Intelligence Support to the Life Science Community: Mitigating Threats from Bioterrorism

James B. Petro

> **A collaboration involving the national security and bioscience research communities could be key to minimizing the challenges posed by proliferation of research findings that have bioterror and BW applications.**

The al-Qa'ida attacks of 11 September 2001 and the delivery of *Bacillus anthracis* (anthrax) via the US Postal Service triggered a significant increase in initiatives to improve defense against biological attacks. They also reinvigorated a decades-old debate about the contributions that openly published scientific research might make to the efforts of bioterrorists and others who may be developing a biological warfare (BW) or other weapons of mass destruction (WMD) capability. Resolution of this debate could be made easier by input from knowledgeable intelligence and other national security professionals. Collaboration involving the national security and bioscience research communities could be key to minimizing the challenges posed by proliferation of research findings that have bioterror and BW applications.

Unfortunately, while there have been recent discussions involving these communities, the relationship between them has been nearly nonexistent. Accordingly, initial approaches and interactions must be planned and carefully carried out to ensure that the bridges built between the two communities are solid and long lasting. A necessary first step is to make sure that national security professionals who enter this collaboration are thoroughly familiar with the current and past debates among scientists about the potential openly published research findings have to enable BW or bioterrorism. This article is an overview of this debate, and it summarizes the most recent discussions among bioscience researchers. In addition, it offers some options the Intelligence Community (IC) can consider to help the life science community continue its work effectively, while safeguarding national security.[1]

Early Discussions of National Security and Science

Since the 1940s the US national security community has worked with scientific organizations and research communities to develop a policy for identifying areas of basic and applied research requiring control of information. Such research, historically related either to weapons development or sensitive nuclear technologies, has been designated as classified and is subject

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[1] For another review of these topics, see D. Shea's "Balancing Scientific Publication and National Security Concerns: Issues for Congress," *CRS 2003 Report for Congress* (Washington, DC: Congressional Research Service, 2003).

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to strict dissemination controls. For example, before the United States entered World War II, physicists in the private sector researching nuclear fission voluntarily stopped publishing results in scientific journals for fear of contributing to Germany's nuclear bomb project.[2] In early 1940 the joint National Academy of Sciences (NAS)–National Research Council (NRC) Advisory Committee on Scientific Publications was established to explore options for restricting publication of information about nuclear fission. After US entry into the war, this committee secured the cooperation of scientific journals in the United States.[3]

"Not only is generalized federal restriction of life science research impractical, it could be disastrous."

Control of information concerning research into nuclear power has also been instituted. Private industry was permitted to explore limited applications of nuclear power under the Atomic Energy Act of 1954. Before then, the federal government protected nuclear energy activities with security and secrecy programs. The Atomic Energy Act prohibited dissemination of nuclear research information from its creation regardless of who controls it.[4] Such information, even if developed privately and without federal government aid, is regarded as "born classified." Importantly, when fundamental research is not classified, no other information controls are placed on it.[5] However, the federal government retains authority over results that relate to atomic weapons, production of special nuclear material (SNM), and use of SNM in the production of energy.[6]

Federal government controls have been relatively successful in mitigating security concerns related to the proliferation of specific nuclear technologies. In large measure this is because federal regulations regarding nuclear research were implemented at a time when the research field was relatively young and expertise was consolidated within a handful of talented minds. This made it possible to, in effect, capture fission research by creating mutually beneficial relationships between key scientists and the federal government, in which Washington supported research and development in a secure environment under classification control.

The same circumstances do not exist in the life sciences, making the challenge of providing protection against threats enabled by the life sciences much greater. With the exception of specific work pertaining to the former US bioweapons program—halted in 1969 under executive order by Richard Nixon—and a handful of biodefense projects funded by the Department of Defense (DOD), the vast majority of life science research projects over the past 50 years have advanced without any restrictions or controls. Expertise exists in an international network containing tens of thousands of researchers working to address fundamental questions across a broad spectrum of life science fields. Federally mandated containment is not the effective option it was 60 years ago.

Not only is generalized federal restriction of life science research impractical, it could be disastrous. Life science research builds upon multiple findings across a variety of seemingly unrelated fields in a manner not unlike a spider's web. Removing one strand of that web through federal restriction likely would have negative implications for the other fields that are difficult to estimate. Even generalized restriction within fields with greatest application towards bioterrorism or BW could greatly hinder biodefense research efforts to develop medical

[2] P. J. Westwick, "In the Beginning: The Origin of Nuclear Secrecy," *Bulletin of the Atomic Scientists* 56 (November, December 2000): 43–49.

