

THE CHRONICLE OF HIGHER EDUCATION

Research & Publishing

From the issue dated October 11, 2002

<http://chronicle.com/weekly/v49/i07/07a01601.htm>

Publish and Perish?

As the nation fights terrorists, scientists weigh the risks of releasing sensitive information

By RICHARD MONASTERSKY

In 1863, when Abraham Lincoln was waging war against renegade Southern states, the U.S. Congress recruited the nation's top scientists to help. They formed a private body, the National Academy of Sciences, that has advised presidents and Congress ever since, through two global wars and the threat of nuclear annihilation. Now, as the United States finds itself again in battle, the academy has broken with its independent tradition and allowed the federal government to assume unusual oversight power.

Earlier this year, an academy committee was finishing a report on agricultural bioterrorism that found the nation markedly ill-prepared for countering an attack against livestock and crops.

The report identified broad weaknesses, especially within the U.S. Department of Agriculture, which had paid for the study. Mindful of the threat of bioterrorism, the report's authors had taken pains not to divulge any information they felt would compromise the nation. More than a dozen scientific reviewers, including specialists from the U.S. Army and the Federal Bureau of Investigation, raised no security concerns about the study. The White House Office of Homeland Security, in its review, also determined that the report contained no classified data.

Nonetheless, the office and the Agriculture Department asked the academy to withhold the report from the public indefinitely, to keep potentially dangerous information away from enemies of the United States.

Academy officials say they struggled to balance security concerns against the need to advise the nation about a serious threat. The academy's leaders eventually made the extraordinary decision to cut out a substantial section of the document. The incomplete report, including an explanation of the self-censorship, was published last month on paper, but it is noticeably missing from the academy's Web site, which makes other reports available for free downloads. The academy is providing Congress, the administration, and select others with access to the report's missing parts, which detail scenarios for agricultural attacks.

The excisions deeply disappointed R. James Cook and some other members of the committee that had written the report. "We in the scientific community depend on openness to do our work, and we depend on being able to evaluate everybody's results," says Mr. Cook, a professor of plant pathology at Washington State University. "That's how we wrote that [report]. The strategy we seem to be up against from the standpoint of the Office of Homeland Security, and even of a lot of the legislation that's already been passed, is a strategy of security and secrecy and protection. So the two don't match."

The conflict reaches far beyond the marble halls of the academy, potentially spilling into every laboratory in the United States, especially those, in the medical and biological sciences, that investigate diseases. Congress and the executive branch are considering plans to restrict scientific communication in order to prevent the spread of information that could be used in terrorist attacks, such as the anthrax letters of last year. But some of the proposals have sent a chill through academe.

"We are concerned that there may be, in the future, a gutting of some of our publications," says Mr. Cook.

"This could change the very definition of science," says Ronald M. Atlas, president of the American Society for Microbiology and a professor of biology and dean of the graduate school at the University of Louisville. "It can really alter the way we communicate as scientists and who has access to information."

But national-security experts warn that the current system of openness in science could lead to dire consequences. Some papers already published "can be used for nasty, evil, illicit purposes by criminals or terrorists," says Raymond A. Zilinskas, a microbiologist and specialist in biological weapons at the Monterey Institute of International Studies. "Some of the more technical papers could be used by national bioweapons programs, by, for example, Iraq or North Korea."

A Tug of War

Mr. Atlas says he recognized the coming crisis within minutes of learning about the anthrax attacks last October. His association includes members who study anthrax, smallpox, Ebola, and other highly infectious and deadly diseases.

Meeting a few days later with other leading microbiologists, Mr. Atlas posed two questions: "What do we need to do within the scientific community to ensure that we're not providing the information that these terrorists would be using? And at the same time, how do we provide legitimate information to the research community so that we find the next vaccine and cure?"

The tug of war has grown stronger since then. The introduction to the academy report on agricultural terrorism says it appears "in the midst of a vigorous national debate" over the issue of so-called sensitive information -- a vast gray zone of material that is not classified but might, in theory, provide aid to our enemies.

The debate reached the national stage this past summer, following a series of events:

* In late May, the *Proceedings of the National Academy of Sciences* published a study by scientists at the University of Pennsylvania that provided details about how smallpox uses a protein to evade the human immune system. An editorial in the journal noted that there had been calls not to publish such observations because of fears that terrorists might use the information to cook up new bioweapons.

