unstable or unpopular regimes. When the abusive regime of former Somali dictator Maj. General Mohammed Said Barre fell in 1991, his stockpiles of foreign weapons were plundered by rival factions. These weapons were used by the Somali militias to fight a devastating civil war that tore the country apart and prompted the UN Security Council to authorize a humanitarian intervention. Many of the intervenors themselves were killed during this intervention, including 18 US Rangers who lost their lives in the famous “Black Hawk Down” incident.<sup>3</sup>

If we don’t sell them weapons, somebody else will” is a common refrain among governments who transfer arms to problematic recipients. While morally bankrupt, there is some truth to this argument. In the anarchic and ultra-competitive international arms market, governments who take the high road are often penalized for their



*Former Costa Rican President and Nobel Laureate Oscar Arias (bottom row, third from the left) with the attendees of the 2004 meeting of the Arms Trade Treaty Steering Committee, including FAS Research Associate Matthew Schroeder (fourth row, second from the left).*

conscientiousness, as abusive regimes simply take their lucrative weapons orders elsewhere. Deprived of the revenue from these weapon sales, arms manufacturers in countries with rigorous controls exert pressure on their governments to lower their standards, pointing out the futility – and economic cost – of their high-mindedness. The resulting downward pressure on arms export controls not only discourages exporting countries from raising the bar further but imperils existing standards. Breaking this vicious circle requires a multilateral agreement that establishes minimum standards applicable to, and adopted by, all exporters. This is the primary goal of the campaign for an international Arms Trade Treaty (ATT).

### History and Purpose of the Treaty

The ATT campaign is rooted in two earlier efforts. The first is the campaign for a Code of Conduct on European weapons transfers, which culminated in 1998 with the ratification of the EU Code of Conduct on Arms Exports. At about the same time as the EU Code campaign was gearing up, former Costa Rican President Oscar Arias partnered with other Nobel Laureates to draft an International Code of Conduct on Arms Transfers. The two codes are similar in that they both call on member states to condition arms transfers on the potential recipient’s compliance with a long list of human rights, good governance and nonaggression eligibility criteria. However, the EU Code requires member states to apply these criteria on a case by case basis while the Nobel Laureate’s Code adopted a blanket approach. In other words, under the EU Code, applications for arms export

are to be considered individually, and only export applications for weapons that are themselves likely to be used in violation of key criteria<sup>4</sup> are to be denied. In contrast, the Nobel Laureate's Code prohibits all weapons transfers to states that violate key eligibility criteria.

The EU Code has proven to be a useful mechanism for encouraging restraint among European exporters but - as a regional agreement - it is applicable only to the arms exporters of the European Union. The Nobel Laureate's Code is universally applicable but was also a bit ahead of its time. While many governments support the principles embodied in the Nobel Laureate's Code, too few were willing to adopt the Code's "blanket" approach. A closer look at the list of states that presumably would be ineligible to receive arms under the Nobel Laureates' Code reveals why. China, Oman, Egypt, Kuwait, and Saudi Arabia - five of the 10 biggest importers of arms in the developing world - would all be off limits to signatory states because of their autocratic governments. The combined dollar value of weapons sales to these states alone was a whopping \$11.3 billion in 2002 - 27 % of the global arms market.<sup>5</sup> The Code's restrictions on arms sales to countries that violate human rights, that do not participate in the UN arms registry, and that spend too much money on their militaries vis-à-vis public health and education would further reduce the share of the global arms market available to signatory states.

Realizing that the Nobel Laureates' Code was too far-reaching to be viable in the current international political climate, Dr. Arias' coalition drafted a more modest - but also more politically realistic - international agreement, the Arms Trade Treaty (ATT). The purpose of the treaty is two-fold: to crystallize governments' existing obligations under international human rights and humanitarian law in regards to arms transfers, and to provide a framework for addressing additional arms trade issues in the future.

As spelled out in the ATT, existing international law prohibits governments from transferring arms

- to countries under UN Security Council arms embargoes;
- when the arms in question are incapable of being used in a way that distinguishes between combatants and civilians;
- when such transfers or use of the arms are prohibited under customary international law;
- when the transfers would violate any existing international treaty by which the government is bound; and

- if the arms would be used in breach of the UN charter, used to commit serious violations of human rights or international humanitarian law, or to commit genocide or crimes against humanity.

It is important to note that the ATT has adopted the EU Code's "case by case" approach to arms export licensing. That is, member states would be expected to deny arms export license requests only when the recipient is likely to use the items listed in the license request in ways that violate the above mentioned restrictions.