[3] R. C. Cochrane, *The National Academies of Sciences: The First Hundred Years, 1863–1963*, (Washington, D.C.: National Academy of Sciences, 1978), 385–87 and Shea, 2–6.

[4] See 42 U.S.C.S. 2014(y) (2003)

[5] Shea, 2.

[6] H. Relyea, *Silencing Science: National Security Controls and Scientific Communication*, (Norwood, NJ: Ablex Publishing Corporation, 1994), 94–96.

countermeasures, including new vaccines and therapeutics. Before national security professionals can productively engage the scientific community regarding threats presented by the open publication of some research findings, there must be mutual agreement that the generalized, federally-mandated restrictions used to contain nuclear research are not a viable option.

The Life Science/National Security Debate before 2001

Discussions about the impact on national security of discoveries in life science first received major attention in the US research community after major advances were made in recombinant DNA research—specifically the development of reliable techniques to manipulate an organism's genetic material and elicit a novel effect. Genetic engineering and the creation of recombinant species thus became topics of great contention in the 1970s and led to calls for regulation of methods for manipulating DNA and control of experiments containing genetically engineered species.[7] To find ways to resolve these concerns, a number of leading scientists gathered in 1975 at the Asilomar Conference in Pacific Grove, California, to discuss mechanisms for assessing and managing the risks of such research.[8]

Conference participants drafted a consensus statement that called for a voluntary moratorium on certain aspects of recombinant research and an increase in personal security and containment requirements for related research areas. This consensus statement was the starting point for rules later developed by the National Institutes of Health's (NIH) Recombinant DNA Advisory Committee (RAC), which was formed to oversee such research.[9] The RAC and its decentralized Institutional Biosafety Committees have remained the basis for oversight of the safe conduct of recombinant DNA research in the United States and have served as models used by other countries to regulate the creation of genetically modified organisms.[10]

In the early 1980s, concern that potentially hostile foreign students and scientists had too easy access to fundamental information across a wide range of scientific disciplines, including information that might be considered to fall under export control regulations, led to an effort by the DOD to restrict information presented in classrooms and conferences. To better understand the risk to national security, DOD helped fund a study through the NAS, which convened a panel of leading researchers to evaluate the situation in which "recent trends, including apparent increases in acquisition efforts by our adversaries, have raised serious concerns that openness may harm US security by providing adversaries with militarily relevant technologies that can be directed against us."[11]

The panel's extensive report offered a set of principles to "resolve the current dilemma." The panel, with the Soviet Union as its prime focus, concluded that potential security benefits derived from restrictive controls were outweighed by the potential that such controls would weaken US security by hampering scientific advancement. The panel identified three categories of information for consideration of security controls:

- Activities and findings in which the benefits of total openness overshadow their possible near-term military benefits to the Soviet Union.
- Areas of research for which classification is clearly indicated.
- A small "gray" area that lies between the first two and for

[7] Shea, 6.

[8] D. S. Fredrickson, "Asilomar and Recombinant DNA: The End of the Beginning" in *Biomedical Politics* (Washington, DC: National Academy Press, 1991), 258–98 and *The Recombinant DNA Controversy, A Memoir: Science, Politics, and the Public Interest 1974–1984* (Washington, DC: ASM Press, 2001).

[9] Shea, 6.

[10] R. M. Atlas, "Public Health: National Security and the Biological Research Community." *Science* 298 (25 October 2002): 753–4.

[11] This and the following three paragraphs are derived from the report of the NAS Panel on Scientific Communication and National Security, *Scientific Communication and National Security* (Washington, DC: National Academy Press, 1982).

> which limited restrictions short of classification are appropriate.

Furthermore, the panel provided guidelines to assist the federal government in categorizing research activities.

According to the panel, "no restriction of any kind limiting access or communication should be applied to any area of university research, be it basic or applied, unless it involves a technology meeting all the following criteria:"

- The technology is developing rapidly and the time from basic science to application is short;
- The technology has identifiable direct military applications, or it is dual-use and involves process- or production-related techniques;
- Transfer of the technology would give the USSR a significant near-term military benefit;
- The US is the only source of information about the technology, or other friendly nations that could also be a source have control systems.

The panel suggested that in dealing with gray technologies and federally-funded research, the government could achieve sufficient security by restricting the access of foreign students and researchers to the laboratory undertaking the research and stipulating a policy of federal review of research manuscripts and other products before their publication or open dissemination. The panel's findings appeared to provide sufficient guidance for the federal government at the time to adequately address the issue of Soviet acquisition of dual use technologies. The panel recommended that the federal government take the lead in implementing the suggestions, but it stressed the critical need for partnership between the scientific and national security communities to ensure effective and appropriate implementation.