* In June, the Massachusetts Institute of Technology released a report endorsing openness as one of the fundamental values of the university. Among other findings, the report stated that faculty members were facing increasing restrictions on access to scientific information.

* In July, *Science* published a paper in which scientists at the State University of New York at Stony Brook described making poliovirus from mail-order DNA. The publication of that study spurred Rep. Dave Weldon, a Florida Republican, to introduce a resolution criticizing *Science* for publishing "a blueprint that could conceivably enable terrorists to inexpensively create human pathogens for release on the people of the United States." The resolution, which is still in committee, calls on the executive

branch to review policies on the publication of federally financed research.

* In August, officials from the White House Office of Management and Budget met with scientists and lobbyists to discuss new restrictions on what kind of information could be published by scientists employed directly by the federal government.

Fear Factor

The issue of sensitive information has academic scientists and government officials fumbling like newlyweds in an arranged marriage, unsure of how to deal with each other but certain that they must. The tension has produced little agreement and big fears about the dangers that come from leaning too far in the direction of either openness or restrictions.

A case study of those concerns might well focus on a paper published in February 2001 in the *Journal of Virology*. In that study, Australian researchers tried to use a relative of smallpox, called mousepox, to render mice infertile. The strategy was to insert a gene for a molecule called interleukin-4 into mousepox, hoping it would stimulate the mouse's immune system to block reproduction and thereby keep pest populations in check. But the pathogen ended up being the ultimate contraceptive, killing the mice that normally were resistant to mousepox. Even those mice that had been vaccinated against mousepox died of the engineered virus.

To some, the interleukin-4 paper provided an instruction booklet for enterprising terrorists. "There are people who were horrified," says Mr. Atlas, whose organization publishes the journal. "The paper told of the potential that you could manipulate smallpox, if you had access to smallpox, and you could create a more deadly strain that could circumvent our current vaccine." When viewed that way, he says, "that's dangerous information."

After the anthrax attacks, the criticism of Mr. Atlas's group intensified. In meetings with other scientists and with government officials, he heard the study denounced as "the greatest mistake we ever published."

Mr. Atlas was not president of the society at the time of the paper's publication, and he played no role in accepting it. Nonetheless, he defends the report, saying that it raised important points the public needed to know. "That paper said to me that you can't rely on vaccination as your only line of defense against smallpox." When a panel of the National Academy of Sciences met to discuss future security measures, Mr. Atlas used the interleukin-4 paper to push for more research on antiviral drugs that could work even on people already infected with smallpox or other viruses. What's more, the paper placed a renewed importance on quarantine procedures, he says.

Samuel Kaplan, head of the society's publications board, calls the paper an example of excellent science. "If we had to do it all over again, we would proceed to publish it, notwithstanding the flak that it has taken," says Mr. Kaplan, chairman of the department of microbiology and molecular genetics at the medical school of the University of Texas Health Science Center at Houston.

Changing the Rules

The controversy did, however, spur the organization to change its review policy at the start of 2002. The editors of its 11 journals and its book division now look out for sensitive information as they examine manuscripts. If a question comes up, the editors of a particular journal consult and can, if necessary, bring the issue before the society's entire publications board. The members of the board can then decide whether to send the paper on for external review or to tell its author of their concerns.

So far, the society's journal editors have flagged more than 50 papers dealing with such topics as the anthrax bacterium, the botulism toxin, and the Ebola virus. But only two papers have triggered greater concern among the board members, says Mr. Kaplan. Even in those cases, however, the society has proceeded with the review process. The editors have not yet deemed any paper unpublishable, he says.

After adopting the new policy, journal editors at the microbiology society encountered an unanticipated problem: Several authors decided on their own to withhold important pieces of information from their papers because of concerns about giving away too many details to terrorists, they told the editors. But that meant the papers lacked sufficient information for other scientists to replicate the experiments -- procedures that form the foundation of modern science.

The society has always required authors to provide such information, but it had never explicitly said so in its publication policy, says Mr. Kaplan. So the group revised the policy once more this past summer.

Some authors of the problem papers have agreed to supply the missing information, while others have declined. In one instance, an incomplete paper slipped through and was published; the journal now plans to publish the missing data.

As events were heating up over the summer, Mr. Atlas found himself making many trips to Washington to discuss the issue of how to handle sensitive information. In most meetings, participants mentioned the interleukin-4 paper, the smallpox-protein report, or the poliovirus study, and debated their risks and benefits.