Signatories to the ATT would also be expected to enact a "presumption against authorization" of arms transfers when the weapons in question are likely to be used to commit violent crimes, or would adversely affect regional stability or sustainable development. This provision would not ban arms transfers in these cases outright; if the government determines that the transfer is necessary to achieve a competing policy objective, the transfer is permitted. The goal is to ensure that sustainable development, regional stability and law enforcement issues factor heavily into decision-making about arms transfers.

Finally, the current draft of the ATT establishes an International Registry of Arms Transfers, which differs from the existing UN Register on Conventional Arms in two important ways. Unlike the UN Register, the reporting requirements associated with the ATT registry would be mandatory, and would require member governments to provide data on small arms and light weapons transfers.

While important, the provisions outlined above address only a few aspects of what is an immensely complex and multifaceted problem. Equally noteworthy is the ATT's role as a framework for negotiating future agreements on other aspects of the arms trade, which would take the form of protocols to the treaty to be adopted after the treaty is ratified.

Awareness of, and support for, the ATT has grown exponentially over the past four years thanks to the many gifted and dedicated lawyers, analysts and activists that have taken it under their collective wing. Especially important is the recent groundswell of grassroots support for the Treaty generated by the Control Arms Campaign, a global initiative spearheaded by Oxfam, Amnesty International and the International Action Network on Small Arms (IANSA). The ATT is the centerpiece of the campaign, which was launched in 70 countries this past October. Since then, 80,000 individuals have expressed their support for the ATT through the campaign's million faces petition.

### The Long Road Ahead....

Even though the ATT would impose few if any new requirements on member states, and is supported by tens of thousands of people world wide, the path to ratification is likely to be long and treacherous. Advocates of the ATT face two interrelated challenges. First, they must generate and sustain enough grassroots and governmental support to put the treaty on the international community's agenda and keep it there for years. Secondly, they must address - delicately yet decisively - important strategic dilemmas.

The Control Arms Campaign has given the grassroots movement for an ATT a much needed shot in the arm. Maintaining this momentum, and converting it into government support for an ATT, is essential and will be extremely difficult. Legally binding international agreements on any subject take years, if not decades, to ratify. The Convention on the Rights of the Child, for example, took ten years just to negotiate. Agreements on arms transfers are especially vulnerable to delay and derailment because governments view arms transfers as an essential tool for advancing key economic, national security and foreign policy objectives. For this reason, most governments are instinctively leery of any externally imposed constraints on their ability to transfer weapons. ATT advocates have concluded that this reluctance can only be overcome gradually, and thus they have chosen to pursue a "building block" approach to a legally binding treaty. The "building block" approach is premised on the assumption that a direct, all-or-nothing push for a legally binding treaty will be met with overwhelming resistance from governments. Instead, support will be built - and government fears allayed - through actions in regional and global fora (e.g. Organization of American States, Wassenaar Arrangement, etc), including the negotiation of regional, politically binding agreements that embody the main provisions and goals of the ATT. Only after a solid foundation of government and grassroots support has been established will the campaign begin its full court press for a legally binding ATT. Additionally this approach will raise awareness of key arms trade issues (e.g. the need for stronger controls on arms brokers) and help build support for other related efforts.

The drawback of the "building block" approach is that it draws out the campaign, thereby increasing the likelihood that it could stall out before a legally binding agreement is achieved. Building and maintaining grassroots and government support for the ATT requires a tremendous investment of resources - time, money and institutional prestige. A sudden loss of funding, changes in organizational priorities, or insufficient progress at the regional level can sap organizational commitment to the initiative

and - worst case scenario - take key organizations out of the game. However, this danger will subside as the campaign grows and more organizations emerge that have the capacity to take up the mantle of leadership.

The second set of challenges confronting advocates of the ATT are several nettlesome strategic/tactical dilemmas, many of which concern the contents and wording of the treaty text itself. When negotiating legally binding treaties, the devil is in the details. Vague or ambiguous treaty language allows governments to sign onto the treaty without making significant changes to their laws or policies.

Determining when and how to address these ambiguities is difficult. To do so now, while NGOs have control over the draft text and the process, would be problematic for several reasons. First, the current draft of the treaty is just that - a draft. Governments will be the ultimate arbiters of the treaty text and thus the final treaty is likely to look very different from the current draft. Furthermore, nailing down all of the fine points of the treaty too early could be counterproductive. Some ambiguity may be necessary for securing the support of potential government and allies, and for avoiding nay saying by potential "spoiler" governments. Yet as the moral stewards of the ATT concept, NGOs have a responsibility to ensure that the final version of the Arms Trade Treaty governments accomplishes its primary objectives. Doing so will require careful monitoring of the government negotiations and close collaboration with "champion" governments that share their goals.