"The [1980 NAS panel] stressed the critical need for partnership between the scientific and national security communities. . . ."

Following the release of the NAS panel report, President Ronald Reagan issued National Security Decision Directive (NSDD) 189, which reaffirmed US policy regarding the flow of scientific information:

> *It is the policy of this administration that, to the maximum extent possible, the products of fundamental research remain unrestricted. It is also the policy of this administration that, where the national security requires control, the mechanism for control of information generated during federally-funded fundamental research in science, engineering, technology and engineering at colleges, universities and laboratories is classification. Each federal government agency is responsible for: a) determining whether classification is appropriate prior to the award of a research grant, contract, or cooperative agreement and, if so, controlling the research results through standard classification procedures; b) periodically reviewing all research grants, contracts, or cooperative agreements for potential classification. No restrictions may be placed upon the conduct or reporting of federally-funded fundamental research that has not received national security classification, except as provided in applicable US statutes.*[12]

NSDD 189 has not been superseded and remains federal policy concerning the control of federally-funded research. However, throughout the late 1980s and early 1990s, a handful of individuals raised the possibility of increasing security by compartmentalizing research of concern. According to Raymond Zilinskas, "compartmentalization, a less restrictive form of secrecy, allows scientists to exchange data only if they can establish that their colleagues need the data to proceed with their research."[13] The idea did not develop legs at the time,

[12] White House, Office of the President, National Security Decision Directive 189, 1985.

[13] R. A. Zilinskas, T. Wilson, "The Microbiologist and Biological Defense Research. Ethics, Politics, and International Security," *Annals of the New York Academy of Science* 666 (31 December 1992): xi–xvii.

> **“In the post- 9/11 environment, the openness of the life science research community is again a subject of discussion.”**

possibly because so few were concerned about the issue.

Ultimately, although the Asilomar Conference, NAS panel, and later, but infrequent, discussions into the 1990s provided helpful insights, the efficacy of their proposed resolutions must be considered in a broader political and historical context. In general, the recommendations and findings of these groups have largely been superseded by the fall of the Soviet Union, the emergence of international terrorism, and the advancement of science. For example:

> *Although researchers at Asilomar were able to assuage public concerns at the time through their consensus statement and subsequent work within NIH, the central tenet of the conference's recommendations was that personal integrity and accountability were sufficient to prevent the misuse of genetic engineering technology acquired through scientific exchange. Such principles will not deter the nefarious researcher, and information regarding the former Soviet bioweapons program reveals a concerted effort to incorporate genetic engineering technology to enhance biowarfare threat agents had been occurring.* [14]

Close analysis of the subtext of the 1982 NAS panel report on Scientific Communication and National Security reveals that the panel was principally concerned with sciences and technologies other than the life sciences. Discoveries in the life sciences are likely to decrease the amount of time, effort, and expertise needed to develop a biological weapons capability at a rate that will outpace the monitoring ability of the national security community. Thus, people doing security assessments of life science findings need to consider that the applicability of life science findings to BW or terrorism is not as clearly defined as in many of the physical sciences.

The NAS panel report focused exclusively on risks relative to Soviet militarization. The panel itself acknowledged the limitations of their recommendations even as they looked ahead to new challenges: “there are clear problems in scientific communication and national security involving Third World countries. These problems in time might overshadow the Soviet dimension.” [15] Clearly, a reevaluation of the findings of the 1982 panel would be prudent.

Resurrection of the Life Science/Security Debate

In the post-9/11 and post-anthrax attack environment of heightened security awareness the public, legislators, and government leaders have increased their scrutiny of potential sources of support for terrorists. The openness of the life science research community is again a subject of discussion. For example, in an effort to curb the flow of potentially valuable information to bioterrorists, the DOD drafted a report “Mandatory Procedures for Research and Technology Protection within the DOD,” which outlined plans to provide DOD program managers greater oversight of whether DOD-funded laboratories could publish some of their findings. The proposal drew harsh criticism from the scientific community and was eventually discarded. [16]

In addition, NIH and Congress implemented new restrictions on federally-funded life science research laboratories to try to reduce the potential that bioterrorists would gain access to dual-use technologies. The *Public Health Security and Bioterrorism Preparedness and Response Act* required tighter laboratory security, government

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[14] K. Alibek, *Biohazard: The Chilling True Story of the Largest Biological Weapons Program in the World* (New York: Random House, 1999) and I. V. Domaradskij and W. Orent, *Biowarrior: Inside the Soviet/Russian Biological War Machine*. (Amherst, NY: Prometheus Books, 2003).

[15] *Scientific Communication and National Security*, 7.