Given the consternation and the possibility of new federal restrictions on publishing, Mr. Atlas called for backup. He asked the National Academy of Sciences to organize a meeting of scientific publishers to discuss the issue. The academy agreed, but it realized it would need the input of security experts to put together comprehensive recommendations. So it decided to collaborate with the nonprofit Center for Strategic and International Studies to organize the meeting, tentatively scheduled for December.

But that center has run into its own publication problems of late. Earlier this year, the group wrote a report on the nation's response to last year's anthrax attacks and submitted it to the Defense Threat Reduction Agency, which had paid for the study. To produce the report, which recommended ways to improve the response to any future attacks, the center used only publicly available information. But the Defense Department shelved the document, saying it was not to be released.

The center's staff has argued to reverse that decision. "This is really bad policy," says the report's author, David Heyman.

A Slippery Slope

In public, the White House has discussed restricting publications of federal scientists only. But the Defense Department confirms that it is considering whether to require all researchers financed by the department to submit papers for review prior to publication. Other agencies are also considering changes to their review policies. More restrictions could emerge if academic scientists do not adopt voluntary measures, which could come in several forms, says Mr. Atlas.

In one scenario, publishers would manage access to information, keeping sensitive material out of the open literature and allowing only certain people to view it -- the path chosen by the National Academy of Sciences with the recent report. In another plan, authors would submit papers to a security agency that would decide whether to scrub out information, classify an entire article, or let it go through unchanged.

Such policies, however, could create major problems, says D. Allan Bromley, a professor of the sciences at Yale University who served as science adviser to President George H.W. Bush. "I'm not at all happy with federal involvement."

The category of sensitive but unclassified, he says, "is a rather slippery slope because the question then becomes, Who decides whether it's sensitive or not? Bureaucrats can cause considerable damage if they start trying to make that decision rather than the scientists themselves."

He cites the Department of Energy and its national laboratories, which struggled through their own version of the current debate in the late 1990s. The crisis struck after the labs suffered several high-profile security lapses, including the possible loss of nuclear secrets to China.

The department clamped down on the labs, in part by restricting access to sensitive but unclassified information. Mr. Bromley served on a commission that examined the effect of those policies and found serious problems. The definition of "sensitive but unclassified," for example, remained fuzzy and differed from place to place, so scientists and security officers had a hard time developing clear standards. Morale plummeted among scientists, as did their productivity.

Mr. Bromley worries about applying such an approach to universities. "That would have a chilling impact on the training of students -- undergraduate, graduate, postdoc -- and on the conduct of U.S. research generally."

He suggests instead that individual scientists and journals watch out for dangerous information, much as they did in the early 1940s, when physicists agreed to keep a lid on nuclear-fission and microwave research.

Controlled Free Speech

The current debate mirrors one that 20 years ago engulfed mathematicians and computer scientists who did research in cryptography, the making and breaking of codes. During the mid-to-late-1970s, cryptographers were developing significant new algorithms, and they attracted unwanted attention from the National Security Agency.

At first, the agency adopted an ironhanded approach. It pressured a researcher to pull a paper from a conference, and it threatened to seek restrictions on publications if the cryptographers did not voluntarily censor themselves, says Susan Landau, a senior staff engineer at Sun Microsystems and a co-author of *Privacy on the Line: The Politics of Wiretapping and Encryption* (MIT Press, 1998). The American Council on Education intervened and recommended that cryptographers voluntarily submit their papers to the agency for review.

The result now is that some researchers submit and others do not, says Ms. Landau. Some people have altered their papers at the agency's request, she says, and at least one person she knows has withheld a paper at its suggestion. But the agency did help lift a restriction that the U.S. Army had unnecessarily placed on the work of one cryptographer, she says.

"Some people will say it's an uneasy peace" between the cryptographers and the agency, she adds. "Others say it's a good working relationship. There is not the kind of tension as there was 20 years ago. There seems to be a mutual respect."

Administration officials have asked biologists why they can't live with the same restrictions that

cryptographers and nuclear scientists have accepted. An obvious reason is the difference in numbers. The main journal in cryptography, the *Journal of Cryptology*, publishes fewer than 20 papers a year, and researchers present about 125 papers at conferences annually. The American Society for Microbiology, however, publishes about 6,000 papers a year in its journals.

Even more important, says Mr. Atlas, are the consequences of suppressing information. "These are public-health issues," he says. "If we fail to communicate information vital to public health, then people die."

