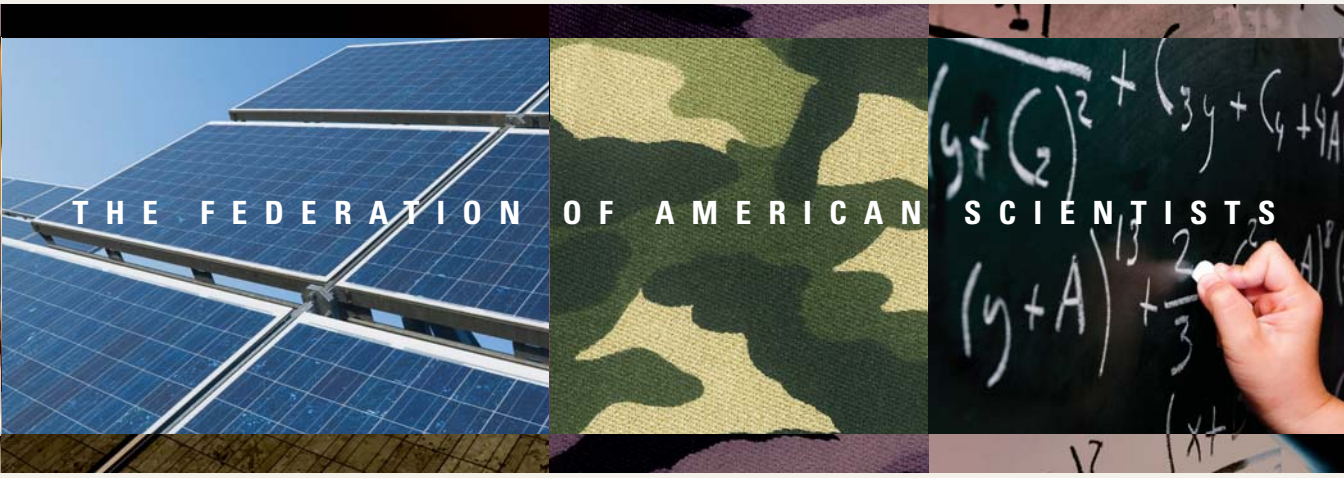
2007 ANNUAL REPORT

FAS



THE FEDERATION OF AMERICAN SCIENTISTS

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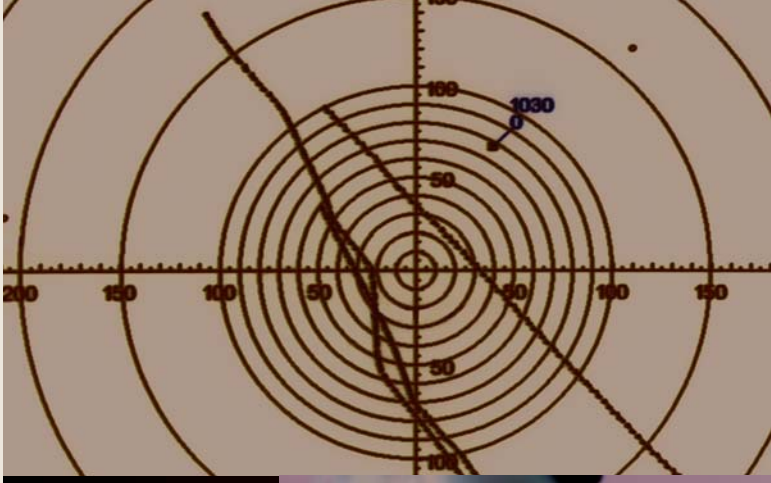
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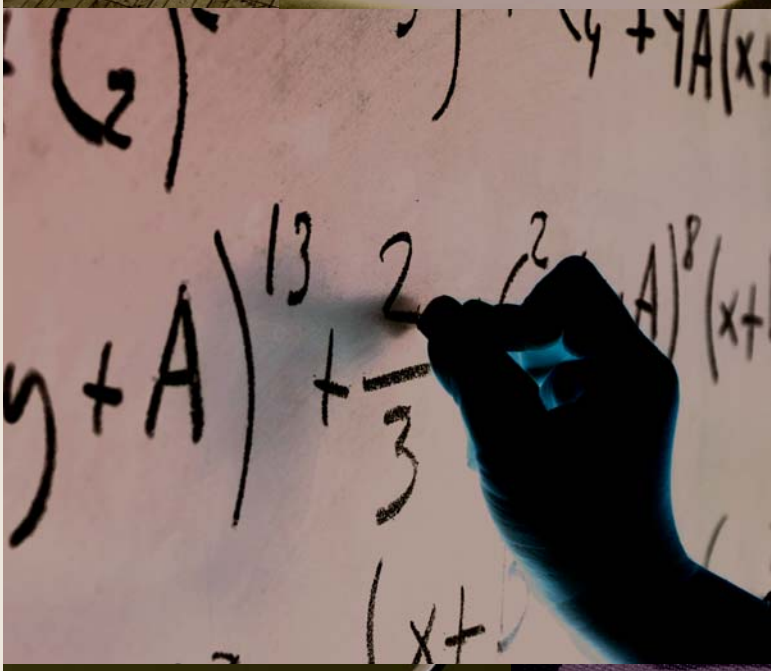

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ABOUT FAS

The Federation of American Scientists (FAS) was founded in 1945 by scientists who had worked on the Manhattan Project to develop the first atomic bombs. These scientists recognized that science had become central to many key public policy questions. They believed that scientists had a unique responsibility to both warn the public and policy-leaders of potential dangers from scientific and technical advances and to show how good policy could increase the benefits of new scientific knowledge. FAS is a 501(c) 3 non-profit organization.

With 68 Nobel Laureates on its Board of Sponsors, FAS provides timely, nonpartisan technical analysis on complex global issues that hinge on science and technology. Priding itself on agility and an ability to bring together people from many disciplines and organizations, the organization often addresses critical policy topics that are not well covered by other organizations. FAS today has major projects in nuclear nonproliferation, bio-security, conventional arms transfers, government secrecy, learning technology, and energy and environment, focusing on construction technology.

PROGRAM AREAS

THE STRATEGIC SECURITY PROGRAM

The Strategic Security Program pursues projects that can reduce the threat to the United States and the world from biological, chemical, conventional, and nuclear weapons. The U.S. confronts a broad range of threats in a security environment that has changed dramatically since the end of the Cold War. Policymakers working on security issues must master an increasingly sophisticated set of technical issues and need ready access to the relevant facts and analysis. FAS continues to give high priority to projects to reduce the number and role of nuclear weapons, secure existing weapons and materials, strengthen international non-proliferation regimes, and guard against the spread of dangerous technologies to unreliable states and terrorist groups.