[16] D. Malakoff, “National Security. Pentagon Proposal Worries Researchers,” *Science* 296 (3 May 2002): 826.

registration, and background checks for scientists and others handling any of more than three dozen potential bioterror agents identified on the Center for Disease Control's (CDC) "Select Agent List."[17] In addition, agencies such as NIH for the first time considered supporting classified research. Following implementation of these regulations, scientists began to express concern that some biologists with government funding were being encouraged to rein in full publication of their own work. [18] Following similar developments in the United Kingdom, some scientists became concerned that the defensive response was disproportionate to the actual threat.[19]

Growing tension between some leading researchers and the federal government continued to escalate throughout the spring and summer of 2002, largely due to media reports that highlighted the dual-use potential of a number of recent scientific publications.

- In 2000, Australian researchers genetically engineered a strain of mousepox virus in a way that inadvertently increased its virulence.[20] At the time, publication of their findings was met with harsh criticism.[21] This mousepox research and associated criticism were raised again in 2002 during additional debates on science and security.

- In July 2002, researchers at the State University of New York at Stony Brook revealed that they had successfully created infectious poliovirus from artificially engineered DNA sequences.[22] Some observers saw open publication of their achievement in the journal *Science* as enabling the proliferation of a methodology with high BW potential. [23]

- Researchers at the University of Pittsburgh identified key proteins in *variola* (smallpox) that contribute to the virus' virulence and demonstrated how to synthesize the virulence gene via genetic modification of smallpox's less deadly cousin *vaccinia*. The published report was the subject of a highly publicized news article that questioned the value of publishing discoveries that might aid bioterrorists.[24]

- Researchers at the University of Pennsylvania successfully developed a hybrid virus composed of an HIV core surrounded by the surface proteins of *ebola*. This new virus was capable of infecting lung tissue, potentially enabling aerosol delivery, and could facilitate the expression of foreign genes in infected cells. The published findings arguably provided a roadmap to engineering of a viral vector capable of efficiently delivering bioregulatory agents.[25]

- Researchers in Germany reported the creation of a DNA-based system for performing reverse genetics studies on the *ebola* virus. This system introduced the possibility of reconstituting live *ebola* virus from DNA in the absence of a viral sample. Other researchers expressed concern that this information could lead to the artificial synthesis of the virus, increasing the potential for agent proliferation, as DNA can

[17] D. Malakoff, "Bioterrorism. Congress Adopts Tough Rules for Labs," *Science* 296 (3 May 2002): 1585–87.
[18] E. Check, "Biologists Apprehensive over US Moves to Censor Information Flow," *Nature* 415 (21 February 2002): 821.
[19] M. McCarthy and S. Ramsay, "Fears that Security Rules will Impede US and UK Science," *Lancet* 359 (23 February 2002): 679.
[20] R. J. Jackson, A. J. Ramsay, C. D. Christensen, S. Beaton, D. F. Hall, and I. A. Ramshaw, "Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox," Journal of Virology 75 (2001): 1205–10.
[21] J. Stephenson, "Biowarfare Warning," *Journal of the American Medical Association* 285, no. 6 (2001): 725.
[22] J. Cello, A. V. Paul, and E. Wimmer, "Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template," *Science* 297 (9 August 2002): 1016–18.
[23] R. Weiss, "Polio-Causing Virus Created in N.Y. Lab: Made-from-Scratch Pathogen Prompts Concerns about Bioethics, Terrorism," *Washington Post*, 12 July 2002.
[24] A. M. Rosengard, Y. Liu, Z. P. Nie, and R. Jimenez, "Variola Virus Immune Evasion Design: Expression of a Highly Efficient Inhibitor of Human Complement," *Proceedings of the National Academies of Sciences of the United States of America* 99 (25 June 2002): 8808–13 and N. Boyce, "Speak No Evil: Should Biologists Publish Work that Could Be Misused?" *US News and World Report,* 24 June 2002.
[25] G. P. Kobinger, D.J. Weiner, Q. C. Yu, J. M. Wilson. "Filovirus-pseudotyped lentiviral vector can efficiently and stably transduce airway epithelia in vivo." *Nature Biotechnology* 3 (19 March 2001):225–30.

be more safely transferred than viral samples.[26]

Dana Shea at the Library of Congress has nicely assessed the overall response: "these articles have led some to question the wisdom of openly publishing information that could be used to threaten national security."[27] An editorial in *New Scientist* stated:

> *That this mind-boggling quantity of information is going to transform medicine and biology is beyond doubt. But could some of it, in the wrong hands, be a recipe for terror and mayhem?*[28]

Maybe so. Bioethicist Arthur Kaplan from the University of Pennsylvania was reported as saying:

> *We have to get away from the ethos that knowledge is good, knowledge should be publicly available, that information will liberate us. Information will kill us in the techno-terrorist age, and I think it's nuts to put that stuff on websites."*[29]

"Members of Congress filed a resolution that called on journals, scientists, and funding agencies to exercise greater caution before releasing . . . information."

