Flanked by seven US senators, President Harry S. Truman signs the Atomic Energy Act of 1946. One of the act's provisions empowered the Atomic Energy Commission to regulate "restricted data," a new and sweeping category (Courtesy of the US Department of Energy.)

A TALE OF OPENNESS AND SECRECY
The Philadelphia Story

Alex Wellerstein

A now little-known manuscript prepared by nine young physicists as a statement about the futility of scientific secrecy quickly became a test of the limits of free discourse in the nuclear age.

Alex Wellerstein is an associate historian in the Center for History of Physics at the American Institute of Physics in College Park, Maryland. His book on the history of nuclear secrecy in the US will be published by the University of Chicago Press in 2013, and he runs *Restricted Data: The Nuclear Secrecy Blog* (http://nuclearsecrecy.com).

William E. Stephens (1912–80) joined with eight young colleagues at the University of Pennsylvania in the fall of 1945 to learn, and then publish, details about how the atomic bomb works. They were opposed to the notion of scientific secrecy, but the US War Department saw things differently. (Courtesy of the AIP Emilio Segrè Visual Archives, Physics Today Collection.)

During the months immediately following the use of the first atomic bombs on Japan, a fierce debate raged concerning the future of scientific freedom. Former Manhattan Project scientists worked to bring the issue to the forefront of public attention in one of the first major attempts by US scientists to organize and lobby for specific political action. To what degree would nuclear research become shackled by the requirements of national security? Would the open circulation of new scientific knowledge cease if that knowledge was relevant to nuclear fission? Those questions were hardly idle speculation: From the fall of 1945 through the summer of 1946, the US Congress was crafting new, unprecedented legislation that would legally define the bounds of open scientific research and even free speech. The idea of restricting open scientific communication "may seem drastic and far-reaching," President Harry S. Truman argued in an October 1945 statement exhorting Congress to rapid action. But, he said, the atomic bomb "involves forces of nature too dangerous to fit into any of our usual concepts."

The former Manhattan Project scientists who founded what would eventually become the Federation of American Scientists were adamantly opposed to keeping nuclear technology a closed field. From early on they argued that there was, as they put it, "no secret to be kept." Attempting to control the spread of nuclear weapons by controlling scientific information would be fruitless: Soviet scientists were just as capable as US scientists when it came to discovering the truths of the physical world. The best that secrecy could hope to do would be to slightly impede the work of another nuclear power. Whatever time was bought by such impediment, they argued, would come at a steep price in US scientific productivity, because science required open lines of communication to flourish.[1]

At the University of Pennsylvania were nine scientists sympathetic to that message. All had been involved with wartime work, but in the area of radar, not the bomb. Because they had not been part of the Manhattan Project in any way, they were under no legal obligation to maintain secrecy; they were simply informed private citizens. In the fall of 1945, they tried to figure out the technical details behind the bomb.

Into the danger zone

Led by William Stephens, an assistant professor of physics, each of the nine—five faculty members and four graduate students—gave a series of seminars on topics related to the new nuclear world. Stephens himself looked at the physics of fission fragments and long-term practical applications such as power generation. Lecturer Margaret Lewis, an astronomer by training, had the new transuranic elements as her topic. Knut Krieger, an assistant professor of chemistry, discussed the chemistry of plutonium, including its separation from spent reactor fuel. Instructor Simon Pasternack lectured on the operation of nuclear reactors, then called piles. Assistant professor of physics Park Miller Jr covered topics relating to fast neutron fission—including the detonation of atomic bombs themselves. All of the presenters were fairly young. The assistant professors were in their early thirties and the youngest of the graduate students was only 22.

None of the physicists was an expert in any of the topics presented in the seminars. Indeed, the entire point of the exercise was that they need not be. The Pennsylvania physicists reviewed the copious prewar published literature on fission—such as the famous Niels Bohr and John Wheeler paper of 1939 that outlined its theoretical mechanism—and the so-called Smyth report, a technical history of the Manhattan Project that had been issued by the government only three days after the bombing of Nagasaki.