NUCLEAR NON-PROLIFERATION PROJECTS

Many of the assumptions behind current U.S. nuclear weapons policy make little sense seventeen years after the Cold War. In the absence of a major public debate over the issue, we are witnessing a program that is for all practical purposes on auto-pilot. This has created an open-ended, indefinite, multi-billion dollar commitment to modernize the nuclear weapons complex, resume production of new nuclear weapons to replace the entire arsenal, and maintain a stockpile of thousands of nuclear weapons, forever. FAS plans to change that by initiating a public discussion about the future of U.S. nuclear weapons.

Specifically, FAS played a key role in helping a bipartisan Congressional effort to block funding for the Robust Nuclear Earth Penetrator (RNEP) or "bunker buster." Using public data, FAS was able to show that this device could not achieve its mission without creating catastrophic collateral damage. FAS introduced this analysis into the debate using printed reports, a computer animation, and numerous briefings for members of Congress and Congressional staff. The work was cited in the Congressional debate.

FAS completed a comprehensive technical and scientific review of the program responsible for insuring the reliability of the U.S. nuclear stockpile, *The Stockpile Stewardship Program: Fifteen Years On* (http://fas.org/2007/nuke/). The paper, co-authored by Ivan Oelrich and Anne Fitzpatrick, reviews the status of the three main projects of the Department of Energy's Stockpile Stewardship Program (SSP). The report describes how each experiment is supposed to work and identifies the problems that have been encountered – including budget overruns and delays.

FAS is also engaged in efforts to block dangerous plutonium reprocessing efforts. Three decades ago, the U.S. government opposed civilian reprocessing because of nuclear proliferation dangers. Recently, however, the Congress reversed this policy by requiring an accelerated schedule of decisions to use unproven reprocessing technologies.

Members of Congress have virtually no access to technical advice on nuclear questions except from representatives of the nuclear industry or national laboratories, both with clear vested interests in the administration's proposed Global Nuclear Energy Partnership (GNEP). Through one-on-one briefings, briefing books, journal articles and web-based materials, FAS is showing that plans for plutonium reprocessing raise serious nuclear proliferation dangers and are decades premature. Since January 2007, Vice President of the Strategic Security Program Ivan Oelrich has personally briefed more than 30 Congressional offices on the technology and engineering behind GNEP. Also, in February 2007, FAS organized a special session on GNEP at the annual meeting of the Association for the Advancement of Science (AAAS) in San Francisco, CA.

FAS was active in opposing the administration's proposed agreement for supplying nuclear materials to India because it threatened to undermine nonproliferation efforts while gaining no significant control over the Indian weapons program. The effort was supported by a letter signed by 37 Nobel Laureates and a well attended press conference. The Congress soundly rejected the administration's proposed legislation and approved the agreement contingent on a number of constraints on India's nuclear enterprise.

THE NUCLEAR INFORMATION PROJECT

The Nuclear Information Project (NIP) informs Congress, the news media, NGOs, and the general public on the world's nuclear weapons arsenals.

In November 2005, NIP called attention to a new emphasis by the Bush administration on preemption in a revised nuclear doctrine. The disclosure triggered intervention from the Senate Armed Services Committee and 16 Senators. Two months later the Joint Chiefs of Staff canceled the Doctrine for Joint Nuclear Operations that included preemptive nuclear strikes.

In December 2005, NIP disclosed that a new Global Strike command had achieved initial operational capability at U.S. Strategic Command. The new preemptive war plan CONPLAN 8022 in support of Global Strike includes nuclear weapons. In March 2006, FAS published the report *Global Strike: A Chronology of the Pentagon's New Offensive Strike Plan,* which documented the policy and planning leading up to the new Global Strike mission. This work led to the first-ever Global Strike hearing by the Senate Armed Services Committee on 29 March 2006.

FAS also obtained and published the first confirmation by the Defense Threat Reduction Agency that the Divine Strake chemical explosion scheduled to be set off at the Nevada Test Site in June 2006 was in fact intended to simulate the use of low-yield nuclear weapons against underground facilities. The resulting press coverage and congressional opposition resulted in the indefinite postponement of the test.

NIP has focused on China and signs that a nascent nuclear arms race is underway between the U.S. and China. To help defuse worst-case planning, debunk the most exaggerated claims about Chinese capabilities, and remind U.S. and Chinese decision makers about what is at stake, a joint FAS-NRDC report was published in November 2006 on Chinese nuclear forces. The publication reviewed China's nuclear weapons and documented widespread U.S. government exaggerations about Chinese capabilities and was subsequently presented at the 10th PIIC Beijing Seminar on International Security held in Xiamen and was also distributed to Congress, government officials, NGOs, and libraries.

The NIP also co-authors the Nuclear Notebook column in the *Bulletin of the Atomic Scientists* and the overview of world nuclear forces published by the *Stockholm International Peace Research Institute (SIPRI) Yearbook*. Both publications are among the most often cited for current numbers of nuclear weapons in the world and the latter is translated into Russian, Chinese and Arabic. The "Notebooks" are frequently referenced in reports by the Congressional Research Service.

"THE NUCLEAR INFORMATION PROJECT (NIP) INFORMS CONGRESS, THE NEWS MEDIA, NGOS, AND THE GENERAL PUBLIC ON THE WORLD'S NUCLEAR WEAPONS ARSENALS."

THE ARMS SALES MONITORING PROJECT

The Arms Sales Monitoring Project (ASMP) has raised awareness of, and shaped policy on, a range of issues related to the international arms trade and the threat posed by illicit small arms and light weapons.

The Small Arms Trade was published in November 2006 and provides an overview of the illicit arms trade written specifically for lay readers and policymakers. The book, co-written by ASMP Manager Matt Schroeder with analysts Rachel Stohl and Dan Smith, features a four-chapter history of the proliferation and control of man-portable air defense systems (MANPADS) – the first of its kind. It has received glowing reviews from the editor of Foreign Policy magazine and the former director of the State Department's Office of Export Controls and Conventional Arms Nonproliferation Policy.

The ASMP works closely with Congress and the executive branch to educate policymakers and shape policy. A briefing for Senate staff sponsored by the office of Senator Barak Obama featured an in-depth briefing on the proliferation and use of small arms by Iraqi terrorists and insurgents from a Defense Department official who had recently returned from Iraq.

After several years of consistent pressure from the ASMP, this year the President requested, and Congress is set to approve, a significant increase in funding for a critically important but chronically under-funded US program that secures and destroys surplus, obsolete and poorly secured weapons in foreign countries. The funding increase will allow the US government to address the threat from tens of thousands of vulnerable small arms and light weapons, including shoulder-fired, surface-to-air missiles.

Similarly, the ASMP advised several foreign government officials on small arms trafficking, MANPADS control, and regional military build-ups.

FAS will leverage and build upon these accomplishments to shape counter-MANPADS efforts, expand U.S. foreign assistance programs that secure small arms stockpiles and destroy surplus weapons, call attention to potentially problematic changes to U.S. export controls, and mitigate the threat from reckless arms transfers.