Apparently, a number of members of Congress agreed with Kaplan. After a series of news reports about the prevalence of dual use in scientific journals, a handful of members of Congress filed a resolution that criticized *Science's* publication of the synthetic creation of a poliovirus and called on journals, scientists, and funding agencies to exercise greater caution before releasing such information. Representative Dave Weldon (R-FL) and seven other congressmen introduced a resolution criticizing *Science*'s publisher, the American Association for the Advancement of Science (AAAS), for publishing "a blueprint that could conceivably enable terrorists to inexpensively create human pathogens."[30] Weldon's resolution called on the executive branch to review current policies and ensure that information that could be useful in the development of WMD is not made accessible to terrorists or countries of proliferation concern.[31]

In addition to congressional interest, the Office for Homeland Security (OHS) announced that it would be considering initiatives to create a category of information that would be "sensitive, but unclassified" for application to a variety of dual-use topics, possibly including life science research of concern.[32] This naturally raised the suspicion and concerns of researchers who feared OHS might seek to make decisions that in their opinion would be more appropriately made by NIH.[33] Separately, the American Society for Microbiology (ASM) sent a letter to NAS requesting a meeting of biomedical publishers to discuss whether and how editors of leading research journals should publish research that might be coopted by terrorists.[34] By fall 2002, the debate on scientific openness and national security had officially been reopened.

The Current Debate

As the federal government initiated informal efforts to develop a strategy for addressing the issue of science and security in late 2002, insights were coming from

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26 V. E. Volchkov, V. A. Volchkova, E. Muhlberger, L. V. Kolesnikova, M. Weik, O. Dolnik, H. D. Klenk, "Recovery of Infectious Ebola Virus from Complementary DNA: RNA Editing of the GP Gene and Viral Cytotoxicity," *Science* 291 (9 March 2001): 1965–69; Epub 1 February 2001 and S. P. Westphal, "Ebola Virus Could be Synthesized," *New Scientist*, 17 July 2002.
27 Shea, 5.
28 "Surfing for a Satan Bug. Why are we Making Life so Easy for Would-be Terrorists?" *New Scientist*, 20 July 2002: 5.
29 E. Lichtblau, "Response to Terror; Rising Fears that What We Do Know Can Hurt Us," *Los Angeles Times*, 18 November 2001: A1.
30 J. Couzin, "A Call for Restraint on Biological Data." *Science* 297 (2 August 2002):749–51.
31 H.R. 514 107th Congress of the United States of America.
32 E. Check, "US Prepares Ground for Security Clampdown," *Nature* 418 (29 August 2002): 906.
33 G. Brumfiel, "Mission Impossible?" *Nature* 419 (5 September 2002): 10–11.
34 Couzin, 749–51.

a variety of highly knowledgeable sources. Mitchel Wallerstein, former deputy assistant secretary of defense for counterproliferation policy (1993–97) offered guiding principles:

- *First, open access to scientific knowledge on university campuses remains as important as it was 20 years ago;*
- *Second, the areas of scientific knowledge and/or technological application that are immediately applicable to the development of WMD are already known;*
- *Third, carefully conceived restrictions on scientific and technical communications remain necessary but should be applied to substantially fewer areas of scientific inquiry and technology development than during the Cold War;*
- *Fourth, university faculties have a responsibility for imparting values that emphasize the positive role of S&T in addressing human needs and the immorality of their use to cause mass casualties and human suffering.*[35]

Wallerstein's first, third, and fourth recommendations provide a good roadmap to address many underlying concerns. However, it may be presumptuous to assert that all "areas of scientific knowledge and/or technological application that are immediately applicable to the development of WMD are already known." The central issue of the exponential increase in discoveries in the life sciences and the potential implications of those discoveries for a revolution in BW fundamentally requires a continuing reevaluation and identification of research disciplines with application to BW and biodefense.[36]

Ideally, such evaluations should include insights from leading life science researchers actively engaged in "cutting edge" science, as they will have the clearest insights on the technical capabilities and limitations of biotechnologies for malevolent purposes.

Partially in response to media frenzy surrounding the Weldon resolution, on 18 October 2002, NAS outlined its recommendations for addressing the issue in its "Background Paper on

National Academy of Sciences Action Plan Highlights

Action Point 1: The scientific…community should work closely with the federal government to determine which research may be related to possible new security threats and to develop principles for researchers in each field.