The Smyth report, named after its author, Princeton physicist Henry DeWolf Smyth, had been issued specifically to sate the appetite of physicists and journalists with regard to the technology behind the bomb, but it only went so far. In many areas it had been truncated for security purposes—it barely mentioned plutonium chemistry, for example, despite that element's central role in wartime work. It was also meant to let Manhattan Project scientists know the boundaries of "safe" speech about the bomb. The Pennsylvania physicists, however, used the report as a starting point and extrapolated into dangerous territory wherever they felt their knowledge could take them further.

The seminars were a success, and the participants took extensive notes. Those were mimeographed and compiled in early 1946 into a volume for publication, titled *Nuclear Fission and Atomic Energy*. The manuscript was a dense, technical read; however, the introduction, written by the chairman of the physics department at the University of Pennsylvania, Gaylord Harnwell, made the text's political intent overt:

> Free and unrestricted research in nuclear physics ceased abruptly in 1941. Activity in the field went underground

> and certain aspects were the subject of intense study and investigation in secret under the forced draft of military urgency and unlimited support. . . . Unfortunately this book perforce marks a departure from traditional scientific publications, a departure which it is hoped is only a temporary result of abnormal post-war conditions. . . . There is nothing herein that any physicist, be he American, English, Russian, French, Indian or Chinese, could not already know if he himself had taken the time to rework the excellent report of Dr. H. D. Smyth and the recent literature of physics with nuclear fission in mind.[2]

Salvo thus prepared, the authors submitted their book to their publisher, McGraw-Hill, in early 1946. And the trouble began.

A murky legal situation

During World War II, the Office of Censorship had been formed to screen US periodicals for sensitive information that included, from 1943 onward, details about "atom smashing, atomic energy, atomic fission and atomic splitting."[3] But the office lacked legal teeth: The censorship was entirely voluntary. A scientist or soldier who gave secret defense information to a newspaper could be prosecuted under the Espionage Act of 1917. But prosecuting the newspapers that published such information was almost unheard of, due to the strong protections granted to the press under the US Constitution's First Amendment and because prosecuting such cases would draw more attention to disclosures than would quiet censure.

In 1946, however, the situation was even murkier. The Office of Censorship had been disbanded at the end of the war, and the famously unregulated state of the American free press had resumed. Scientists who had worked on the atomic bomb were still bound under the terms of the Espionage Act, but scientists who didn't have security clearances were ostensibly free of such encumbrances. At the same time, though, it was clear that the bomb was being considered as a special category of technology, and the restrictions being debated by Congress could criminalize exactly the sort of private speculation that the Pennsylvania scientists had engaged in.

McGraw-Hill sent the manuscript to what it called two "competent critics," who reported back that certain sections of the book contained information that would probably be considered classified by the War Department and should probably be edited. The Pennsylvania physicists were unhappy with that conclusion and held a press conference to denounce scientific censorship. "If the Manhattan District should object to the publication of certain sections," physicist Miller explained to the press in attendance, "we believe they are exceeding their authority."[4]

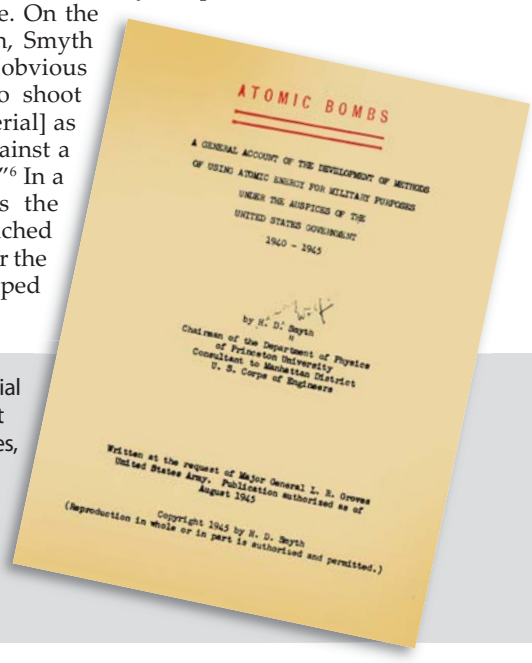
The Manhattan Project censors, however, had not yet looked at the manuscript. The Pennsylvania physicists consented to sending a copy of their book to the War Department soon thereafter, with the request that the government confirm their opinion "that the published position of the War Department is (as an official spokesman is quoted in the press) that summaries of published unclassified information, together with basic scientific comments and conclusions thereon, do not come within the terms of any legal restrictions or voluntary rules which the Government has requested publishers to observe."[5] From there the manuscript was turned over for comment to the office of Leslie Groves, director of the Manhattan Project; Groves's office passed it on to the Manhattan Engineer District's Declassification Office.

