MacArthur

A newsletter from The John D. and Catherine T. MacArthur Foundation

Rethinking Global Security

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In the five years since I joined the Foundation, the questions I have most often been asked are: Where has MacArthur made a difference? How do you measure the impact of your grants? Why should the public trust that MacArthur's grants are being invested wisely? The answer to all of these questions begins with the caveat that foundations rarely accomplish anything directly or alone. When change takes place on a significant scale, it is almost always because of the good work of many individuals and nonprofit organizations and multiple funders, often working in collaboration with government and the private sector.

Since we opened our doors more than 25 years ago, we have chosen to take on difficult and important issues. Our biggest accomplishments have often been the result of trusting our instincts, taking risks, and staying the course in the arduous search for solutions to longstanding problems. A belief in the power of the creative individual, a conviction that institutions matter, a commitment to research and its application to public policy, a faith that people will make sensible choices if given good information tested through reasoned discourse and enriched with a diversity of views: These are the principles that guide our choices.

Three times a year, MacArthur will publish a newsletter that describes a major aspect of our work. In this inaugural edition, we focus on an area of grantmaking — efforts to promote international peace and security — that has long been at the core of our broader mission to "improve the human condition." Over the past two years, public concern about international terrorism and U.S. strategy has brought far greater attention to the dangers of weapons proliferation, particularly involving nuclear and biological technology. For nearly 20 years, MacArthur has invested in training, research, and policy engagement to reduce the dangers posed by weapons of mass destruction, and we plan to deepen our commitment in the years ahead.

Whether it is a debate about military intervention to counter proliferation, the development of new measures to prevent bioterrorism, or plans to deploy weapons in space, MacArthur supports work that seeks to identify the right questions, stimulate vigorous discussion informed by the best available evidence, and nurture fresh thinking in the development of new policy approaches. We believe that governments, markets, and civil society will all play a role in meeting humankind's greatest challenges. We understand that progress is uneven, and that grave dangers persist, including the possibility of a catastrophic use of the world's worst weapons. But nothing is inevitable. Humankind has choices.

MacArthur itself is not on the frontline working to inform these choices. We rarely influence a public policy problem in the very short run, certainly not acting alone. We do, however, enable others, with information, with resources, with access to influence. The following pages describe some of the best work we support and our strategy in three important areas: cultivating an independent global community of science and security experts; stimulating new cooperative approaches to biological security dangers; and supporting policy research to address proliferation issues and secure the future uses of space.

We hope the work described in this newsletter will yield insights and ideas that will contribute to a more peaceful and secure world. We believe results generated by this work will help answer key questions in a new and volatile period in international relations: How can new frameworks of cooperative security be advanced that recognize the importance of international norms and values? How can we take advantage of the growing international economic and political integration and the emergence of global governance structures to devise new and creative mechanisms to prevent catastrophic violence? How can catastrophe be prevented without unnecessarily compromising state sovereignty, civil liberties, commercial enterprise, and the pursuit of legitimate scientific inquiry?

Can the efforts of those whose work we support make a difference? In the end, we are optimists deep to our core, believing as we do that working together — through research, discussion, advocacy, and common action — we can make a difference.

Jonathan F. Fanton
President

About this newsletter
Each issue of the MacArthur newsletter will highlight one area of the Foundation's grantmaking. Areas selected will reflect the Foundation's overall approach to identifying and carrying out activities to address specific problems. More information about the Foundation and its grantmaking can be found online at www.macfound.org.

In its grantmaking, the John D. and Catherine T. MacArthur Foundation develops and follows a set of strategic, nonpartisan priorities related to a selected problem, holding itself accountable for results, over time. This requires defining problems and approaches, and continuously refining strategies as conditions and opportunities change. The Foundation reaches out to individuals and organizations it perceives to be the most promising and effective, and provides support over a sufficiently long period of time.

About the Foundation
The MacArthur Foundation is a private, independent philanthropic institution that makes grants through four programs. The Program on Global Security and Sustainability supports organizations engaged in international issues, including peace and security, conservation and sustainable development, population and reproductive health, and human rights. To aid in this grantmaking, the Foundation maintains offices in Mexico, Nigeria, Russia, and India. The Program on Human and Community Development supports organizations working primarily on national issues, including community development, regional policy, housing, public education, juvenile justice, and mental health policy. The General Program supports public interest media and the production of independent documentary films. The MacArthur Fellows Program awards five-year, unrestricted fellowships to individuals across all ages and fields who show exceptional merit and the promise of continued creative work. With assets of about $4.5 billion, the Foundation makes grants totaling approximately $180 million each year.