### Conclusion

As the list of arms exporting states grows, competition in the global arms market is likely to intensify. The ATT would help to mitigate the ill-effects of this competition by providing a common set of principles around which the international community could unite, and a framework for devising multilateral solutions to the many difficult problems stemming from the global arms trade.

<sup>1</sup> World Military Expenditures and Arms Transfers (1988 and 1989).

<sup>2</sup> Hartung, William and Jennifer Washburn, "U.S. Arms Transfers to Indonesia 1975 - 1997: Who's Influencing Whom?", *World Policy Institute Issues Brief*, March 1997, available at <http://www.worldpolicy.org/projects/arms/reports/indoarms.html>.

<sup>3</sup> Hartung, William, "Weapons at War", *World Policy Institute Issues Brief*, March 1995, available at <http://www.worldpolicy.org/projects/arms/reports/wawrep.html>.

<sup>4</sup> Only four of the EU Code's 8 criteria prohibit arms transfers outright. The others require states to take into consideration the likely impact of the transfer when considering an export license request.

<sup>5</sup> Grimmett, Richard, *Arms Transfers to Developing Nations, 1995-2002*, Congressional Research Service, 22 September 2003, available at <http://www.fas.org/asmp/resources/govern/crs-r132084.pdf>.

### Author's Note:

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# PLANNING FOR THE NEXT WAVE OF DENUCLEARIZATION: A PANEL DISCUSSION CO-SPONSORED BY FAS AND WIIS

by Jennifer Laird and Jaime Yassif

On December 10, 2003, the Federation of American Scientists (FAS) and Women In International Security (WIIS) hosted a panel discussion entitled “Planning for the Next Wave of Denuclearization.” This marked the first collaboration between FAS and the Science and Technology project at WIIS. Panelists included Paula DeSutter, Assistant Secretary of State for Verification and Compliance; Dori Ellis, Director of International Programs at Sandia National Laboratories; and Maureen McCarthy, Director of Research and Development in the Science and Technology Directorate at the Department of Homeland Security (DHS). Rose Gottemoeller, Senior Associate at the Carnegie Endowment for International Peace, chaired the panel discussion.

Rose Gottemoeller opened the event by offering the topic of verification and monitoring of cooperative and uncooperative regimes to the panel for discussion. She raised key questions about the application of current and future technologies and challenged the panelists to examine the potential for technology crossovers from different areas.

Assistant Secretary DeSutter spoke about the importance of responding to proliferation threats. She stressed the need to send a strong message to other nations that the U.S. has zero tolerance for noncompliance and that it is a matter of global consequence. However, DeSutter also noted that detecting and dismantling a covert program can be very difficult. She explained that her office is responsible for assessing other nations’ compliance under their obligations and making compliance verifiable by using National Technical Means and satellite data. DeSutter emphasized that this is a difficult problem and that no verification regime is perfect. She also noted that verification is as much a policy issue as it is a technology issue and that the U.S. needs improved compliance more than it needs expanded verification measures.

Maureen McCarthy illustrated the symbiotic relationship between homeland security and nonproliferation. She described how DHS is leveraging technologies that were originally developed for nonproliferation application and

how DHS research and development will be able to feed back into nonproliferation efforts. McCarthy explained that her office is responsible for developing technologies that will allow the anticipation, prevention and management of a terrorist attack. She added that part of the DHS layered defense strategy is to invest in technologies that can be used to protect this country, such as radiation detectors.

With regard to the technical challenges, McCarthy asserted that in terms of materials science “we need to push physics to its limit,” but also stressed the importance of systems engineering. She noted that “we have pushed the edge of sensor development,” but that “we need to be more efficient and selective with data extraction.” McCarthy also spoke about the need for more investment in personnel training, particularly at mega-ports around the world. Although it “requires a lot of energy,” training is necessary because “we can have zero tolerance for false positives [in detecting smuggled materials].”

Dori Ellis discussed her role in developing technology to support nonproliferation agreements. She gave an overview of the history of verification technologies, citing the reliance on satellite technologies in earlier verification programs. Ellis emphasized the need for a systems-based approach, especially as the threat base gets larger and relevant technologies become prohibitively expensive. She also spoke about the need to develop performance standards for verification technologies and to deconflict existing standards. Ellis gave examples of specific technology needs, including virtual private networks that transmit data without risk of interception, refined remote monitoring capabilities to fill in the gaps left between occasional inspections, and improved radiation detection mechanisms that can rapidly differentiate between medical and industrial isotopes and special nuclear materials.