A dangerous chapter?

From a security point of view, the most problematic chapter of the Pennsylvania volume was chapter 11, "Fast neutron chain reaction." Based on one of Miller's seminar lectures, its subject was the physics of an atomic bomb.

The chapter covered major topics in the design of a fission weapon, including methods of calculating the critical mass for a bomb—that is, the amount of fissile material that would be necessary for an exponential nuclear chain reaction. It also included discussions of how one would rapidly assemble a super-critical mass of material at the instant of a desired nuclear explosion, and no earlier.

On both of those issues, the Smyth report had been deliberately vague. On the subject of bomb design, Smyth noted only that the "obvious method" would be "to shoot one part [of fissile material] as a projectile in a gun against a second part as a target."[6] In a crude sense, that was the mechanism—with enriched uranium as the fuel—for the Little Boy bomb dropped on Hiroshima.


ATOMIC BOMBS

A GENERAL ACCOUNT OF THE DEVELOPMENT OF METHODS OF USING ATOMIC ENERGY FOR MILITARY PURPOSES UNDER THE AUSPICES OF THE UNITED STATES GOVERNMENT 1940 - 1945

by H. D. Smyth
Chairman of the Department of Physics of Princeton University
Consultant to Manhattan District U. S. Corps of Engineers

Written at the request of Major General L. R. Groves United States Army. Publication authorized as of August 1945

Copyright 1945 by H. D. Smyth
(Reproduction in whole or in part is authorized and permitted.)

The Smyth report was known after its author Henry DeWolf Smyth because its official title, "A general account . . . ," was too long and bureaucratic sounding. But the report was intended to be called "Atomic Bombs," with the rest being a subtitle. Leslie Groves, director of the Manhattan Project, was so afraid the title would leak out, however, that he directed the title "Atomic Bombs" be applied with a rubber stamp just before distribution. But in the haste after the use of the bombs, the covers were almost never stamped. This rare edition has the stamp affixed. (Courtesy of the Library of Congress.) When the report was published in book form by Princeton University Press, the title was changed yet again, to *Atomic Energy for Military Purposes*.

An employee pin given to workers at the US Office of Censorship: "Silence hastens victory."

Chapter 11 of the Pennsylvania volume went much further. The final section of the chapter, "Assembly of reacting material," discussed not only the specifics of the gun-type design gestured at by Smyth but another approach altogether:

> There is [another] method of bringing the system into the over-critical condition[,] in which the tamper and U-235 core of fixed mass are compressed so as to increase its density. . . . The material can be brought into the over-critical condition by means of a spherically symmetrical implosion.[2]

Unbeknownst to its authors, the passage describes in a simplified form the type of design used in the Trinity test of July 1945 and the Fat Man bomb dropped on Nagasaki. As is by now well known, the design required that significant scientific resources be developed during World War II, and was necessitated by the fact that impurities in reactor-bred plutonium meant that the material could not be used in a gun-type design without fear of predetonation.

In 1946, however, the idea of "implosion" was still classified. In fact, it would not be declassified until 1951, well after the Soviet Union had demonstrated its own mastery of the technique. (A little known fact is that it was declassified specifically for use as evidence in the trial of Julius Rosenberg and Ethel Rosenberg.) Even the word "implosion" was considered taboo within the US atomic establishment—which is why its inclusion in the Pennsylvania manuscript was guaranteed to raise official eyebrows.