Cultivating a new generation of experts on science and security issues

Above: A former Soviet missile base in the Ukraine is dismantled in 1997. As issues of verification become more complex and politically charged, the expertise of independent scientists can provide critical information for this debate.

Right: What homeland security programs represent the most cost-effective investment? Independent scientists and engineers can help inform those decisions.

Front cover: North Korea's spent nuclear fuel rods, photographed (through a sheet of glass) by a South Korean news agency in 1986 and released to the West in 2003.

The Cold War and its aftermath galvanized an entire generation of American scientists to enter the policymaking arena. Through their roles as independent researchers and government officials, these scientists brought their considerable technical expertise to bear on a vast range of security and defense issues that shaped and eventually helped to end the superpower standoff.

Since then, however, the number of scientists outside of government conducting research on security issues has decreased markedly.

The consequences are considerable in an age when terrorism and new technologies for mass destruction — including biological pathogens and weapons for use in space — threaten global security.

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Policymakers are confronted with new and often poorly understood dangers that may require immediate action. Terror networks able to transport weapons and dangerous technologies across borders, and threats to civilian infrastructure are just a couple of the emerging policy challenges.

To attract new scientific and engineering talent to security policy research and encourage greater engagement with policymakers, the MacArthur Foundation has launched a $50 million Science, Technology, and Security Initiative. Over the next six years, the Initiative will provide funding for leading U.S. universities to create ten new tenured faculty positions for scientists and engineers, and 100 positions for mid-career scientists and postdoctoral students. *(See sidebar page 6)*

The Initiative also seeks to add as many as 50 analysts to the community of experts providing authoritative analysis outside the U.S. through grants to three institutions in Russia, two in China, and one in the United Kingdom.

"Science divorced from policy is inadequate, and policy that ignores good science is irresponsible," says Frank von Hippel, co-director of the Program on Science and Global Security at Princeton. "This is the best opportunity in a generation to create a new critical mass of independent science and security experts."

"Even as security issues become more complex politically, they have an ever-increasing scientific component," says Christopher Chyba, co-director of the Center for International Security and Cooperation at Stanford. Chyba says he fears that "as a nation, we're not well enough prepared. We have a rich collection of scientific advisory bodies that draw from the academic and industrial communities, need people who are capable of informing the arguments with independent analysis."

While many U.S. universities worked on arms control and nuclear weapons-related analysis during the Cold War, the collapse of the Soviet Union signaled to many young scientists that security studies was a dead-end field. Their institutions followed suit: By most accounts, the appointments funded through the Initiative are the first in the science and security field at a U.S. university in almost two decades. "At many universities, anyone interested in policy issues got a very clear message: Why aren't you in the lab?" says Judith Reppy, associate director of the Peace Studies Program at Cornell. "Anyone who wanted to pursue policy issues from an independent viewpoint faced an extremely uncertain career path. And people do have families to feed and mortgages to pay, so there were real life considerations involved." Reppy says the creation of more institutional homes and tenured positions through the Initiative "completely changes the landscape for any young person thinking about an academic career in science and security policy issues."

Thinking that goes beyond the borders of the United States is an important element of the newly funded work. "You can make much more progress when you have people brainstorming in more than one capital," says von Hippel, whose Princeton program has a history of attracting young scientists from countries such as India, Pakistan, and China. With transnational terrorism rendering the old "state vs. state" security model obsolete, there's a critical need to build a truly international community of independent scientists who can engage in the free exchange of ideas. But there's seldom funding at the local level to foster the kind of expertise that is fundamental to cooperation.

"In Russia, a culture of public discussion of security policy is relatively new," says Pavel Podvig, a physicist and missile defense specialist at the Center for Arms Control Studies at the Moscow Institute of Physics and Technology. "Outside funding allows us to expand our training program, but it has an even greater impact. It serves as an endorsement of independent expertise — which is important in societies where people wonder if they can really have an impact on government's decisions."