The discussion was then opened to questions from the audience. Ambassador Tom Graham asked about the severity of the “dirty bomb” threat and the potential for damage. Maureen McCarthy acknowledged that radio-

**“We don’t need more verification; we need more compliance.”**

*Assistant Secretary  
Paula DeSutter*



logical dispersal devices are a major concern for DHS as a “weapon of mass disruption” and that DHS is currently developing decontamination technologies to mitigate the effects of an attack. Dori Ellis also mentioned that the National Nuclear Security Agency has started to prioritize the protection of radiological materials around the world based on such factors as the source of the material, the size of the source, and the mobility of the source across borders.

Laura Holgate, Vice President for the Russia and New Independent States Program at the Nuclear Threat Initiative, raised the issue of balancing the need to protect classified information and the need to share information with other countries in the course of a denuclearization program. Dori Ellis responded, citing the development of a glossary of terms and the creation of a sensitive

information exchange route between the U.S. and Russia in 1994. She further noted that “the U.S. has established a thick line between technologies used to protect our own systems and those technologies used to protect outside materials.”

The organizers would like to extend special thanks to Rose Gottemoeller for her valuable contribution in assembling this first rate panel of experts.

**Authors’ Note:**

*Jennifer Laird is the Science and Technology Coordinator at Women in International Security, and Jaime Yassif is a former Research Assistant with the FAS Strategic Security Project, now a Program Officer at the Nuclear Threat Initiative.*

## UNLOCKING THE POTENTIAL OF GAMES FOR LEARNING

by Kay Howell

“Wouldn’t it be great if kids were willing to put in as much time on task on challenging material in school and enjoy it as much as video games?” This is an all too common lament among parents with kids college age and under. Studies by the University of Chicago provide revealing numbers:

- An 8th grader plays video games an average of 5 hours/week
- By high school, 77% of students have played games
- 60% of college students play games more than 15 hours per week
- Games sales reached nearly \$7B in 2002.

Clearly, computer games hold a special interest to a generation who has grown up with them, and as such, they show great promise as educational tools. Considerable interest has been generated in electronic games for education, in large part because of the enthusiasm with which many children and adults currently play them. Whether this is due to the inherent challenge built into game play, the richness of graphics presented to the user, the opportunity to interact with other users (in web-based games), the story or context in which the game is couched, or some other feature is worthy of study. Moreover, the advent (and availability) of immersive environments for entertainment purposes is likely to grow considerably in the next few years, and surely will have important applications in learning.

Given what we know about cognition, gaming environments seem to offer a multitude of potential advantages such as the opportunity to learn by doing, to learn in context, to build on prior knowledge, to get feedback, and to be engaged. Typical classrooms are not very interactive; many lectures and PowerPoint presentations are one-way experiences. This limits the learner’s ability to receive feedback and revise their thinking – a critical part of the learning process, points out learning expert John Bransford, of the University of Washington. He adds that in contrast, with games, at least two individuals or groups must adapt to one another’s changing strategies in order to win. Games offer self-pacing and feedback that make the student want to go back and master the experience. The key benefit of gaming lies in acquiring massive amounts of time on task. (Computer games take many hours to master, many good video games

can take up to 50 – 100 hours to win, even for good players.) In addition, games provide a safer environment for risk-taking. Students are often intimidated by taking risks; however, games make risk taking easier. Taking a risk, even if it leads to failure, teaches something, if only to prepare students in ways to handle failure in the real world.

Exploiting the inherent motivational aspects of games and simulations for education and training must be based on a sound understanding of which features of these systems are important for learning and why. FAS is playing an important leadership role shaping the discussion on technology and learning. Our Learning Federation project recently produced a report that examined the potential of games for learning and highlighted key research questions: Can we use these forms of highly engaging, interactive environments to improve learning outcomes? How should they be used, with whom and for what? The study report: *Instructional Design in Technology-Enabled Learning Systems: Using Simulations and Games in Learning*, is one of a five part series of technology roadmaps for Learning Science & Technology R&D. The report, developed with input from leading learning scientists, game developers, and simulation developers, identifies the key R&D priorities for designing and evaluating the use of simulations and gaming in instructional environments. The roadmap identifies research priorities, an R&D chronology and metrics of success and a management plan for forming research teams and disseminating R&D results. This roadmap, as well as the full roadmap series, is available at [www.thelearningfederation.org](http://www.thelearningfederation.org).