Today, the chemical, biological, and even social science communities bear new responsibilities to identify materials and areas of research that should—or should not be—classified, and to provide assessments on the impact of classification on scientific, engineering, and health research.

The science, engineering, and health community can also clarify the distinction between the basic research that yields fundamental new understanding and the technological developments that are required for weapons development.

Action Point 2: The federal government should affirm and maintain the general principle of National Security Decision Directive 189, issued in 1985.

A successful balance…demands clarity in the distinctions between classified and unclassified research.

We believe it to be essential that these distinctions not include poorly defined categories of "sensitive but unclassified" information that does not provide guidance on what kind of information should be restricted from public access.

Even classified research, within its much smaller universe, must be confirmed through the participation of a community of outstanding science, engineering, and health researchers.*

*The National Academies "Background Paper on Science and Security in an Age of Terrorism," (Washington, DC: National Academy Press, 2003). Accessed online at: http://www4.nas.edu/news.nsf/isbn/s10182002?OpenDocument

[35] M. B. Wallerstein, "Science in an Age of Terrorism." *Science* 297 (27 September 2002): 2169.

[36] J. B. Petro, T. R. Plasse, and J. A. McNulty, "Biotechnology: Impact on Biological Warfare and Biodefense," *Biosecurity and Bioterrorism* 1, no. 3 (2003): 161–68.

Science and Security in an Age of Terrorism." It contained a list of action items for the life science research community and the federal government, citing the success of recent collaborations between government and scientists:

> *The nation must balance two needs for achieving a safe and secure society: 1) the need to restrict access to certain information, and 2) the need for a strong research enterprise that improves both our general welfare and our security. Clearly, policy-makers must seek mechanisms by which both interests can be served.*
>
> *To this end, we call for a renewed dialogue among scientists, engineers, health researchers, and policy-makers. To stimulate such a dialogue, we present two "action points": one focused on scientists, engineers, and health researchers and the other focused on policy-makers.*

Scientists quickly voiced support for the highlighted principles, including their distaste for the concept of creating a category for "sensitive but unclassified" research. Ron Atlas, the president of ASM, and others testified before the House Science Committee that the government needs to clarify what constitutes a threat before it can implement protective guidelines, such as screening foreign graduate students for entry to U.S. laboratories.[37] Moreover, scientists argued that clear distinctions need to be made between classified and unclassified research since "poorly defined third categories of sensitive but unclassified research that do not provide precise guidance on what information should be restricted from public access …generate deep uncertainties among both scientists and the officials responsible for enforcing regulations."[38]

"NAS demonstrated its willingness to withhold certain information from general release without a demonstrated "need to know."

Editorials in leading scientific journals expressed concern that many scientists would either deal with the issue of classification by determining that it should be rejected from university laboratories as unsuitable (as was the case at the Massachusetts Institute of Technology) or deem the "sensitive" label as prone to too many interpretations to be accommodated in an academic setting.[39] Despite these views, however, NAS demonstrated its willingness to withhold certain information from general release without a demonstrated "need to know." This option came into play when the academies agreed to remove an entire chapter of the 2002 NAS study on agricultural bioterrorism that the authors and the Department of Agriculture agreed would be of high-dual use value to individuals with bad intentions.[40] Also, with some scientists, the concern over research classification was secondary to the potential consequences of misuse of their research. As one such researcher wrote, "scientists need to be aware of the regulatory and ethical implications of bioweapon proliferation."[41]

In addition to lobbying Congress and federal agencies, biologists began to independently discuss new voluntary guidelines on publishing potentially dangerous information, in part to head off possible government rules.[42] On 9 and 10 January 2003 NAS and the Center for Strategic and International Studies (CSIS) hosted a workshop for life science researchers and national security experts to discuss the issue of assessing and mitigating potential threats presented by biological research. Although

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37 D. Malakoff, "Security and Science. Researchers See Progress in Finding the Right Balance." *Science* 298 (18 October 2002): 529.

38 B. Alberts, R. M. May, "Scientist Support for Biological Weapons Controls." *Science* 298 (8 November 2002): 1135.

39 D. S. Greenberg, "Homeland Security is Good and Bad News for US Scientists," *Lancet* 360 (21–28 December 2002): 2056.

40 M. Enserink, "Science and Security. Entering the Twilight Zone of What Material to Censor," *Science* 298 (22 November 2002): 1548.