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—Frank von Hippel
Princeton University

Supplying technical information and analysis

In August 1997, the U.S. government accused Russia of breaking the nuclear test-ban treaty. As proof, it pointed to seismic signals that seemed to indicate a nuclear explosion at a site once used for Soviet testing. Nongovernmental seismologists, however, examined the data and published findings indicating that the signals were actually caused by a nearby undersea earthquake. The U.S. government withdrew the allegation. "If the government hadn't been informed by independent scientists, there would have been new pressure on the U.S. to resume its own testing," says von Hippel.

Nongovernmental expertise also can be brought to bear on issues such as weapons verification. "What if North Korea says, 'Yes, we'll get rid of our nuclear capability'?" says von Hippel. "There are bound to be arguments about how it should be done, or even that verification isn't possible, and that regime change is the only way to go. You but in some prominent cases we've taken advantage of them less and less. Encouraging new talent is a step in the right direction."

The Initiative has three main objectives: supplying technical information and analysis on security issues available to policymakers; meeting new demands for information and advice; and translating research into policy options.

Top left: Academia was engaged in ongoing, substantial discussions during the Cold War. The Science, Technology, and Security Initiative will help reopen those channels of communication.

Above: The vulnerabilities of infrastructure and civil systems such as dams have become critical considerations in the post 9/11 security environment.

Director's Message

Authoritative scientific analysis of national and international security issues is necessary for sound policy-making. But scientific knowledge alone will not be sufficient to address some of the most fundamental security and foreign policy issues of this period in international affairs.

In addition to the activities described in these pages, the Foundation also seeks to support new inquiry and the development of new security frameworks. We understand the need for new answers to old questions about the use of force, about how the U.S. can use its power to enhance its security, and about the ways to control and constrain nuclear weapons, dangerous missile technologies, and biological pathogens, among many other questions. We will be identifying a range of projects that address these questions in innovative ways.

And because scientific knowledge and new frameworks are of little use without policy action, we will continue to support channels for information exchange between policy researchers and policymakers. We will report on the results of these efforts in future issues of the newsletter.

Kennette Benedict
Area Director
International Peace and Security
The John D. and Catherine T. MacArthur Foundation

Work of U.S. universities funded by MacArthur's Science, Technology, and Security Initiative

Carnegie Mellon University, Engineering and Public Policy Program
Research on chemical weapons control, nuclear infrastructure security in China and South Asia; issues related to societal vulnerability to terrorist attack, including protecting mail systems, cyberspace, electrical grids, and air transportation; providing for bioterrorism surveillance; civil liberties considerations in the use of biometric identification technology. **www.epp.cmu.edu**

Cornell University, Peace Studies Program
Research on the full range of dangers posed by nuclear weapons and components and the new scope of weapons proliferation; safety and security of the former Soviet nuclear complex; ballistic missile defense; biological weapons development; technological change in weaponry; new methods of surveillance; cyberwarfare. **www.einaudi.cornell.edu/PeaceProgram**

Georgia Institute of Technology, Sam Nunn School of International Affairs
Research on alternative livelihoods for scientists from the former Soviet Union; a range of issues associated with weapons of mass destruction, including safeguarding dangerous materials, controlling the spread of advanced delivery systems, and protecting nuclear information systems from attack. **www.inta.gatech.edu**

Harvard University, Belfer Center for Science and International Affairs
Research on issues at the nexus of science, technology, and public policy; full range of nuclear security and nonproliferation issues, including nuclear smuggling, international standards for the protection of fissile material, cooperative threat reduction programs. **bcsia.ksg.harvard.edu**

Massachusetts Institute of Technology, Security Studies Program
Research on technology-related international security problems, including ballistic missile defenses, nuclear arms reductions, fissile materials, and the future uses of space; nuclear materials management; nuclear cooperation around early warning; defense budget policy and analysis. **web.mit.edu/ssp**

Princeton University, Woodrow Wilson School of Public and International Affairs
Research on the full range of dangers posed by nuclear weapons; biological and chemical weapons control; cyberwarfare; biotech dangers; future of U.S. nuclear energy; missile defense testing and deployment; cooperative threat reduction in outer space. **www.wws.princeton.edu**

Stanford University, Center for International Security and Cooperation
Research on nuclear weapons and material security issues, including investigations of nuclear smuggling and a campaign to improve international standards for the protection of fissile material; biological weapons and terrorism risk assessment and response; container security; research reactor security. **cisac.stanford.edu**