Unlocking the potential of gaming to make learning more productive and more engaging will require a collaborative research effort that brings together content experts, curriculum designers, cognitive scientists, game producers, and learners. FAS’ Learning Federation project is working with national experts in academia, industry and government to make this happen.

### Author’s Note:

Kay Howell is the Vice President of the Information Technologies Project at FAS.

## BUSH ADMINISTRATION ANNOUNCES BIOSECURITY POLICY

by Stephanie Loranger

On Thursday, March 4, 2004, the Bush Administration announced its biosecurity policy designed to ensure open communication among researchers while preventing terrorists from using legitimate research results to create novel bioweapons. Department of Health and Human Services (HHS) Secretary Tommy G. Thompson, accompanied by Dr. John Marburger III, Director of the White House Office of Science and Technology Policy, Dr. Elias Zerhouni, Director of the National Institutes of Health (NIH) and Dr. Anthony Fauci, Director of the National Institutes of Allergy and Infectious Disease (NIAID), announced that HHS will lead a government-wide effort to establish improved biosecurity measures for any legitimate biological research that could be misused to threaten public health or national security, often referred to as “dual-use” research. This move follows the recommendations of a National Academy of Sciences (NAS) report released in October 2003, *Biotechnology in an Age of Terrorism: The Dual-Use Dilemma*.

As a first step in this initiative, Secretary Thompson announced the creation of the National Science Advisory Board for Biosecurity (NSABB). The new board will advise the Secretary of HHS, the Director of the NIH, and the Directors of all federal agencies that support life sciences research, including Agriculture, Energy, Environment, with regard to biological research that has the potential for misuse and could pose a threat to public health or national security. Thompson noted that the board will consist of 25 members from a wide variety of fields, and all will be appointed by the Secretary of HHS for a two-year term. The members of the board will bring expertise from a wide variety of fields, including molecular biology, epidemiology, pharmaceutical production, veterinary medicine, food production, bioethics, national security, export controls, and represent perspectives from academia, industry, and the public. Thompson also announced that the board will meet on a quarterly basis and will be managed by the NIH.

Importantly, the NSABB will only be an *advisory* board, not a *regulatory* board. The role of the NSABB will be limited to providing guidance on biological research with potential dual-use applications. The board will help researchers, publishers of scientific journals, funders, and federal agencies determine whether certain research should be moved to high-security labs and whether

some research results should be voluntarily withheld from publication. The goal, Secretary Thompson said, is to create a culture of responsibility in the biology research community, not to stifle important research. In order to achieve this aim, the board will not review individual experiments; rather, it will review general research areas and subjects of experiments. There are no punishments for not complying.

Specifically the Board will:

- Advise on strategies for local and federal biosecurity oversight of all federally-funded life sciences research.
- Advise on strategies to work with journal editors and other stakeholders to ensure the development of guidelines for the publication of potentially sensitive life sciences research.
- Advise on the development of guidelines for mandatory programs for education and training in biosecurity issues for all life scientists and laboratory workers at federally-funded institutions.
- Provide guidance on the development of a code of conduct for life scientists and laboratory workers that can be adopted by federal agencies as well as professional organizations and institutions engaged in life sciences research domestically and internationally.

The NSABB is not the first national advisory board in the life sciences. The precedent was set in the mid-1970s, when scientists called for the creation of a committee to set guidelines for recombinant DNA research, then an emerging technology with unknown risks to the environment and human health. The Recombinant DNA Advisory Committee (RAC) was given authority to govern recombinant DNA research at all NIH funded institutions. In 1976, the RAC published a set of research guidelines establishing local Institutional Biosafety Committees (IBCs) with the authority to enforce the guidelines on a case-by-case basis. NIH-funded institutions must comply with the guidelines, or funding can be withheld or rescinded. An important distinction between the two is that the RAC creates enforceable guidelines, whereas the new NSABB will only suggest new policies and guidelines.

Originally the NAS committee recommended that the NSABB be made part of the RAC at the NIH; however

Thompson announced that the new NSABB will be a separate entity. The IBCs will be advised by the NSABB and will refer to the NSABB when there is a novel issue on which they need guidance. It is significant that the NSABB will not advise on a particular experiment, leaving the IBCs to make the final decision. In addition, researchers cannot appeal IBC decisions to the NSABB, which is seen as a limitation by many in the community.

The NSABB also will not weigh-in on classified research, unless asked. This could prove to be a large omission, because a good deal of classified research involves potential agents of biological terrorism. Not only could the NSABB advise on the direction of that research, but it could also provide guidelines and advice on the clear security concerns with that research.