41 J. A. Singh, P. A. Singer, "Isolationism is not the Answer to Bioterrorism." *Nature* 420 (12 December 2002): 605.

42 Malakoff, "Security and Science," 529.

many of the 200 senior scientists and researchers argued that scientists should be free to publish all unclassified work, some academicians acknowledged that the community needs to reassure the public and the government that it is acting responsibly.[43]

Moreover, statements by senior policymakers reassured scientists but challenged them to take the initiative. According to Dr. Parney Albright, then associate director of homeland security for the president's Office of Homeland Security, "it is the policy of this administration that, to the maximum extent possible, the products of fundamental research remain unrestricted" and that as per NSDD 189, "no restrictions will be placed upon the conduct or reporting of federally-funded fundamental research that has not received national security classification."[44] However, Dr. Albright did not give the research community a free pass, making it clear that "the science community ought to come up with a process before the public demands the government do it for them…that will be driven by the rate at which controversial papers hit the street."[45]

"The scientific information published in peer-reviewed journals carries special status, and confers unique responsibilities."

Ultimately, scientists at the NAS/CSIS meeting agreed that there may be some research that should not be published, although clear guidelines would be helpful in identifying future papers of concern. To help craft a better definition of such "taboo" science, the academies and CSIS announced a plan to convene such meetings in the future. Gerald Epstein, a security expert with the Institute for Defense Analyses, proposed a simple question to aid scientists in deciding whether a paper should be more closely reviewed: "Would you like it to be found in a cave in Afghanistan with sections highlighted in yellow?"[46]

During the second day of the workshop, a group of editors from leading scientific journals crafted a statement on the publication of research with potential for aiding bioterrorism.[47] An editorial that ran alongside the statement in *Science* highlighted the need for researchers, editors, and national security professionals to reach a consensus on guidelines for scientific information that should not be published.[48] The editorial did not represent a radical departure from standing policy, but concisely stated the opinions of the editors present at the workshop. It made four points:

- First, the scientific information published in peer-reviewed journals carries special status, and confers unique responsibilities on editors and authors.
- Second, the editors recognize that the prospect of bioterrorism has raised legitimate concerns about the potential misuse of published information, but also recognize that research in the very same fields will be critical to society in meeting the challenges of defense.
- Third, scientists and their journals should consider the appropriate level and design of processes to accomplish effective review of papers that raise such security issues.
- Fourth, on occasion an editor may conclude that the potential harm of publication outweighs the potential societal benefits.[49]

The response of researchers and security experts to the statement was mixed. Some researchers complained that they were not consulted. For example, Steven Block, a biophysicist at Stanford

[43] E. Check, "US Officials Urge Biologists to Vet Publications for Bioterror Risk." *Nature* 421 (16 January 2003): 197.
[44] B. Vastag, "Openness in Biomedical Research Collides with Heightened Security Concerns." *Journal of the American Medical Association* 289 (12 February 2003): 686, 689–90.
[45] Check, "US Officials," 197.
[46] D. Malakoff, "Science and Security. Researchers Urged to Self-Censor Sensitive Data." *Science* 299 (17 January 2003): 321.
[47] "Statement on Scientific Publication and Security." *Science* 299 (21 February 2003): 1149.
[48] D. Kennedy, "Two Cultures," *Science* 299 (21 February 2003): 1148.
[49] "Statement," 1149.

University, was quoted as saying the statement is "more equivocal and less definitive" than he would like to see. Others believe that scientists should go much further to address security concerns about life science research. David Heyman, a science and security expert at CSIS, said that the statement was "only a step" and that scientists should make changes earlier in the research process to reduce the risk of biological research being misused.[50]

By far the sharpest public critic of the statement, respected microbiologist Stanley Falkow, has taken issue with the failure of its authors to elicit more discussion before its publication. Falkow faults the authors for failing "to provide guidelines regarding who exactly would make decisions about publication and what constitutes a potential contribution to the activities of bioterrorists."[51] Falkow's statement suggests that he supports the formation of a committee to provide insight and oversight regarding research of concern. However, it is his opinion that the issue should be "earnestly discussed by the broad community of scientists, together with those whose mission it is to guard national security."[52]

"The NAS Fink Report called for a role for the life sciences in efforts to prevent bioterrorism and biowarfare."

In a further effort to characterize the challenges posed by misuse of biotechnology, the NAS created the Committee on Research Standards and Practices to Prevent the Destructive Application of Biotechnology. It directed the committee to consider ways to minimize threats from BW and bioterrorism without hindering the progress of biotechnology. The committee's report, *Biotechnology Research in an Age of Terrorism* (commonly referred to as the Fink Report), released in October 2003, proposed a new system for mitigating the potential for the misuse of life science knowledge by establishing "a number of stages at which experiments and eventually their results would be reviewed to provide reassurance that advances in biotechnology with potential applications for BW or bioterrorism receive responsible oversight."