University of Illinois, Program on Arms Control, Disarmament and International Security
Research on chemical and biological agents, disease vectors, dual-use technology for bioterrorism surveillance and response, nuclear materials management, nondestructive nuclear testing technologies, protection of aerospace systems, cyberwarfare, and cyber security. **www.acdis.uiuc.edu**

University of Maryland at College Park, Center for International and Security Studies
Research on advanced cooperative security practices including information sharing, military-to-military exchange, risk reduction, arms control in outer space, control of dangerous pathogens, biological weapons control. **www.cissm.umd.edu**

In China, the time is right to encourage more international dialogues. A growing number of top scientists who once worked for the government are now at Chinese universities and are seeking to be part of a larger intellectual community. "A security order no longer dominated by the superpowers also offers opportunities for global dialogues that will inform a consensus on future world orders," says Li Bin, director of the Arms Control Program at Tsinghua University in Beijing, an Initiative grantee.

Meeting new demands for information and advice

Traditional frameworks of arms control, deterrence, and containment are being challenged by transnational terrorism. Advances in biology, chemistry, nuclear and aerospace engineering, and computer science are making new weapons possible.

The growing threat of biological weapons, for example, is a particular focus at Stanford University, where researchers are using the tools of risk assessment to quantify such factors as how fast an infection can spread through individual contact. It is information that could prove invaluable to political leaders in formulating more realistic civil defense and medical response plans.

Along with this research, Stanford has also put together workshops for first responders and journalists in the Bay Area. "It's myopic to think about policy impact at solely the international and national level," Chyba says. "If there's a dirty bomb attack, we don't want critical people spending the first hour on the phone trying to get a grasp of the problem."

With fears of terrorism and unconventional attacks at an all-time high, vulnerabilities in American civil systems — transportation, communications, public works — are seen as critical aspects of security. To orient more young engineers toward building better protections into those systems, Carnegie Mellon researchers are looking at a wide range of issues, including securing the mail system and making airplane guidance systems less susceptible to tampering from electronic devices on the ground. M. Granger Morgan, who heads the Department of Engineering and Public Policy at Carnegie Mellon University, points out that dual-use technology also holds promise. One researcher is looking at how a more effective version of biosensor technology, which is already used in screening for inadvertent water supply contamination, might be used to sound the alarm of a biological attack before thousands are sickened. Another project is a cost-benefit analysis of implementing more distributed generation systems — in essence, breaking down the power grid into small, localized power sources. Very small generators already comprise more than 10 percent of total capacity in parts of the Netherlands, and if larger units are included, distributed generators make up as much as 70 percent in some locales. Such systems are more energy efficient and can make electric power systems more robust, whether the disruption is intentional or the kind of accidental cascading failure that produced the massive blackout of August 2003.

Translating research into policy

Along with strengthening university-based research centers, the Initiative is making grants to a number of programs, such as the Federation of American Scientists and Union of Concerned Scientists, designed to help move scientific and technical analysis into the policymaking process. "We can't possibly afford all the measures being proposed — how do we choose the most cost-effective places to make investments? There's really a need for good, day-in-day-out analytic input," says Granger Morgan.

Two new Washington-based projects have also been launched through the MacArthur Foundation Initiative to help do this: the Jefferson Science Fellows program *(see sidebar below)* and a new Center for Science, Technology and Security Policy, which will operate under the auspices of the American Association for the Advancement of Science (AAAS).

"Academic research often moves at its own pace and imperative, while policymakers need specific information rapidly from sources they trust," explains Alan Leshner, CEO of the AAAS. The center will serve as a proactive communications portal for science and government, identifying policy issues for researchers to pursue and accelerating the translation of academic analysis into useful policy advice.

Encouraging more scholars and programs in peace and security is an important step in dealing with the 21st century's new security threats. "The kind of folks we're looking for are rare, but not all that rare," says Carnegie Mellon's Morgan. "I'm hopeful that we're going to convince people that clear analytic thinking does make an impact on the policy process. It doesn't always have the impact you'd like. But it is worthwhile doing, and it does make a difference. ■

Above: This Pakistani nuclear missile has a range of 900 miles. The emergence of new nuclear states and the global black market in nuclear weapons will remain poorly understood dangers without the availability of objective analysis and information.

Jefferson Science Fellows join State Department

In 1999, the National Research Council released a report documenting the State Department's decade-long decline in scientific literacy and called the decline a near crisis. The origin of the problem lay in the gradual attrition of scientists from policy-advising positions.