To censor or not to censor

The Declassification Office of the Manhattan Project had only recently begun operation, spurred by the slow pace at which Congress was drafting the first atomic legislation. If project scientists wanted to publish their wartime research, they would send articles to the office, which would then send them on to "responsible reviewers" armed with "declassification guides." This now-familiar process of declassification was proposed by top Manhattan Project scientists in November 1945.

But there was no precedent for what to do with work created outside the Manhattan Project's auspices. The volume created by the Pennsylvania scientists was, in fact, the first such case that the Declassification Office had considered. Copies of the most problematic chapters were sent to Los Alamos to be reviewed by Norris Bradbury, who had taken over the directorship there after J. Robert Oppenheimer's departure, and by John Manley, who was the primary responsible reviewer for topics on weapons design.

Unsurprisingly, Bradbury and Manley were disturbed by chapter 11's discussion of bomb design, which clearly violated their declassification guides. But they also recognized that they had been thrust into a problematic realm of policy. Would the Manhattan Project become a reviewer of private publications? And if it did, how would it indicate to the uncleared authors which sections were considered secret, without giving away secrets in the process? As Bradbury reported back in a teletype he and Manley sent to the Oak Ridge laboratory,

> In order to remove the objectionable part of chapter eleven the authors could be asked to omit any reference to assembly methods, but could hardly be asked to delete more specifically without loss of security. I would strongly recommend that the declassification procedure of the Manhattan Project not be asked to attempt to consider non-project work of this type.[7]

Bradbury further suggested that "this situation will frequently arise, and that the War Department should neither give sanction nor denial to the publication of such a document." He continued:

> I would urge as forcefully as possible that since this document does not specifically involve any work done by the project, the War Department should say so, and make no further comment on the manuscript.

The issue highlighted an epistemological bind that had dogged the security system since the early days of the Manhattan Project. If you make it clear that there is a secret you want to have kept, you must, in part, give away some of the secret. If you try to censor something, you inadvertently draw attention to it. If you fail in your censorship effort, you perforce validate information that was otherwise considered speculative.

There seemed, however, to be little will to just let the manuscript pass unadulterated. After all, the authors had voluntarily submitted it for comment—the implication being that if they had simply published it outright, no sanction would have been forthcoming. It was proposed to Groves that the War Department tell the Pennsylvania scientists that it neither approved nor disapproved of the publication, but that inasmuch as it had been submitted and reviewed, there were "national security" objections to the text as it stood, and deletions might be recommended. Groves approved the recommendation, and William Hutchinson Jr, director of the Declassification Office, went to Philadelphia twice that July to meet with Stephens and Miller.

Hutchinson accused the physicists of having gained access to secret reports. How else would they have known, for example, the rate of production of plutonium? Or, for that matter, the word "implosion"? Stephens responded that the rate for plutonium they had cited had come from Bohr, quoted in the *New York Times*, and that implosion was a "common technical term for bursting in-wards and is

even in the Webster-Collegiate dictionary."[8] Stephens and Miller, however, agreed to rewrite the section to make it less problematic.

Hutchinson was satisfied with that resolution, but Groves was not and decreed that the section on bomb design had to go. In Hutchinson's words, that was because implosion "was an idea the War Department would prefer that any potential enemies of the United States would have to work out for themselves rather than obtain from American literature on the subject."[8] Hutchinson offered a letter assuring the Pennsylvania scientists a clean bill of health from the War Department if they dropped the offending section. If they didn't, their publisher would get a letter saying that the War Department objected to the document's publication.

Stephens and Miller talked it over with the other authors. They agreed to drop the section, so long as Groves personally sent them a letter "stating that no suspicion attaches to the authors and their colleagues for improper actions with regard to material for the book." The matter seemed resolved, and the public relations division of the War Department forwarded a letter to the Pennsylvania scientists voicing approval for publication. Groves, however, begged out of sending a no-suspicion letter, claiming that he did not know enough about the matter to express an opinion on it one way or the other. "After all," he added, "I did not make or circulate any imputations."[9]

"Loaded with dynamite"

It was, by this point in the story, October 1946. The Atomic Energy Act of 1946 had finally been passed by Congress and signed by Truman; it would come into effect in January 1947. If the law did anything, though, it only complicated the situation.