BIOLOGICAL AND CHEMICAL WEAPONS CONTROL

The FAS Biosecurity Project defines biosecurity challenges that face the nation, provides sound information and policy guidance, and advocates for overall preparedness for public health emergencies such as pandemics, disasters, and terrorism events.

For the last decade, FAS has maintained one of the largest archives of biosecurity information on the web, which is now organized in a user-friendly biosecurity resource page that includes an interactive biosecurity and biodefense research map. This interactive biodefense research map includes a comprehensive list of groups worldwide working in biosecurity. The online resource also features an extensive list of reports and legislation relating to biosecurity. The resource serves as an essential clearinghouse for biosecurity and bioterrorism information. (http://www.fas.org/biosecurity/resource)

In August 2006, FAS analyzed the information provided on the Department of Homeland Security's Ready.gov website and found it to be poorly organized, sometimes incorrect, and usually inadequate for preparing the public for emergencies. Emily Hesaltine, an intern from the University of Virginia, reorganized and corrected the information to launch reallyready.org. FAS,

and by extension the DHS, received tremendous attention for the work in the press and in the homeland security community. DHS is considering FAS's evaluation and recommendations in revising ready.gov.

FAS realizes that the scientific research community is struggling to recognize that some research, although undertaken for legitimate reasons and beneficial ends, could be misused for nefarious purposes. While the physics and chemistry research communities are keenly aware of this fact, the biological research community continues to operate in a collective state of denial despite many historical misuses of biological agents. This is perhaps because advanced biological research technology has not, to date, been implicated in specific instances of bioterrorism. It is essential that the research community understand and accept some responsibility for national security.

FAS is increasing awareness in the life sciences research community of dual-use research through a series of case studies. The online education series, funded by the Carnegie Foundation of New York, raises awareness in the academic research community that some of their work could be misused for the creation of biological weapons. FAS created the first comprehensive dual-use research curriculum for graduate students that includes video interviews with the scientists involved in dual-use research discussing their experiences. Each case study includes a historical perspective on the research being conducted, animation explaining the dual use experiments, and video clips of the scientists discussing the details and rationale for their work, their perspective on dual use research, and their experiences. The curriculum is provided for free online. (http://www.fas.org/biosecurity /education/dualuse/index.html)

The first case studies feature Eckard Wimmer's research with the polio virus, aerosol drug delivery research with David Edwards, and the infamous mouse pox virulence experiments performed by Ron Jackson. The modules currently are being used in classrooms around the country. FAS is also collaborating with the Federal Bureau of Investigation (FBI) to distribute DVDs of the modules at scientific meetings and conferences.

FAS held a DARPA-funded workshop on DNA synthesis technology in biosecurity. Representatives from the academic research community, the DNA synthesis industry and biosecurity experts discussed current capabilities for screening synthetic DNA orders against lists of known agents and toxins that could be used to develop a weapon. The group formulated recommendations that were conveyed to the National Science Advisory Board for Biosecurity working group on synthetic biology. In November 2006, every recommendation made at the FAS workshop was accepted by the NSABB.

FAS's approach has the potential to fundamentally reshape the way the biosecurity community interacts and capitalize on its strengths. The Biosecurity Program at FAS aspires to turn the biosecurity community into a model for cooperation and cohesiveness that can be applied to many other policy issues.

PROJECT ON GOVERNMENT SECRECY

The FAS Government Secrecy Project has worked for many years to ensure that critical national secrets are protected and also that Americans have access to information they need to participate in the democratic process. In 2006, the American Library Association recognized the FAS Government Secrecy Project and Project Director Steven Aftergood with the prestigious James Madison Award for championing, protecting, and promoting public access to government information and the public's right to know. The project was also awarded the Public Access to Government Information Award from the American Association of Law Libraries.

The Government Secrecy Project promotes public access to government information and fosters development of rational information security policies. The project collects and publishes hard-to-find government records of public policy significance and reports on them to a growing audience among the public, the press and government itself. Through research, advocacy and public education, the Government Secrecy Project challenges excessive government secrecy and promotes public access to national security information.

Restrictions on access to information are a perennial problem in national security policy. In recent years official secrecy has taken on

"ON AN ALMOST DAILY BASIS, FAS INTRODUCES HUNDREDS OF HARD-TO-FIND GOVERNMENT DOCUMENTS INTO THE PUBLIC DOMAIN."

whole new dimensions, encompassing a growing volume of classified information and many kinds of so-called "sensitive but unclassified" information. The Government Secrecy Project has worked successfully to illuminate, to challenge, and to actually help overcome some of the more extreme and unnecessary forms of secrecy.

During the summer of 2007, the project pointed out that the Office of the Vice President had failed to comply with reporting requirements of the Information Security Oversight Office. In response, the director of the Information Security Oversight Office took the matter to the Attorney General, casting a rare spotlight on the secrecy policies of this Vice President.

On an almost daily basis, FAS introduces hundreds of hard-to-find government documents into the public domain. Some of the more popular documents posted online include:

- A draft of a new U.S. military doctrine on counterinsurgency, which advances a concept quite different from the U.S. war in Iraq.
- A new human resources plan for U.S. intelligence that tries to come to grips with the "generation gap" facing intelligence agencies, and the competition they face from contractors.
- A U.S. Army manual presenting a new conceptual approach to national security classification policy.

FAS presented the most complete public access to records on the controversial trial of two former officials of the American Israel Public Affairs Committee, who were accused of improperly receiving and transmitting classified information. In a troubling precedent, this case is the first time that the unauthorized recipient of a "leak" has been prosecuted in this way.

The Government Secrecy Project also uncovered and published official resources on the Bush Administration's warrantless surveillance program, detention of suspected enemy combatants, domestic military intelligence activities, and much more. Hundreds of reports of the Congressional Research Service were published online this year that were not otherwise publicly available. Many of these were made available through the Secrecy News newsletter and blog.

Secrecy News is published 2 - 3 times per week and provides original reporting on news and emerging issues in secrecy policy, with links to source documents online. More than 12,000 people have requested to be on the distribution list.

FAS fought and won a Freedom of Information Act (FOIA) lawsuit against the National Reconnaissance Office (NRO), the agency responsible for development of intelligence satellites. The NRO had told FAS it did not have to comply with the FOIA request for unclassified budget documents, but a federal judge said it did and ordered the agency to comply. (An appeal by the NRO is pending.)

LEARNING TECHNOLOGIES PROGRAM

The Learning Technologies Program currently focuses on ways to use technology to improve how we teach and learn. Well paid, rewarding jobs in the U.S. depend on a workforce prepared to operate in a fast-paced, technologically sophisticated global economy. Doing this in an affordable way for a highly diverse population demands new approaches. But progress in improving education and training has been slow.