"Scientists working primarily on policy tend to get disconnected from advances in their fields and lose their professional scientific currency," explains chemist and physicist George Atkinson, Ph.D., who serves as Secretary of State Colin Powell's science adviser. "The rapid pace of advances in recent years — particularly in biotechnology and nanotechnology — has made it increasingly difficult for scientists who want to bridge the science-policy gap. Yet policymakers need their input now more than ever."

To more effectively integrate the science and technology community into the formulation and implementation of U.S. foreign policy, Atkinson conceived and developed the new Jefferson Science Fellows program. Funded primarily by the MacArthur and Carnegie foundations, the program is a partnership involving university-based scientists, scientific societies, private foundations, and the U.S. government.

As part of a pilot program, five tenured academic scientists active in research will join the State Department each year for one-year assignments in Washington, D.C., or abroad, followed by five years of being on call for short-term assignments. Each Jefferson Science Fellow could address a specific security issue, such as weapons of mass destruction, terrorism, energy, water, or infectious disease.

In keeping with the Science, Technology, and Security Initiative's mandate to link the supply and demand sides for scientific data, the fellows will generate pertinent research, translate that research into language understandable by policymakers, and respond to policymakers' needs for new information.

Having scientists work side by side with policymakers will enable the latter to move "from a reactive mode to an anticipatory mode," says Atkinson. "For the past decade, policymakers have been getting their science news from the press along with the general public, which may inaccurately anticipate scientific solutions to major issues before they are possible — the use of biometrics to identify terrorists is one example. Policymakers will be well-served by having someone who can help them understand what science and technology can, and cannot yet, do."

For their part, the fellows will learn a more practical, participatory way of working that will bode well for future engagement with government officials. "Scientists are used to deciding on a direction and then proceeding, but in government you have to share ideas and get consensus," says Atkinson. "When they return to their university posts, the fellows will help the academic community understand more clearly how government really works."

Visit the Foundation's website, www.macfound.org, for an electronic version of this newsletter, including direct links to all sources and more information about MacArthur efforts related to international peace and security.

Containing the biological threat

The threat posed by biological agents is slowly gaining recognition as one of the most challenging threats to international security. Thousands of clinical and diagnostic laboratories around the world have access to pathogens, and advances in biotechnology make possible the creation of novel and synthetic strains capable of overcoming both natural and vaccine-induced immunity. In recent years, Congress has had to deal with anthrax and ricin scares within its own offices. The prevention of bioterrorism has become a major priority of the Department of Homeland Security.

Reducing the biological threat requires not only new frameworks for security and enforcement, but also new partnerships between the life sciences and security communities, and new ways of thinking about the freedom of scientific research and publication. And because contagions have no regard for borders, any effective strategy must be international in scope.

With MacArthur Foundation support, three projects are engaged in international efforts to build awareness about the bioterror threat and lay the groundwork for responses ranging from prevention to enforcement. The project leaders are John Steinbruner, director of the Center for International and Security Studies at the University of Maryland; John Hamre, president and CEO of the Center for Strategic and International Studies (CSIS) in Washington, D.C.; and Barry Kellman, law professor at DePaul University in Chicago and director of DePaul's International Weapons Control Center.

"What we're trying to do in the realm of biological weapons is a microcosm of the enormous geopolitical change underway," says Kellman. "We're shifting from security being an issue among states to one that is international in the most literal sense — the international community working together to protect itself against the bad guys. It goes to the very core of what it means to live in a global society."

Redefining oversight

In February 2001, Australian genetic engineers announced that in looking for alternatives to toxic pesticides used in mice eradication, they had inadvertently transformed mousepox into a disease so virulent that it killed even those subjects with resistant immune systems. Two years later, scientists at Saint Louis University reported they had deliberately developed an even faster working version of killer mousepox, defending their work as research that could lead to developing new human defenses to "designer" versions of smallpox and other viruses.

"For years, scientists believed they could do no worse than what nature has done," John Steinbruner says. "Now, thanks to the remarkable momentum in molecular biology, we know we *can* do worse than nature — but we're not organized to handle the consequences." Regulatory practices, he argues, no longer reflect the realities of scientific discovery, the extended implications of knowledge generated, or the rapid and global distribution of biomedical research.