Thompson gave few details about how this new biosecurity policy or the NSABB would enlist the cooperation of other countries. One possibility, as happened with the RAC, is that other countries will simply adopt our system. The announcement also did not include any plans

for how to extend the policy to industry and pharmaceutical companies. The expectation is that industry will eventually follow suit and adopt the guidance and advice from the NSABB to create a “culture of responsibility.”

The creation of the NSABB, while an important initiative, is only one step towards a comprehensive national biosecurity policy. The ultimate goal is to take proactive measures to prevent the use of pathogens and biotechnology as terrorist agents, without stifling legitimate research. A heavy-handed approach to governing biological research is not feasible given the nature of the research, and will only stifle the creation of medical therapies. The only way to monitor dual-use biology is through self-regulation and codes of conduct. Hopefully the new NSABB will provide the nation’s scientists with the guidance to establish a code of conduct and a culture of responsibility in the life science research community.

**Author’s Note:**

*Stephanie Loranger, Ph. D. is the Biology Issues Director at FAS.*

**NATIONAL SCIENCE ADVISORY BOARD FOR BIOSECURITY WILL:**

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▶ UBC 26-3 Standardized 15 minute fire test set up.

▶ Fire test in progress: flames contained to wood crib.



<sup>1</sup> The second technology, designed by One World Living Systems (OWLS) had been previously certified by the International Code Council (ICC).

<sup>2</sup> Henry Kelly, “The Afghan Housing Crisis: Can New Technology Make a Difference?” *Federation of American Scientists Public Interest Report*, Summer 2003, 7.

<sup>3</sup> Uniform Building Code 26-3 15-Minute Room Corner Fire Test

**FAS HOUSING TECHNOLOGY CERTIFIED IN FIRE SAFETY TEST**

by Rachel Jagoda

The FAS Housing Technology project, which is currently focused on finding affordable, energy efficient new materials and design methods for residences, reached a milestone at the end of February when one of the two technologies intended for use in earthquake-prone Afghanistan was approved for use in the United States.<sup>1</sup>

Over the past several months, the Housing Technology group has been working to find technologies to be used both in the United States and abroad, that best fit the criteria of safety, reliability, and economy. The group finally settled on designs incorporating expanded polystyrene (EPS) cores with cementitious skins. This technology, developed by engineer H. H. “Hoot” Haddock of Florence, Alabama, uses Hardiboard connected to the EPS core with a special adhesive to form the structural insulated panels (SIPs). This innovative technique shows great promise for fulfilling the criteria established by the Housing Technology project<sup>2</sup>, but was not yet certified for building in the United States.

One of the hurdles remaining before this technology could be approved was a fire test that would exhibit the panels’ ability to resist burning for fifteen minutes, a period deemed long enough to allow occupants time to escape if the panels were used for a residential structure. As part of the Housing Technology project’s goal of finding technologies that exceed existing requirements, FAS submitted the cement board SIP design to two fire tests.

The first test, a standard test required for construction materials in the United States<sup>3</sup>, determines whether the building can withstand heat stresses for 15 minutes. The test involves building a small fire in an alcohol-soaked wood crib in one corner of a windowless room. The fire is allowed to burn continuously for 15 minutes, while temperatures are measured throughout the room. Additional sensors record information on chemicals present in smoke from the fire.

The second test, a modified version of the standard test designed by the FAS Housing Technology team, included a window that promoted greater oxygen flow

to the fire. Addition of the window also increased stress on the wall panel by decreasing structural support and adding joints which were exposed to direct flame and extreme heat. The fire was allowed to burn for just over 20 minutes in the second test.

The results of both examinations proved to be extremely encouraging. In the standard test, which the cement board SIPs passed, the damage to the panels was minor after fifteen minutes, and the flames never spread beyond the wood crib. Moisture present in the cement board skin used to coat the EPS core caused some cracking, leaving portions of the EPS core exposed to flame and heat that reached 1000° C. Exposed foam melted from the heat, but the foam immediately adjacent to the highest temperatures shrank back rather than melting, which helped to maintain a high level of structural integrity. Removing portions of the cement board covering after the fire had been extinguished revealed that overall, the areas not exposed to excessive heat and flame had minimal to no damage to the panels. Also, during both tests, smoke production was minimal, an important factor when testing for fire safety in residences because smoke inhalation accounts for many of the injuries and deaths that result from residential structure fires.