Simulations, search engines, computer games, and other information technology tools have revolutionized the way people acquire information. Finding ways to use them effectively in learning must be an essential part of meeting the nation's education and training challenges. These tools have the potential to make learning more productive for students of all ages and all backgrounds. Simulations and games, for example, allow users to make immediate use of a scientific or mathematical concept and solve authentic – if virtual – challenges.

The U.S. military and many corporations are already making heavy use of information technologies for training. But few formal educational institutions have been able to do so.

Computer hardware is not the problem. Thanks to aggressive public funding, even the poorest schools now have computer and internet access. While a "digital divide" remains in homes, it is closing rapidly as the price of computation continues to fall. It's difficult to find a home with a child that doesn't have a powerful simulation computer in the form of a video game machine.

The problem is the shockingly low level of investment in software that can use the computational power to implement new approaches to learning. Firms that have driven continuous waves of innovation in software designed for business or entertainment markets have not been able to justify the level of research, development, testing, and evaluation needed to make effective use of the new tools

in formal learning. Educational institutions are unique and difficult markets under the best of circumstances.

Effective use of new information tools will require extensive training for instructors and a significant amount of new thinking about how the process of instruction is managed. Conservative institutions will not consider such changes without strong evidence that the innovations proposed will work. And this evidence cannot be obtained without major RDT&E investments. This uncertainty about markets further increases the risk faced by privately financed innovators.

A technology with the potential to implement powerful, affordable, democratic new approaches to learning is being missed because private investors find the risk of development too high. This situation cries out for a major federal research investment.

The National Science Foundation does a superb job funding basic research on education – how the brain processes information, theories about how people learn. The Department of Education has a very small research budget and conducts virtually no research on learning technology. But no organization focuses on the tough, expensive process of converting these concepts into practical tools and evaluating their practical utility in helping diverse sets of learners acquire expertise in different areas. No organization is well prepared to draw on the enormous range of innovations that have been developed outside of formal academic settings to provide new services in entertainment (including games), user modeling, inquiry management, and other areas.

The absence of a coherent national program in research, development, and evaluation of learning technologies is one of the largest and most dangerous gaps in the federal R&D portfolio.

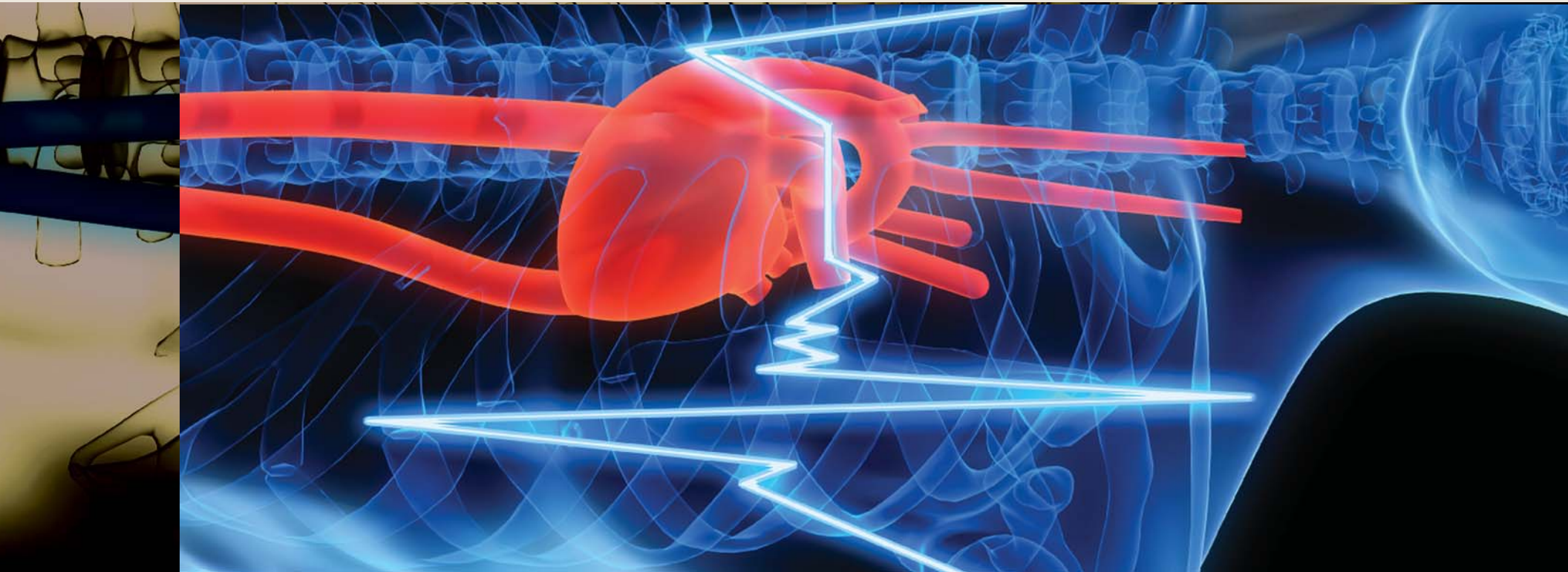
LEARNING SCIENCE AND TECHNOLOGY ROADMAP

FAS has been working actively to address these problems by working to establish a major federal research program in RD&E in learning technologies. FAS developed a research plan for such an organization and a major program of outreach to the public, the press, and the Congress to build support for such an organization. Work has included working with hundreds of experts with highly diverse backgrounds to develop priorities for a new national institution.

Prepared at the request of Congress and supported by the National Science Foundation, the Department of Education, foundations (Hewlett and Carnegie Corporation) and private industry (Hewlett Packard and Microsoft), a comprehensive learning science and technology roadmap identified key R&D areas for next-generation learning systems: instructional design, building physically correct interactive simulations, dialogue and question management, modeling, and tools for assembling and constructing learning systems.

This report was delivered to Congress and highlights the need for research while providing a practical plan for action. FAS also hosted numerous briefings for members and staff to review the findings of this report. It formed the underpinnings for legislation now under active discussion.

This work was expanded by three projects that look in detail at several important areas of research detailed in this report.



NATIONAL SUMMIT ON EDUCATIONAL GAMES

On 25 October 2005, FAS hosted a *National Summit on Educational Games* in Washington, D.C. The Summit brought together more than 100 experts to examine how to harness the power of video games for learning. Participants included executives from the video gaming industry and educational software publishers, researchers and experts on technology and pedagogy, game developers, representatives of user communities such as teachers and the U.S. military, R&D funders, and government policy makers. The Summit was sponsored by FAS, the Entertainment Software Association (ESA), and the National Science Foundation.

Summit participants agreed that features of video and computer games can make learning more effective and accessible by teaching players higher-order learning skills such as strategic thinking, interpretative analysis, problem solving, plan formulation and execution, and adaptation to rapid change – skills very much in demand from present day employers. A report from the study (www.fas.org/gamesummit) expanded on the original FAS roadmap and identified steps that the federal government, industry and education community could take to use features of video games to strengthen U.S. education and training. The report also identified the market failures that have made it difficult to connect the creative talent of the IT and game industry to the needs of education and suggested steps that could be taken to remedy these failures.