During the period of the Manhattan Project, it was assumed that the limit of nuclear secrecy extended only to material generated by government employees. The Atomic Energy Act, however, was much more vague on the subject. It gave the newly created US Atomic Energy Commission (AEC) the power to regulate "restricted data," a new legal entity defined as "all data concerning the manufacture or utilization of atomic weapons, the production of fissionable material, or the use of fissionable material in the production of power," except as had been explicitly declassified by the government.

Did "all data" really mean *all* data? Even data not created by employees of the US government? The law was vague on the issue. A not uncommon interpretation of the day saw the law as authorizing the AEC to declare that even privately generated nuclear weapons designs were restricted data. And the mishandling or publication of restricted data came with strict consequences—including the death penalty.[10]

Nothing appears to have progressed on the Pennsylvania matter until January 1947, when it was handed off to the new AEC. In the meantime, the issue had resurfaced due to a chance meeting between William "Deak" Parsons and the Pennsylvania scientists. Parsons had been central in the development of ordnance engineering at Los Alamos and had personally been the weaponeer on the *Enola Gay* when it dropped an atomic bomb on Hiroshima. He was at the University of Pennsylvania as part of their Founder's Day exercises, and he happened to have "a few highballs" with some of the younger members of the physics department.[11] They proudly told Parsons of their colleagues' plans to publish the volume, and that they considered the work to be a real blow against the idea that bomb secrets could be protected. As Parsons later fumed,

> The avowed purpose of this publication is to demonstrate how many of the so-called Manhattan secrets can be penetrated by deduction from facts available to any bright physicist. I was surprised and somewhat disturbed at the frankly expressed attitude of this group as to the desirability of such a publication. They seemed to regard it as somewhat of a triumph that they had achieved embarrassment of the Manhattan District.[11]

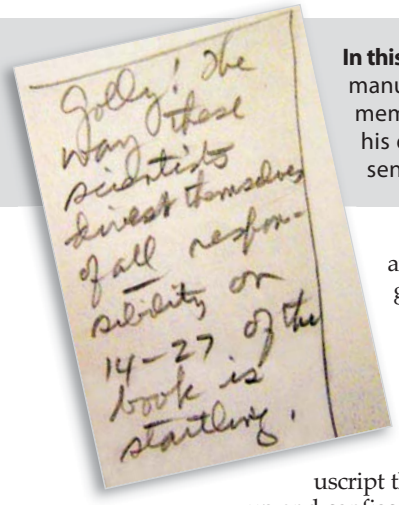
Parsons suspected that the physicists had gotten some of their information indirectly from classified sources. He argued that the "bright boys [sic] at Pennsylvania can easily circulate among ex-Los Alamos physicists and by suggestion and auto-suggestion determine what points are correct and what points are not correct in their hypotheses as to the design of the bomb." He considered it "a most effective and unfair form of spying."

Parsons obtained the early draft of chapter 11, with its discussion of implosion, from the Manhattan Project files. He was unaware that the Pennsylvania physicists had agreed to drop the offending section, as, apparently, were the members of the newly created AEC. Parsons thought that the chapter flagrantly violated the restricted-data clause of the act. Worse, he was afraid that all members of the AEC could be found liable under the Atomic Energy Act if they let the chapter be published. "I think that this matter is loaded with dynamite," he wrote to a security officer, "and we should confer with the AEC in regard to action to be taken immediately."[12]

The Philadelphia Story

The draft of the Pennsylvania book was circulated to AEC commissioners Robert Bacher and William Waymack. Bacher, a physicist who had worked at Los Alamos and would serve as the point person on the issue, was generally sympathetic to issues of scientific freedom. Waymack, however, was aghast at the book and the policy problem it created. Before passing it on to Bacher, he stuck a note into the offending section stating his apprehension. (The note appears on page 52.) Moreover, he wrote, the incident "underlines the desirability of approaching this whole 'Security Problem' in the broadest way, and getting mobilized behind a sane general policy a moral force greater than the mere caution, whim, or indecision of the A.E. Commission."[2]