The first line of defense, Steinbruner believes, must be a universal and much more systematic process of prudent oversight for fundamental research. He and his colleagues are proposing a global, transparent oversight process based on the tenets of peer review. Independent groups composed of both scientists and public representatives — "so that judgments are based on social consequences, not just scientific merit" — would carry out the process. These groups would be charged with international licensing and monitoring of individuals and research facilities involved in extremely dangerous research activity. They would also determine and enforce the rules under which the results of these projects would be disseminated.

Steinbruner acknowledges that there are very limited precedents for the kind of international oversight and consistency he's calling for, and that even jurisdiction that reflects independent, informed, and broadly representative scrutiny will confront the legitimate fears about interference in the process of scientific discovery. But the current state of affairs, he says, is no longer tenable. "We need consequential oversight and the changing of some highly cherished attitudes. But we have to impose some constraints on ourselves — and I'm reasonably optimistic that there will be a constructive response."

For more information on biological weapons:

The Center for Strategic and International Studies Biological Threat Reduction Initiative
www.csis.org

The Center for International and Security Studies at the University of Maryland
www.cissm.umd.edu

International Weapons Control Center, DePaul University
law.depaul.edu/institutes_centers/ihrli/programs/weapons_index.asp

Harvard-Sussex Program on CBW Armament and Arms Limitation
www.sussex.ac.uk/spru/hsp

Center for Arms Control and Non-Proliferation Working Group on Biological and Chemical Weapons
www.armscontrolcenter.org

Stanford University Center for International Security and Cooperation
cisac.stanford.edu

"Now we know we can do worse than nature — but we're not organized to handle the consequences."

—John Steinbruner
University of Maryland

Above: Members of the Pentagon press corps practice putting on gas masks in 2003 as part of preparedness training for a biological or gas attack. Prior to 9/11, the long-standing threat posed by biological weapons had garnered little public, government, or even scientific attention.

Left: Protecting the public against biological terrorism will require unprecedented, transnational collaboration among the life sciences community, law enforcement, public health organizations, and governments.

Inset, left: The ready availability and relative low cost of pathogens such as anthrax make the risk of proliferation much higher than with nuclear weapons.

Building bridges

Much of CSIS's work focuses on building bridges between life scientists and government security officials through workshops and consortiums. In doing so, John Hamre says CSIS is mobilizing "the idealism and openness of the life science community itself."

A successful effort to galvanize scientists is the best way to stigmatize the production of biological weapons and encourage the reporting of illicit activities, Hamre says. But it means overcoming a significant lack of shared history. There has been no equivalent of the Manhattan Project to rally the community and nothing akin to Hiroshima to raise a sense of alarm. "Unlike the physics community, the life sciences community has never been deeply connected to national security issues," he says. "There's been a gap in technical consciousness and a lack of vitality surrounding the issue to motivate passions."

But Hamre believes there is great potential to involve the life sciences community in a three-pronged approach to reducing the biological weapons threat: limiting the availability of technology and materials; stigmatizing the behavior of malicious actors; and preparing public health response and recovery to minimize the impact of biological weapons. In January 2003, CSIS and the National Academy of Sciences jointly held a conference on developing voluntary restraints for the publication of so-called "sensitive unclassified information" — research that could be used as blueprints for biological weaponry. To further strengthen the voices of scientists, Hamre is urging eminent researchers to form an advocacy group, Scientists for a Biological Weapons Free World. Working with the World Health Organization, the U.S. Department of Health and Human Services, and other organizations, Hamre is also looking at ways to increase preparedness at both the local and international levels.

Bio-criminalization and enforcement

In most countries, it is still legal to make a biological weapon — to propagate pathogens and prepare a device for dissemination. Encouraged by what he calls the "growing infrastructure of international law," Barry Kellman and his colleagues are developing a "Transnational Strategy for International Bio-Criminalization," which confronts issues of biological threat reduction from legislative and enforcement perspectives.

In a first-ever global survey of national legislation relevant to preventing the misuse of biology, Kellman is looking at what laws exist to: restrict access to pathogens and sophisticated biological equipment; license entities and individuals engaged in biological research or the production of pharmaceuticals; monitor and report biological research or production activities; and prohibit unauthorized development or release of biological agents. "For many countries, there aren't laws relating to bio-terrorism," says Kellman. "You have to go through a lot to see what's not there." Identifying legislative gaps, Kellman says, is the first step in spurring the development of new institutional structures.