THE VIRTUAL PATIENT

FAS also hosted *The Virtual Patient* workshop to explore training for medical personnel using computer-based tools. Medical schools face enormous challenges finding ways to deliver high quality, up-to-date training while facing tight budget constraints. They are looking increasingly to computer-based training tools ranging from manikins to virtual reality environments that can track a student's progress, provide feedback and remediation, and practical opportunities without harming patients. The report from the workshops outlines a detailed plan for better integration of computer simulations and medical education.

COMMON SOFTWARE PLATFORM FOR EDUCATION AND TRAINING

FAS is organizing a consortium of federal agencies, companies, universities, and foundations that will develop and use a common software platform for education and training. A number of commercial systems (such as Second Life) offer many of the features required. Several federal agencies have agreed to participate and the Kauffman Foundation has been leading the effort to organize non-governmental organizations. FAS hosted interagency meetings and is working with Kauffman to select a platform and encourage its use. FAS is also working to build an active international community that will build virtual cities in a persistent, online environment.

SERIOUS GAMES

In order to understand the practical challenges faced by developers of advanced instructional technology, FAS built and evaluated operational systems.

These systems will not only lead to useful educational tools, but also provide unique insights into the areas where research in needed. They provide a unique laboratory for exploring the impact of a variety of innovative approaches to learning – including those involving sophisticated simulation and user modeling strategies. The FAS projects are designed for three different age groups and three different subject areas. If nothing else, they provide a unique laboratory for exploring advanced concepts in pedagogy.

Discover Babylon

Discover Babylon is set in the virtual reality of ancient Mesopotamia, modern-day Iraq, and introduces students aged 8- to 14-years-old to the diverse contributions made by this civilization in the invention and development of written language. Mesopotamia was the birthplace of written language, the concept of zero, and law that applied equally to women and foreigners — yet its contributions are not well known to many Americans.

Discover Babylon uses sophisticated video gaming strategies and realistic digital environments to teach about Mesopotamian society, business practices, and trade. The game weaves accurate historical and scientific information with 3D simulations of cities, market places and temple complexes that allow for exploration and discovery.

The game was developed through a collaboration between FAS; the Cuneiform Digital Library Initiative at the University of California, Los Angeles; and the Walters Art Museum in Baltimore, MD. A kiosk version of the game was developed by Carnegie Mellon University and is installed at the Walters Art Museum, while a longer game experience intended for home or classroom use is under development by Escape Hatch Entertainment of Austin, TX. More information about this initiative can be found on the project's website: www.discoverbabylon.org.

Immune Attack

Immune Attack is a state-of-the-art video game that challenges students to defeat increasingly sophisticated infections by training the key elements of their immune system in sophisticated defensive strategies (www.fas.org/immuneattack). Developed by

FAS, Brown University, the University of Southern California, and Escape Hatch Entertainment in Austin, TX, the game is played by navigating a biologically accurate, three dimensional environment of blood vessels and tissues in a human body.

Each level of *Immune Attack* features a different infection with a new type of immune cell for the player to train. The player pilots through the system and acquires information about a strange, beautiful, and sometimes ominous environment. It's essential to tell friends from foes, to find out what trails to follow to find the invaders, and when to signal for help from other members of the immune system. Early tests suggest that even students ordinarily uninterested in science take interest in finding ways to train macrophages and neutrophis to track, identify, and destroy invaders.

Multi Casualty Incident Response

Multi Casualty Incident Response, developed in partnership with the Fire Department of New York (FDNY), trains chiefs to manage complex events involving many deployed units. The high-stress, interactive decision-making training simulation teaches firefighters and serves as a model for other first responder training. This emergency responder training software creates scenarios easily that are customized for local needs. For a more personal training experience, there exists an option for a single user, stand-alone artificial intelligence driven computer simulation.

To learn more about how FAS is working to integrate information technologies with learning, please contact Michelle Roper at mroper@fas.org and 202-454-4683.

"The video game experience is a wonderful complement to the learning that happens in the classroom. The game allowed students to use sights, sounds, and touch to get better acquainted with the immune system. Students also interacted with each other, having problem-solving discussions to enhance their game-play, and ultimately learning of the subject," said Angelique Bosse, a teacher at Montgomery Blair High School in Silver Spring, MD.

ENERGY AND ENVIRONMENT

BUILDING TECHNOLOGY PROJECT

People spend the majority of their time in residential and commercial buildings. The quality of these structures has a profound impact on an individual's comfort, safety, and productivity.

The quality of construction also plays a major role in our global environmental impact. Buildings in the U.S. consume more than two thirds of all electricity generated and nearly 40 percent of all energy. This translates into an environmental liability since energy production and use are responsible for 85 percent of human greenhouse gas production and for 80-90 percent of most other sources of air pollution. Material waste from building construction and demolition amounts to roughly 130 million tons annually.

Technological advances in composite materials and improved modeling techniques raises the possibility that significant gains can be made in the quality, performance, and impact of buildings while simultaneously decreasing construction costs. Unfortunately, the construction industry conducts very little research on its own and has a record of reacting slowly to innovations that have transformed manufacturing enterprises.

Innovation is slowed in part by the confusing and uneven structure of building regulation. Local, state and federal building regulations are often in conflict. For example, regulations designed to improve the performance of buildings in strong winds and earthquakes may result in recommendations that make it more difficult to improve energy efficiency. Builders, of course, need to sell structures that meet buyer expectations in many areas – and keep costs low.

In 2006, FAS assembled an interdisciplinary team of experts to face the challenge of designing a building shell that could meet a variety of performance goals simultaneously. The system would need to:

- Be compatible with a wide range of attractive housing designs (and meet design objectives in many different markets);
- Provide high levels of safety in strong winds, earthquakes, and fire;
- Resist mold, insects and other threats;
- Provide high levels of energy efficiency in many climates;
- Be easy, safe, and inexpensive to build; and
- Have low operating costs (including low energy costs).

The FAS team worked closely with the Lawrence Berkeley National Laboratory, the Florida Solar Energy Center and the Oak Ridge National Laboratory, the Institute for Building Safety, and a number of building suppliers and construction firms to evaluate products to meet and exceed these goals.

The technology identified as most promising in a first round of design reviews involved use of a simple composite product called "structurally insulated panels" or SIPs. The composite involved a core of expanded polystyrene laminated on both sides with a commercial fiber-cement board. Initial testing showed that the panels could simultaneously meet national structural, fire, and seismic standards, and could also be built and assembled at a comparatively low cost. The panels have the advantage of offering reliably high and unbroken levels of thermal insulation as well as providing bearing strength for all roof, floor, and wall loads. Additionally, the panels resist mold, insects, and fire, and provide exterior and interior surfaces that require minimal finish treatment.