The Fink Report included seven recommendations for the mitigation of the potential for misuse of dual-use knowledge and seven guidelines for identifying "research of concern."[53] The report clearly identified the absence of an "established culture of working with the national security community among life scientists as currently exists in the fields of nuclear physics and cryptography" as a challenge to achieving consensus on the identification of dual use information and mitigation of its potential misuse. In one of its seven recommendations, the NAS committee called for a role for the life sciences in efforts to prevent bioterrorism and biowarfare, recommending that "the national security and law enforcement communities develop new channels of sustained communication with the life sciences community about how to mitigate the risks of bioterrorism." The report suggested that leading scientists believe some guidance from intelligence professionals would assist the scientific community as it seeks to identify information that may be of use to terrorists and to support comparative assessments regarding the cost-benefit ratio of limiting the availability of such information.[54]

In response to the recommendations of the report, the Department of Health and Human Services (DHHS) recently announced the creation of a National Scientific Advisory Board for Biosecurity (NSABB).[55] According to the DHHS press statement, the NSABB will "advise the Secretary of HHS, the director of the NIH, and the heads

[50] E. Check, "Journals Tighten Up on Biosecurity," *Nature* 421 (20 February 2003): 774 and "Biodefense Plans Earn Lukewarm Response from US Academics." *Nature* 422 (20 March 2003): 245–6.
[51] S. Falkow, "Science Publishing and Security Concerns." *Science* 300 (2 May 2003): 737–9.
[52] *Ibid.*, 739.

[53] G. Fink *et al.*, *Biotechnology Research in an Age of Terrorism* (Washington, DC: The National Academies Press, 2004), 3, 111–26.

[54] *Ibid.*, 85, 123.
[55] DHHS press release available at: http://www.biosecurityboard.gov/NSABB_press_release.pdf.

of all federal departments and agencies that conduct or support life sciences research" by "recommending specific strategies for the efficient and effective oversight of federally conducted or supported potential dual-use biological research taking into consideration both national security concerns and the needs of the research community."[56] According to the NSABB Web site, the group will be charged specifically with guiding the development of guidelines for the identification and conduct of research that may require special attention and security surveillance.[57]

Although NSABB members have not yet been publicly identified, the board will consist of voting and *ex-officio* members from the national security and intelligence communities as well as an abundance of leading life scientists. Thus, the NSABB may serve as one vehicle for consistent and productive interaction between the intelligence and life science communities. Maximum benefit of this relationship could best be realized by ensuring that intelligence and national security professionals assigned to support NSABB efforts possess a strong background in the life sciences; it will do little good for intelligence professionals who do not adequately understand the underlying principles to engage life scientists in discussions on the potential security implications of highly technical research findings.

"A deeper relationship between the IC and life science communities has the potential to benefit the Intelligence Community."

Intelligence Support to the Scientific Community

The life science research community clearly would benefit from insights of the IC and other national security professionals if it is to progress beyond the current state of discussion and develop a coordinated strategy for assessing and mitigating threats enabled by research of concern. Engagement of the scientific community should be of paramount importance to biological warfare and CBRN terrorism analysts in the IC.

In addition to obvious areas in which security experts could contribute, such as providing insights and methodologies for deriving threat assessments and offering national security information to cleared life science experts, there are many less obvious opportunities for IC input. For example, the IC is well positioned to see that life science experts are educated about the activities terrorist groups and foreign states allegedly undertake to support their BW efforts. Also, IC personnel possess access to a wealth of information pertinent to the physical properties and characteristics of biothreat agents. Much of this information, at least that which is unclassified or for official use only (FOUO), would be useful to researchers struggling with the development of novel countermeasures and systems for civilian biodefense.

A deeper relationship between the IC and life science communities has the potential to benefit the IC, which has long struggled to maintain an internal core of bioscience expertise. In addition, formulation of a positive view among life science professionals about the IC could lead to an increase in the number of top graduate students and young life science researchers who seek employment in intelligence or national security agencies. Most importantly, closer and continuing contact with life science investigators could yield greater insight regarding suspicious attempts of foreign researchers to acquire from legitimate scientists information, reagents, or technology of high dual-use value. Such insights could enable further targeting of IC resources. In order to develop the potential synergy between the two communities; the national security community will need to take the first steps. Ultimately, none of the potential benefits will be realized until long after IC professionals have sown seeds of goodwill within the life science research community and engaged influential scientists as partners on BW counterproliferation initiatives.

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[56] *Ibid*., 1.
[57] NSABB Web site: http://www.biosecurityboard.gov.