The definition of sensitive information could be quite broad, because all such data have good and bad sides, health researchers say, especially as they start designing drugs aimed at particular spots on the genome. "Every target we have for drug therapy is also a potential target for manipulation by a terrorist," says Mr. Atlas. "That's the Catch-22 of all this."

But others argue that the gray zone of truly sensitive information is actually quite narrow. "We're talking about a very small subset of papers that would not be completely published," says the Monterey Institute's Mr. Zilinskas, who recently organized a conference on the issue that brought together scientists, Defense Department officials, and journal editors.

And not all academic scientists are displeased at the prospect of tighter restrictions. Harley W. Moon, a professor of veterinary pathology at Iowa State University and the chairman of the National Academy panel that wrote the recent agriculture report, says he understands the academy's decision to leave out information that his committee had deemed safe. "I think it was the right process," he says.

Some researchers even denounce the journals' policies of openness. "That's fine in theory, but we live in a new world right now, a world with the threat of bioterrorism," says Richard F. Meyer, director of a laboratory at the Centers for Disease Control and Prevention that designs tests to quickly determine the presence of bioweapons such as the anthrax bacterium.

Mr. Meyer ran afoul of the publication policies when he and colleagues submitted a paper on a smallpox-detection test to the *Journal of Clinical Microbiology*, published by the American Society for Microbiology. The journal initially refused to publish the report because the researchers did not list the specific DNA sequences they had used to identify the virus. "It makes absolutely no sense to me to give away the shop by giving out all the information that would allow someone with the knowledge and sophistication to create a genetically altered organism that perhaps could bypass our detection strategies," says Mr. Meyer, who notes that he is not speaking for the CDC.

His group finally put the information in the article, because it was an experimental technique and was not being used by the government to detect smallpox. In cases where the stakes were higher, however, Mr. Meyer has withheld the information. "The way things are going now," he says, "unless there's a change in attitude from the journals, it's really going to prevent people in this area of work -- the bioterrorism arena -- from going forward and publishing anything." That would cut off needed information for public-health officials, and could limit its value to prosecutors bringing alleged terrorists to court, he says.

Another scientist at a national laboratory encountered problems with the same journal when editors insisted that his team provide complete DNA sequences. "For reasons that are obvious to us at least, this was not possible," he says. "Letting potential terrorists know exactly what portions of a genome we are using for detection signatures is not worth whatever benefit is gained by having a publication."

Security concerns were not the only roadblock in this case, admits the scientist, asking not to be

identified. The research group withheld information on one of the organisms in the paper in order to protect the intellectual-property rights of the university that runs the laboratory. The team plans to rewrite its paper using organisms not encumbered by security or commercial restrictions and then resubmit it to the journal.

Still, the scientist blames the journals for having unrealistic policies. "It appears that the journals themselves have been caught ill-prepared to deal with these kinds of issues that arise when research science -- and scientists -- get thrust onto the front lines of a war against terrorism."

The Wrong Kind of People

Most scientific leaders, however, support openness and fear that the restrictions will chill more than just publications. The federal government has removed volumes of data from the World Wide Web, and it is prohibiting certain scientists from having access to even unclassified information.

Federal regulations bar the export of hardware, software, and information related to military technology, but the rules exempt basic and applied scientific research at universities. Now, there is growing concern that the government will begin to apply the same strict regulations to university research in sensitive areas, according to MIT's recent report "In the Public Interest," which examined the issue of access to scientific information. Such rules could forbid scientists to discuss research with foreign colleagues and students.

Indeed, the MIT report says that "the designation 'No Foreign Nationals' is often placed on scientific and technical material, and access to such materials and meetings discussing them is restricted. Clearly, such restrictions are not compatible with the educational environment at MIT."

As new laws and regulations emerge, the university will comply with them, says Sheila E. Widnall, an MIT professor of aeronautics and astronautics and head of the commission that wrote the report. "But we always reserve the right not to do research in an area that is heavily impacted by rules, regulations, and legislation."

"It's a very slippery slope, once one turns the coin over and decides that scientific openness is a threat," adds Ms. Widnall, who served as secretary of the Air Force under President Bill Clinton. "Then there really is no limit to what can be regulated and restricted. And it's a failure to understand the conditions under which science advances and the benefits that flow to our society, both in terms of actual results and in terms of the people who are educated."

Because foreign graduate students play important roles in many top research programs, restricting their activities would force major changes on American universities and would slow scientific progress here. What's more, international students bring back American ideals of openness to their home countries when they return, says Ms. Widnall.