To gain practical, first-hand experience with composite products, FAS collaborated on the construction of several structures. These include two small homes built in collaboration with Habitat for Humanity in Mobile, Alabama, that will be occupied by victims from hurricanes Katrina and Rita. In collaboration with the largest construction firm in Turkey, a large home was also constructed in a suburb of Istanbul. As these homes near completion, FAS has documented their performance in order to optimize the building process and end product.

"BUILDINGS IN THE U.S. CONSUME MORE THAN TWO THIRDS OF ALL ELECTRICITY GENERATED AND NEARLY 40 PERCENT OF ALL ENERGY."

The next phase of the FAS Building Technology Project will test a wide range of SIPs and other composite materials at the University of California, Berkeley. This most comprehensive SIP test to date will provide the first systematic comparison of the structural properties of different composites, systems for connecting composite panels, and the energy efficiency of the different systems. The collaboration between FAS, the state of California, and the SIP industry will eventually lead to a new, more accurate building code governing the performance of materials in seismic events and the widespread adoption of SIPs in both residential and commercial structures. This work is supported by the U.S. Department of Energy.

While most of the Building Technology Project efforts have focused on residential structures, composite materials also offer significant opportunities for commercial structures. The use of composites in commercial construction doubled in the last year. With the support of the Pankow Foundation, FAS is leading a team of academics, designers, and engineers to develop strategies for optimizing the use of advanced composites in commercial structures to result in safer, stronger, and more efficient buildings. This project will provide builders with an affordable, energy efficient, environmentally friendly building tool to further minimize the impact of buildings upon our global environment.

Field testing or demonstration of new technologies and a variety of composite materials will continue in parallel with this fundamental research.

DEMONSTRATION PROJECTS

Mobile, AL

Habitat for Humanity will work with FAS to build a series of test homes constructed with cement SIPs and competing composite technologies. The homes will feature identical designs for scientific comparison. Construction will start in the fall of 2007 and is supported by the Oak Hill Foundation.

Houston, TX

FAS will build a large, green, and energy efficient show home using cement SIPs in downtown Houston.

Mississippi

Joe Hagerman, director of FAS Building Technologies, is working with FEMA to design and install 5,000 small modular homes for post-Katrina hurricane victims. These homes represent the largest single order of manufactured, modular homes in U.S. history. All the homes are designed to withstand high wind loads and will significantly exceed Energy Star requirements.

FAS is working with Congress and federal agencies to encourage increased research on construction and building science quality, and to modify financial, regulatory and other programs in ways that strengthen markets for innovations in energy efficiency and high performance components. FAS, in collaboration With the National Institute of Building Sciences (NIBS), is preparing a report called for in the Energy Policy Act of 2005 that will set research priorities for "high performance buildings" and recommend standards that will encourage their adoption. Several committees in the 110th Congress have also expressed a strong interest in strengthening construction research and creating financial incentives for high performance construction through loan programs and tax credits, and for creating performance-based regulations that

encourage innovative ways to meet safety and performance goals simultaneously. FAS will continue to provide advice and technical support for these efforts.

For more information on the Building Technology Project, please contact Joe Hagerman at jhagerman@fas.org and 202-454-4671.

CHINA LANDS PROJECT

Areas in southern China the size of California have been badly degraded by unsustainable forestry and agricultural practices. This FAS project has worked closely with scientists and environmental groups in China to document the extent of the damage and point to technologies that can recover these lands. Land restoration can recover economic value, reduce flooding, and sequester carbon. A recent project assembled sketches and paintings of Chinese landscapes created over a period of several centuries that clearly documents the environmental changes.

CELEBRATING 60 YEARS

Many of the scientists who'd worked on the Manhattan Project were deeply troubled by the way the technology they'd developed would be used but unable to discuss them openly until the end of the war. When the war finally ended, it was obvious that technology had played a central role in the allied victory. Code-breaking electronic computers, radar, advanced aircraft, cathode ray tubes, and other inventions changed the nature of conflict forever. But it was the implications of atomic energy that dominated discussions and the issue that led directly to the formation of the Federation of American Scientists in 1945.

The bomb provided stark evidence that the power of scientific understanding could give humans the ability to do damage on a global scale. But it also provided hope for new sources of inexpensive electricity. One of the first issues engaged by FAS was an effort to put atomic energy under civilian control. The Federation lobbied hard for passage of the McMahon bill that set up the civilian Atomic Energy Commission – now part of the US Department of Energy. Another original goal was to put the nuclear fuel cycle under some form of international control.

Ironically debates over both issues are still central to national political debate. FAS hosted a public conference to celebrate its 60th Anniversary to review the state of play. The meeting included two debates. One focusing on a proposal for international control of nuclear materials advocated by the Director General of the International Atomic Energy Agency and Nobel Laureate Mohammed ElBaradei. The second panel explored whether development of nuclear weapons should remain under the civilian control of the Department of Energy or be moved to the Department of Defense.

The event, "Rethinking Civilian Control Over Nuclear Weapons Development and the International Fuel Cycle," featured talks by:

- **John F. Ahearne**, Lecturer in Public Policy Studies at Duke University and Director of the Sigma Xi Center
- **Steve Fetter**, Dean of the School of Public Policy at the University of Maryland
- **Richard Garwin**, Philip D. Reed Senior Fellow for Science and Technology at the Council on Foreign Relations and IBM Fellow Emeritus at the Thomas J. Watson Research Center
- **John R. Harvey**, Director of Policy Planning, National Nuclear Security Administration, Department of Energy
- **Carl Kaysen**, Former Deputy Special Assistant for National Security for John F. Kennedy
- **Henry Kelly**, President, Federation of American Scientists
- **Ernest J. Moniz**, Director of the Bates Linear Accelerator Center at the Massachusetts Institute of Technology
- **Theodore C. Sorensen,** Former Policy Advisor, Legal Counsel and Speech Writer to President John F. Kennedy
- **Frank N. von Hippel**, Professor of Public and International Affairs; Co-Director, Program on Science and Global Security, Woodrow Wilson School, Princeton University.

AWARDS

FAS recognizes the efforts of individuals with two awards: the Hans Bethe Award and the FAS Public Service Award.

HANS BETHE AWARD

Hans A. Bethe co-founded the Federation of Atomic Scientists, now the Federation of American Scientists (FAS), with the belief that scientists had an obligation to participate in the difficult choices that were forced on our country by the extraordinary advances in nuclear physics so vividly demonstrated by the development and use of atomic weapons.

In the sixty years since the founding of the organization, the range and complexity of issues hinging on sound scientific advice has increased.

In 2003, Hans Bethe presented the award to Philip Morrison for his unfailing ethical compass to America's most critical decisions.

In 2005, FAS presented the Hans A. Bethe Award to Steve Fetter in recognition of his outstanding contributions as an advocate for arms control and nonproliferation, and for his insightful and rigorous analyses of nuclear energy climate change and of carbon-free energy supply. Dr. Fetter is a former vice chairman of the FAS Board of Directors and the current dean of the University of Maryland's School of Public Policy.