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Working toward security in space

MacArthur Foundation
Rethinking Global Security

The thousands of satellites orbiting the earth — providing everything from global weather mapping to telecommunications to military reconnaissance — would suggest that outer space is shared by everyone for the benefit of all societies. Increasingly, however, space is being viewed as a vulnerable front that could be the next battlefield. The 2001 report of the Rumsfeld Commission, chaired by Secretary of State Donald Rumsfeld, warned of the threat of a "Space Pearl Harbor." Subsequent Air Force doctrine clearly allows for the deployment of space-based weapons to achieve "full-spectrum dominance" in space.

Plans to develop space weapons demonstrate a new way of thinking about the cosmos, says Bruce DeBlois, a retired Air Force officer and recently an adjunct fellow of the Council on Foreign Relations. "Although there is no formal treaty or law that prohibits weapons in space, all nations have previously shown restraint, and there is an international precedent for keeping space free of weapons," he says. "During the Cold War, the U.S. and Russia tested anti-satellite capabilities, and both countries unilaterally agreed not to go further. But now there are several factors propelling us toward weapons in space: First, some technological hurdles have been overcome. Second, there is only one superpower. And third, the U.S. military is engaging in global applications of satellite technology in its operations."

The last frontier

Although there are no weapons in orbit, space is heavily militarized, says Susan Eisenhower, president of the Eisenhower Institute. The military campaign in Afghanistan used four times the amount of satellite bandwidth than the previous campaign in Kosovo — which was ten times the amount of information that U.S. military satellites conveyed during the Gulf War. The war in Iraq showed a sharp increase in the use of satellites for reconnaissance, communication, navigation, and targeting of weapons.

"The U.S. has billions of dollars of civilian and military investments in space," says Eisenhower. "The space station alone is in the $20 billion category, and it's only one of a vast number of satellites in orbit. When you have such a huge investment, you have to ask: How secure are our assets in space?" The question is made more urgent by the lack of an internationally accepted code of conduct in space, Eisenhower says. "In Antarctica, the seas, and other areas considered mutually shared by the international community, we have legal treaties and agreements. But space is the last unregulated frontier."

The debate on space weapons, diverted by anti-terrorism discussions following September 11, has begun to reemerge, says Gordon Adams, co-director of the Security Space Forum at George Washington University. "This is a highly technical issue, and very few people know anything about it. Those who do are physicists, engineers, Air Force specialists — and their knowledge curve is way ahead of national security advisors, members of Congress, and journalists. We need to understand the implications of, and alternatives to, space weapons, because this is a train that is rolling down the track. Military spending is going up, programs are being developed; we're seeing the biggest push since Star Wars."

Bruce DeBlois, Susan Eisenhower, and Gordon Adams each direct projects funded by the MacArthur Foundation that are broadening the space weapons debate beyond a small circle of experts and creating new opportunities for policymakers and others to engage on issues of space security. Both the Council on Foreign Relations and George Washington University have convened people — from military planners, security analysts, researchers, and policymakers to scientists, industry representatives, and journalists — to consider all the implications of and alternatives to space weapons. The Eisenhower Institute is building an international network of space policy practitioners and developing a space policy framework for managing and promoting security in the new frontier of outer space.

"Right now our technological capacity is way beyond our understanding, but the space weapons program is growing."

—Gordon Adams
George Washington University

Considering the issues

Advocates of space-based weapons advance several primary arguments, says DeBlois. "The first is drawn from the seas: Where trade goes, piracy follows. The U.S. has a huge economic interest in space, just as many nations did on the seas 300 years ago, and we must be prepared to protect our commercial interests. When assets are wide open, they need to be protected.

"Second is an argument based on inevitability and inertia. If there's no clear policy to keep weapons out of space, and someone tells a military planner that a space laser can give him the high ground, he's going to build it into his plan; that's his job.

"Then there's the straightforward military perspective: The U.S. has secured military superiority in space, but other countries are developing the same kind of intelligence gathering that could threaten our systems. In Desert Storm, if Iraq had had access to an intelligence satellite, they could have seen the left hook coming. If a U.S. military officer has troops on the ground and lives at stake, he's going to want a space-based system to knock out Iraqi intelligence; otherwise he feels his hands are tied."