The second test’s results were equally promising. The foam at the joint areas exposed to high heat and direct flame melted, as in the previous test. Because of the greater number of joints exposed, more foam melted away, especially under the window frame. However, in spite of greater foam loss, the walls exposed to the fire maintained their structural integrity and could be easily fixed. These successful demonstrations further prove that the cement board SIPs maintain structural integrity even under extreme conditions that go beyond those required by US building code, and show the tremendous potential of this technique as a safe, reliable, and economical technology.

Having passed the final requirement, certification of the cement board SIPs is complete. Using this technology, construction of model homes can now begin in the United States. Projects are under consideration for several areas around the country, including Houston, Seattle, and California. Additional tests and computer models will be used to conduct further research on the best new technologies for residences around the world.

**Author’s Note:** Rachel Jagoda is Project Manager for the Housing Technology Project at FAS.

## GOVERNMENT SECRECY PROJECT NEWS

Steve Aftergood, FAS' Government Secrecy Project Manager, continues his efforts to increase the availability of key documents and to highlight government secrecy policies and promote policies in which only genuinely sensitive information are withheld from the public

### ONE WORLD OR NONE (1946)

An interesting addition to the digital archives is the 1946 publication entitled *One World or None*. In an early assessment of the threat posed by nuclear weapons, the Federation of American Scientists published this best-selling volume that is now posted on the FAS web site.

"*One World or None* is an illuminating, powerful, threatening and hopeful statement which will clarify a lot of confused thinking about atomic energy," according to one review in the New York Herald Tribune on March 17, 1946.

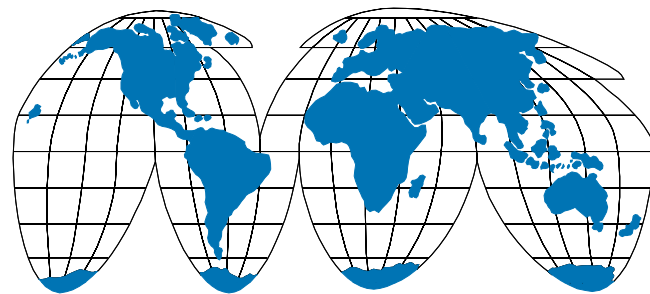
Others disagreed. "You cannot intelligently discuss the atomic bomb except against the background of present political realities," including the looming threat from the Soviet Union, according to an ABC News critique, and the authors displayed "a terrifying unawareness of politics."

"It remains a document of intense cultural interest," wrote historian Paul Boyer in his book *By the Bomb's Early Light*, though it is also "a very disjointed affair.... For all their eloquence, the contributors were much better at evoking the atomic nightmare than at prescribing remedies."

Those contributors included Hans Bethe, Albert Einstein, J. Robert Oppenheimer, Niels Bohr, Leo Szilard and other luminaries.

"By far the most gripping chapter of *One World or None*" according to Boyer, "was 'If the Bomb Gets Out of Hand' by Philip Morrison."

"Priced at a dollar, the FAS '*One World or None*' sold a hundred thousand copies," he noted. The full text of *One World or None* is now available here: <http://www.fas.org/oneworld/index.html>



### LOS ALAMOS SCIENCE JOURNAL RESTORED TO THE WEB

The recovery of information that was removed from the web site of Los Alamos National Laboratory continues with the posting of all back issues of Los Alamos Science, the lab's esteemed annual journal, on the Federation of American Scientists web site.

"In this magazine, we hope to provide a forum for scientists and engineers at [Los Alamos] to present their work to each other and to the wider community in a fashion that promotes understanding," according to the journal's inaugural issue in 1980.

Los Alamos Science has covered a daunting array of current topics in science and technology in reasonably accessible form, from nuclear science to supercomputing to "unsolved problems in the science of life." Its accounts of nuclear weapons history are themselves considered primary sources in the field. The special 1987 memorial issue on Stanislaw Ulam represents science at its most cultured and humane. The deletion of this material was an error that promotes public stupidity, not national security.

Los Alamos Science "was taken off the web after 9-11" explained Joy E. Baker of the journal's editorial staff, as part of a scrub of the entire Lab web site.

"They plan to bring it back," she said on February 23, "but I couldn't hazard a guess when."

How about now?

All issues of Los Alamos Science from 1980 through 2002 are now posted here:

<http://www.fas.org/sgp/othergov/doe/lanl/pubs/LaScience.htm>

Most of this material was captured by Gregory Walker and Carey Sublette in their Los Alamos document collection (SN, 02/19/04). The remainder was located, ironically enough, on a temporary Los Alamos web page, with articles marked "restricted to LANL." No more.