The AEC commissioners gave the entire affair a new nickname, the Philadelphia Story, in apparent reference to the classic 1940 film about divorce, flirtation,



In this note stuck inside the Pennsylvania manuscript, Atomic Energy Commission member William Waymack expresses his dismay at the authors' inclusion of sensitive material.

and remarriage. Bacher and Stephens got in touch and tried to iron out the issue; Stephens tried to explain that he and his colleagues had, in fact, deleted the implosion section. One snag remained, though; if the section on implosion was indeed restricted data, then every copy of the original manuscript that contained it needed to be rounded up and confiscated or destroyed.[13]

The problem was that the authors had sent around 30 or 40 mimeographed copies of the manuscript and the seminar notes on which it was based, and their publisher had apparently lost the list of who had copies. A Federal Bureau of Investigation agent contacted Stephens and suggested that the physicist write out the list from memory. Stephens was perhaps justifiably uneasy about doing so until he knew what, exactly, would happen to people on the list. He wrote to Bacher to ask him what the AEC planned to do to that unfortunate group, who may have never read the manuscript, and to request that he clarify "definitely what items the Commission objects to in the original manuscript and on what grounds."

Bacher turned the matter over to the AEC's security division, which requested an additional set of the page proofs. The saga continued to stretch out, particularly because an alternative publisher looked to take over the job but wanted approval from the AEC before proceeding. Stephens was loath to secure such approval for obvious reasons: The entire mess in which he was embroiled could have been avoided if he and his colleagues hadn't asked the Manhattan Project officials what they thought. Moreover, they had already agreed to cut considerable material in the name of security. "We have heard rumors that material contained in the book is not releasable by the AEC," he wrote to Bacher in December 1947. "We are not and have not asked AEC for clearance for the reason that this material has already been cleared by the Manhattan District and published before the AEC took over administration" of the Atomic Energy Act.

It was not until February 1948 that the final reply to the Pennsylvania physicists arrived from the AEC. Morse Salisbury, the director of the AEC's Public and Technical Information Service, explained that "the Commission cannot give its approval to publication of the book in its present form, since, in several respects, it does not appear to conform to the understanding reached between you and the Manhattan Engineer District in July, 1946."

Too little, too late

Nuclear Fission and Atomic Energy finally found its way into print by late 1948, with the offending chapter 11 ending abruptly before discussing any specifics of bomb design.

It was too little, too late. By the time the book was released, material that had seemed fresh in late 1945 looked stale and out of date. One of the few journals to announce its publication offered this assessment: "The result of a series of seminars on nuclear fission held in the Physics Department of the University of Pennsylvania in the fall of 1945, this book is a review of the known facts published in the literature."[14] Not exactly a thrilling write-up. The book apparently went unreviewed and unnoticed.

Alas, the saga of the Philadelphia Story did not end there—it would be resurrected one more time in a far more ominous setting. In late 1948, Robert Vought, who had worked on the book as a graduate student, found himself at the center of a security clearance hearing by the AEC. One alleged blot on his record was his involvement in the supposedly subversive book. Stephens, his former adviser, had to testify on his behalf that the entire matter was a tempest in a teapot.[15]

As for the AEC, the question of what to do with private speculation would go unresolved. The issue would continue to haunt it throughout the cold war. In general, the no-comment policy espoused by Bradbury prevailed, though largely because throughout most of the cold war, few dared to push the envelope when it came to restricted data. A few attempts cropped up in the earliest years of the atomic age, the Philadelphia Story being the most noteworthy, but none of significance appeared through the 1950s and 1960s.

In the 1970s things began to change. A new form of activism arose, in which college students, most famously Princeton University's John Aristotle Phillips, attempted to show that even they could design nuclear weapons based on the published information. Such demonstrations were intended as an argument in favor of stronger safeguards for fissile materials. Like the Pennsylvania scientists, all those later undergraduates agreed to censor themselves.