FAS PUBLIC SERVICE AWARD

In 1971, the Federation of American Scientists presented the first FAS Public Service Award to Richard L. Garwin for his courageous and effective testimony on the civil supersonic transport (SST). Garwin's unique contribution toward the defeat of the SST program required the courage to defy the Nixon Administration by testifying before Congress. Since then, the Public Service Award has recognized individuals who have served as the conscience of the scientific community.

The award is given to an outstanding scientist, statesman, or public interest advocate who has made a distinctive contribution to public policy at the intersection of science and national security.

This year, Edward J. Markey (D-MA) will receive the FAS Public Service Award for his leadership and commitment to nuclear non-proliferation most recently evidenced in his work to oppose the development of a new generation of nuclear weapons and his efforts to block an unwise nuclear agreement with India.

COMMUNICATIONS

FAS.ORG

FAS was among the first organizations to publish online. Since 1993, the website has grown to provide a rich set of resources that is used by more than a million unique visitors a month (see www.fas.org). The site is a valuable resource for other organizations with almost 8,000 websites linking to the FAS.org homepage.

FAS.org is often the only place to find documents and reports that were once widely available through other websites. People rely on FAS.org to find new Congressional Research Service reports, up-to-date information on the status of pending legislation, and as a means to voice their opinion by commenting on the FAS blogs or signing online petitions.

FAS PUBLIC INTEREST REPORT

The Federation of American Scientists published its first newsletter in 1946. In continuous publication for more than 60 years, the FAS *Public Interest Report* is a widely respected quarterly publication mailed out to members, Congress, government agencies, policymakers, academia and think tanks.

FAS OCCASIONAL PAPERS

In Spring 2004, the first FAS Occasional Paper was published, "Small Arms, Terrorism and the OAS Firearms Convention." Since then, five titles have been released.

Occasional Paper No. 6: The Stockpile Stewardship Program: Fifteen Years On

In May 2007, FAS published Occasional Paper No. 6, "The Stockpile Stewardship Program: Fifteen Years On," which reviews the status of the experimental devices that support the Stockpile Stewardship Program (SSP) at the Department of Energy. Co-authored by Ivan Oelrich and Anne Fitzpatrick, the report describes how each experiment is seriously over budget and seriously behind schedule. For example, the National Ignition Facility (NIF) should have been finished four years ago and was originally budgeted at just over one billion dollars. Now its first experiments are expected to occur in 2010 to a cost of more than another billion dollars to complete – greater than the original estimates of total cost.

Occasional Paper No. 5: Chinese Nuclear Forces and U.S. Nuclear War Planning

Co-produced by FAS and the Natural Resources Defense Council (NRDC), Occasional Paper No. 5 used commercial satellite images of Chinese installations and declassified documents to determine that the U.S. military, intelligence agencies, and conservative think tanks and news organizations are exaggerating China's nuclear weapons capability to justify developing a new generation of nuclear and conventional weapons. The 250-page report also found that the Chinese

"FAS EXPERTS ARE OFTEN CALLED ON AS INFORMATION SOURCES FOR NEWS REPORTS."

have been citing U.S. weapons upgrades as a rationale for modernizing theirs, locking the two nations in a dangerous action-and-reaction competition reminiscent of the Cold War. The analyses also describe two nuclear strike scenarios that calculate the casualties that each side would suffer. The report's main finding is that the Pentagon and others routinely highlight specific incidents out of context that inaccurately portray a looming Chinese threat.

FAS IN THE NEWS

FAS experts are often called on as information sources for news reports. In addition to appearing on television interviews by CNN and C-SPAN, staff and Board members are often heard commenting on current events on National Public Radio programs or Voice of America. FAS staff also regularly contribute to journals and write articles and opinion pieces for newspapers and magazines.

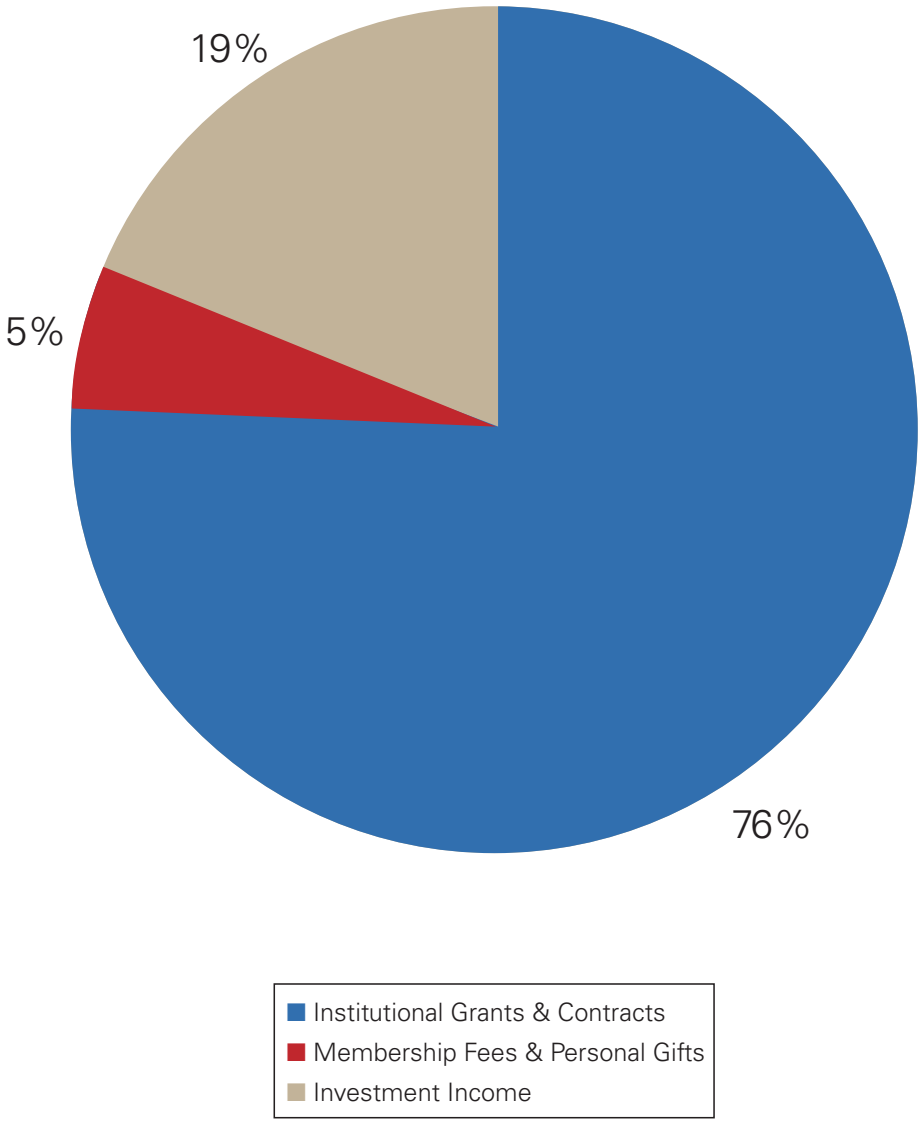
Over the past year, news about FAS has appeared in the *Baltimore Sun*, the *Boston Globe*, the *Christian Science Monitor*, the *Los Angeles Times*, the *New York Times*, *USA Today*, the *Washington Post*, and publications like the *Economist* and *Newsweek*.