## COURT RULING ON INTELLIGENCE BUDGET DATA

Mr. Aftergood's recent lawsuit to force the CIA to disclose intelligence budget numbers for fiscal year 2002 brought important national focus on the CIA's continuing policy to withhold intelligence budget numbers. Although the case was dismissed, Mr. Aftergood was successful in expanding media attention to this irrational secrecy policy – one that restricts the public's ability to participate in the national debate regarding the agency's performance. The Washington Post featured an editorial on Feb. 18th, applauding his work stating "when Americans are debating whether and how the intelligence community failed in Iraq, the numbers might give the American people some sense of the growth of the most secret parts of their government and spur useful debate over whether American spending in this area is an investment that is paying adequate dividends. By resisting such minimal disclosure, the agency only highlights a classification system out of control." The CIA previously released aggregated budget numbers for fiscal years 1997 and 1998 in response to earlier lawsuits by Mr. Aftergood, but has refused to release subsequent years' numbers.

FAS' Government Secrecy project will continue to work to promote policies to balance legitimate secrecy requirements with the information needs of an open democratic society, including collaborative scientific research.

### ANNOUNCEMENT

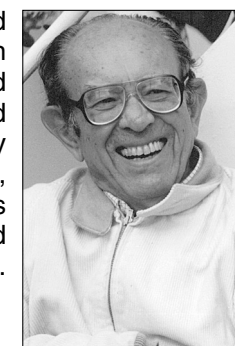
#### FAS to Launch Occasional Papers Series

This spring, FAS will release the first issue of a new occasional paper series aimed at outlining and shaping the debate on current science and security policy issues. The inaugural paper, Small Arms, Terrorism, and the OAS Convention, describes the threats that the thriving illicit trade in small arms and light weapons in Latin America pose to US interests, and the current and potential impact of the OAS Firearms Convention on this trade. Upcoming FAS Occasional Papers will focus on topics ranging from the post Cold War Nuclear Force Posture to bio-security. To order copies of FAS Occasional Paper No. 1, Small Arms, Terrorism and the OAS Firearms Convention, call 202-546-3300, or visit our website: [www.fas.org](http://www.fas.org).

#### A Gift to FAS

FAS gratefully acknowledges a generous contribution given in memory of Morris B. Abramson, Ph.D. (1910-2003). Dr. Abramson was an Associate Professor of Neurology at Albert Einstein College of Medicine, an Adjunct Associate Professor of Chemistry at N.Y.U. and earlier in his career, Chairman of the Physical Science Department at Flushing (N.Y.) High School. He earned his Ph.D. in Physical Chemistry from N.Y.U. in 1939. He was a Post doctoral Fellow in Colloid Science at Cambridge University and a Post doctoral Fellow at Polytechnic Institute of Brooklyn. He was a Sir Ernest Oppenheim Fellow and a member of Sigma Xi, and author of 50 publications in journals including Science and Biochemistry.

In retirement he became an accomplished wood sculptor and enjoyed singing in several local choral groups. He lived independently until February 2003 and died of congestive heart failure in July 2003. He is survived by his sister, Bessie, son, Edward, daughter-in-law, Crystal, his grandchildren, Anne and Jeremy, and his long-time companion, Sylvia Diamond.



**The funds will be used to support the work of FAS.**

### FAS STAFF NEWS

#### The Federation of American Scientists bids farewell to Sharon Gleason

Sharon Gleason served as the energetic Director of Development for a year and a half, during which time she shaped a new development initiative from the ground up. Sharon guided FAS in outreach and development, teaching everyone a great deal along the way. She played a huge role in shaping an influential Board of Directors that will help FAS grow in new directions.

The staff at FAS thanks her for her amazing efforts and daily acts of kindness. Sharon's impact at FAS is sure to be remembered long into the future. We wish her every success in her new endeavors.

#### ...And Jaime Yassif

During her two years as a research assistant for the strategic security project, Jaime Yassif made many contributions. Jaime's work on dirty bombs, including new work on the problems of cleanup, her research into uranium gas centrifuges and the mysteries of the enrichment economy, and her contributions to the nuclear policy project, have clarified and improved the debate on a vital set of national issues.

Jaime helped point FAS to a critical set of new issues in bio-security, and her contributions will continue to be recognized as these new programs grow. Jaime's work at FAS had impact both because of her creative and thoughtful research and because of the clear, compelling way she was able to present complex issues and concepts.

During her time at FAS, we all benefited from her energy, tenaciousness, natural curiosity, and sense of humor. We wish her all the best for a bright future.