But there was one case of noncooperation. In 1979 an antinuclear activist, Howard Morland, attempted to publish a story in *Progressive* magazine claiming to detail the Teller–Ulam design for multimegaton hydrogen bombs. The AEC's successor organization, the Department of Energy, declared Morland's work to be restricted data and received a temporary injunction against *Progressive*'s publication. The ban was short-lived, however; on appeal, the judges looked askance at the government's declaration that Morland's work could constitute a "secret" when it was derived from readily available information. The case never reached a conclusion, because the government declared it moot before any ruling was made. Significantly, though, the one attempt to assert the broadest powers of the Atomic Energy Act instead showcased the shaky legal foundations of the concept of "restricted data."[16]

Would the Pennsylvania scientists have had a similar result if they had refused to cooperate in 1946, in the early days of the cold war? It seems unlikely. The young scientists had started their endeavor in the flush of excitement that followed the

birth of the nuclear age. They had set out to prove that science could not be held back by secrecy. If they could deduce the workings of the bomb, so could anyone else. But they found that the realities of postwar America were unresponsive to such feats of clever logic. Instead of proving the ability of physics to transcend political matters, their story became a woeful tale of their own impotence in the face of state power.

In September 1945 David Lilienthal, the first chairman of the AEC, predicted that "we are, I rather assume, going to have a whole series of crises as a result of increasing scientific knowledge that is adaptable to blowing the hell out of the world."[17] At its heart, the Philadelphia Story was just the first of a recurrent problem, one not limited to the atomic bomb alone. Today, the question of scientific secrecy is still a live one, as scientists have mulled over the implications of publishing, for example, potentially dangerous data about genetically engineered H5N1 flu viruses. The proper balance between scientific openness and state security has not been, and may never be, fully resolved.

References

1. D. Kaiser, *Representations* **90**, 28 (2005).
2. W. E. Stephens, ed., *Nuclear Fission and Atomic Energy*, draft (June 1946), "Philadelphia Story," box 3, R. F. Bacher (RFB) office files, record group 326, National Archives and Records Administration, College Park, MD.
3. Office of Censorship, memorandum (28 June 1943), "Publications," box 65, Manhattan Engineer District (MED) records, record group 77, National Archives and Records Administration, College Park, MD.
4. *New York Times*, 4 April 1946, p. 10.
5. K. D. Nichols to C. L. Wilson, memorandum (22 January 1947), MED records, in ref. 3.
6. H. D. Smyth, *Atomic Energy for Military Purposes*, Princeton U. Press, Princeton, NJ (1945), p. 212.
7. J. H. Manley, N. Bradbury, teletype to Oak Ridge (23 May 1946), document NV0311374, Nuclear Testing Archive, Las Vegas, NV.
8. W. S. Hutchison Jr to K. E. Fields (26 July 1946), MED records, in ref. 3.
9. W. E. Stephens to L. R. Groves (25 July 1946); L. R. Groves to W. E. Stephens (24 October 1946), MED records, in ref. 3.
10. J. R. Newman, *Yale Law J.* **56**, 769 (1947).
11. W. S. Parsons to R. F. Bacher (20 January 1947), RFB office files, in ref. 2.
12. W. S. Parsons to C. H. Banks (27 January 1947), RFB office files, in ref. 2.
13. For the extended correspondence between W. E. Stephens and the Atomic Energy Commission, see W. E. Stephens to R. F. Bacher (4 February 1947), W. E. Stephens to R. F. Bacher (8 May 1947), W. E. Stephens to R. F. Bacher (23 December 1947), and M. Salisbury to W. E. Stephens (20 February 1948), RFB office files, in ref. 2.
14. *Science News Letter*, 13 August 1949, p. 111.
15. J. Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War*, U. North Carolina Press, Chapel Hill (1999), p. 102.
16. A. De Volpi et al., *Born Secret: The H-bomb, the Progressive Case and National Security*, Pergamon Press, New York (1981).
17. D. E. Lilienthal, *The Journals of David E. Lilienthal*, vol. 2, Harper and Row, New York (1964), p. 640. ■