FINANCIAL REPORT

REVENUE FY 2007

REVENUE

Institutional Grants & Contracts	76%	$1,908,370
Membership Fees and Personal Gifts	5%	$126,296
Investment Income	19%	$470,288
Total		**$2,504,954**

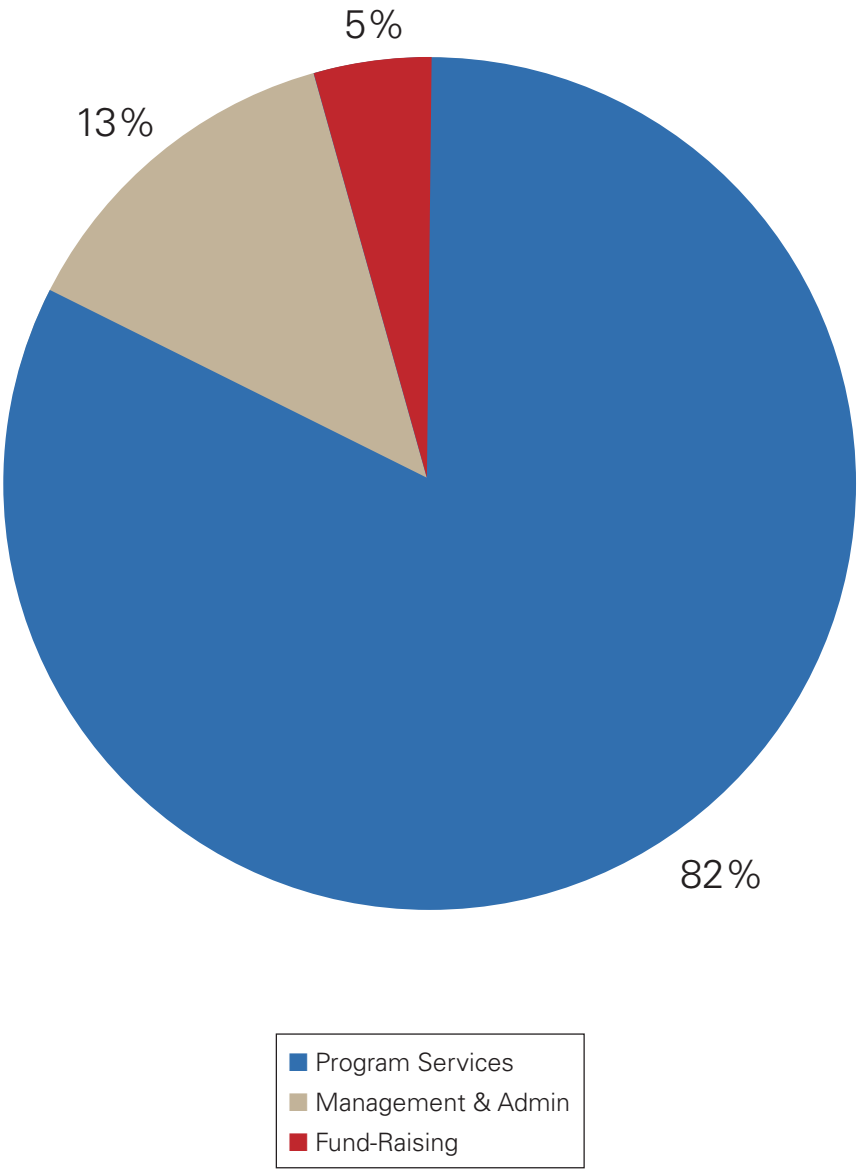


Generally accepted accounting standards require revenue to be declared in the year it is pledged regardless of the length of the grant. The difference between expenses and revenues in FY 2007 was covered by multi-year grants declared as income in previous fiscal years.

EXPENSE FY 2007

EXPENSE

Program Services	82%	$ 2,823,816
Management & Admin	13%	$ 433,847
Fund-Raising	5%	$ 160,400
Total		**$ 3,418,063**



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Individuals may include the Federation of American Scientists in their estate plans through bequests, living trusts, or gifts of retirement plan assets. In addition, life income gifts, such as charitable gift annuities and charitable remainder trusts, provide current tax advantages, possible income for life, and significant recognition for the donor at FAS. By making a bequest, you can support the federation well into the future.

A bequest is both a tangible demonstration of your dedication to the Federation of American Scientists and a way to generate significant tax savings for your estate.
Bequests to FAS can be directed to specific programs or unrestricted.

The following sample language can be used in making a bequest to the Federation of American Scientists:

"I give and bequeath the sum of $_____(or % of my residuary estate) to the Federation of American Scientists, 1725 DeSales Street, NW, 6th Floor, Washington, DC 20036."

For further details about these giving options and more, please call or write:

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Federation of American Scientists
1725 DeSales Street, NW
6th Floor
Washington, DC 20036
(202) 546-3300
jaron@fas.org

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The Federation of American Scientists benefits tremendously from the support it receives from its members, and the public and private sector. These contributions enable the Federation to undertake a vast array of programs and activities.

The support of members and others involved in the scientific enterprise is greatly appreciated. Private support assisted FAS by providing valuable resources to undertake new initiatives, supplement program funding, and address the issues and concerns of the scientific community.

The FAS Board of Directors gratefully acknowledges the support of the following individuals, foundations, corporations, and government agencies whose gifts, over and above membership dues, enabled FAS to supplement program funding and to continue to address the issues and concerns.

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Our work at FAS is driven by the growing threats from nuclear, biological and chemical weapons; innovations to education through new technological resources; and the desire to live in a more energy efficient environment

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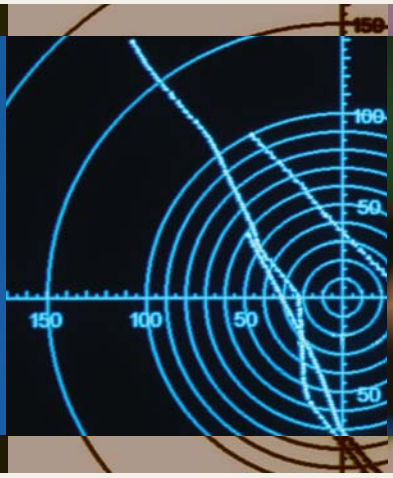
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