For opponents of space weapons, one central concern relates to the potential to incite an arms race. In response to the U.S. space program, the world's other space powers already are enhancing their military space capabilities, says Susan Eisenhower. The European Union is developing a global positioning system that could be used for military purposes; Russia is revitalizing its own military space navigation system; and Russian entities have sold GPS-jamming equipment to U.S. adversaries. The number of space-faring nations continues to grow, with China being the third country to have a manned space program and India being the next likely candidate.

Once we put weapons in space, other nations may feel compelled to follow, says DeBlois. And adversaries who don't have access to space may seek parity through other means, such as terrorism or weapons of mass destruction. Any government can purchase satellite jamming equipment, and those with both ballistic missiles and nuclear weapons could theoretically incapacitate all space satellites in low earth orbit that are not designed to withstand a nuclear blast, he says.

Not all the threats from space weapons are related to the military, says Eisenhower. "We think of all this hostile activity happening in space, but in fact some of the biggest threats could be terrorists attacking satellite ground stations." In addition, "space debris" orbiting the globe could become a more severe problem. "If we destroy a satellite in space, we create millions of smaller satellites," says DeBlois. "This would produce millions of projectiles traveling in low orbit at 17,000 miles an hour. Not too long ago, the impact of a small fleck of paint almost blew a hole in one of our space shuttle windows. Imagine how this could snowball."

(continued on back page)

For more information on space weapons:

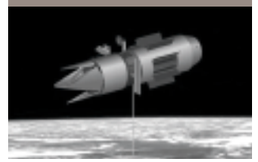
Eisenhower Institute
Future of Space Program
www.eisenhowerinstitute.org

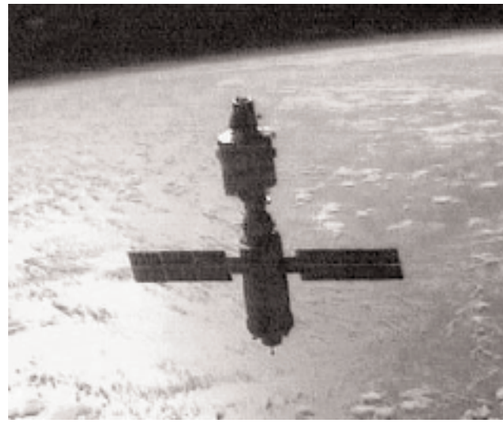
Council on Foreign Relations
www.cfr.org

George Washington University Security Space Forum
www.gwu.edu/~spi/spaceforum

Henry L. Stimson Center
Weaponization of Space Project
www.stimson.org

University of Maryland
Center for International and Security Studies
www.cissm.umd.edu





Above, inset: NASA illustration of a U.S. space-based "laser reboost."

Left: Artist's rendition of a U.S. space-based "kinetic kill boost phase interceptor," which would be designed to destroy missiles and satellites.

Above: The international space station, shown silhouetted against the northern Pacific Ocean, is only one of a vast number of satellites orbiting the earth.

biological threat/continued

At the same time, Kellman is convening workshops for diplomats, national and international law enforcement, public officials, and bio-research regulators to raise awareness of bio-criminalization and discuss challenges of enforcing current and future legal restrictions on bioterror. "I think law enforcement officials can do an enormous amount, but prior to this they haven't been engaged in the policymaking process or asked to work with the scientific community and the pharmaceutical community," Kellman says. "It's still an anarchic environment, but bringing these people together has been far more beneficial than I could have imagined." ■

space weapons/continued

For DeBlois, the most compelling rationale against space weapons is that they will make the U.S. more vulnerable. "We have more to lose than anyone else," he says. "Two-thirds of the systems in space belong to the U.S. If we open that frontier to weapons, we invite conflict in a sanctuary that has given us dominance for 40 years. These weapons are not hard to counter. They are totally exposed in space." In addition, the cost is huge, says DeBlois. "It's easy to conceive these plans, but there are huge technological hurdles and a rich history of failed expectations in space programs. And it still takes $10,000 a pound to get something into space." A significant space weapons capability, he says, would cost more than $1 trillion — more than twice the 2003 military budget.

"It's not possible to spend money on everything," says Gordon Adams. "That raises the question of choice. And before we make a very expensive choice, we must assess all the practical, ethical, and technological issues associated with it. Right now our technological capacity is way beyond our understanding, but the space weapons program is growing. We need to be ready when the issue swings back in the public and Capitol Hill consciousness. Because the first question is going to be: What are we buying with all this money — and what are the risks?" ■

Rethinking Global Security

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