In the wake of last year's airplane and anthrax attacks, the push to restrict information has picked up speed, and scientists must make their voices heard to avert draconian policies, says Margaret A. Hamburg, a bioweapons specialist and vice president for biological programs at Nuclear Threat Initiative, a group working to reduce the threat of nuclear, biological, and chemical weapons.

At the same time, however, she says that some scientists are unaware of the threats that might arise from their work. "There needs to be a deepening appreciation about just how powerful the tools of science are in the brave new world we live in," says Dr. Hamburg, who was New York City's health commissioner at the time of the 1993 World Trade Center bombing and who later served as an assistant secretary of

the U.S. Department of Health and Human Services.

The CDC's Mr. Meyer is even blunter: "American scientists are virtually naive to certain things."

Some scientists do discount the possibility that their work might pose a threat, despite a chorus of criticism. Ariella M. Rosengard, an assistant professor of pathology and laboratory medicine at Penn, caused a stir this past summer, when she published her paper on creating a smallpox protein.

Dr. Rosengard remains unrepentant, however, saying that scientists must disseminate their work in order to cure diseases. "We need to galvanize the scientific community to develop safer vaccines and therapies, not to make it so difficult that scientists say there are so many restrictions that I'm going to study something else. Because then the terrorists really do win."

PAPERS UNDER FIRE

Three recent scientific papers have drawn criticism, and support, in the debate over whether scientists should publish information that might help bioterrorists.

Controversial Paper

By Ronald J. Jackson and colleagues at Australia's Commonwealth Science and Industrial Research Organization and Australian National University

Journal of Virology, February 2001

In trying to develop a mouse contraceptive to control pest populations, the researchers inserted a gene for an immune-system molecule called interleukin-4 into the mousepox virus. Instead of rendering mice infertile, the engineered virus was far more deadly than the natural strain, killing even mice that had been vaccinated against mousepox.

Critics Say

The technique described in the paper could be used to make a more powerful smallpox that could kill people vaccinated against the virus. "That paper shouldn't have been published," says a biodefense researcher at a national laboratory. "You don't want to publish how to make an organism more virulent."

Defenders Say

By publishing, the Australian scientists alerted the world to the possibility of much more deadly diseases. "The best protection against any misuse of this technique was to issue a worldwide warning," says the director of the research center that performed the work. "We also want researchers to use this knowledge to help design better vaccines."

Controversial Paper

By Ariella M. Rosengard and co-workers at the University of Pennsylvania

Proceedings of the National Academy of Sciences, June 25, 2002 (online edition, May 28)

The team took a protein from a relative of smallpox and altered it to form a smallpox protein. In test-tube studies, the researchers studied how the protein turned off human immune molecules.

Critics Say

All scientists contacted by *The Chronicle* said that the paper should have been published, but some noted that bioweaponers could put the smallpox protein studied by Dr. Rosengard into a relatively innocuous virus, rendering it more deadly.

Defenders Say

"The potential for good in doing this kind of research greatly outweighs the bad," says Dr. Rosengard, who emphasizes that she studied just one protein. "One protein does not make a virus. They have thousands of proteins, and they have several hundred for evading the human immune response."

Controversial Paper

By Eckard Wimmer and researchers at the State University of New York at Stony Brook

Science, August 9, 2002 (online edition, July 11)

The scientists used the genetic sequence of poliovirus to order pieces of DNA from a company. By patching the pieces together and putting the complete DNA chain into a soup of cellular molecules, the team created poliovirus particles capable of paralyzing and killing mice.

Critics Say

A resolution was introduced in the U.S. House of Representatives criticizing Science for publishing a potential blueprint for terrorists. Although poliovirus would not make a good weapon of mass destruction, Raymond A. Zilinskas, a bioweapons specialist at the Monterey Institute of International Studies, says that the paper could help a motivated nation to assemble other small viruses that would be suitable as biological weapons.

Defenders Say

The poliovirus created by the team was 1,000 to 10,000 times as weak as the natural form and may offer clues on how to make new vaccines for poliovirus and related viruses, says Mr. Wimmer. What's more, the funds for the research came from the Defense Department, which would not have financed unclassified work with dangerous applications, he says.

SOURCE: *Chronicle* reporting

<http://chronicle.com>
Section: Research & Publishing
Volume 49, Issue 7, Page A16

[Front page](#) | [Career Network](#) | [Search](#) | [Site map](#) | [Help](#)

[Copyright](#) © 2002 by The Chronicle of Higher Education