Exorcising Ghosts in the Age of Automation

United Nations Experts and Atoms for Peace

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"Fear of science and technology, which have empowered humans since the beginning of history," nuclear physicist Edward Teller once wrote, "is the height of folly."[1] The comment was rooted in his lifelong effort to persuade Americans that civilian nuclear power should be embraced, not feared. Today, peaceful atomic energy has not yet escaped the negative associations that Teller dismissed; and the term "nuclear power" is perhaps more likely to conjure up thoughts of Chernobyl than of abundant energy. In the 1950s, however, civilian nuclear power was the centerpiece of a political effort—President Dwight Eisenhower's 1953 Atoms for Peace plan—to limit the proliferation of nuclear weapons while turning the atom into a positive force in the world. The plan emphasized cooperation rather than competition; promised to turn the horrors of nuclear war into the prosperity presented by peaceful atomic power; offered fission materials to other countries; and proposed an international body to manage the nonmilitary development of atomic energy on a global scale.

Shortly after Eisenhower's "Atoms for Peace" speech, discussions surrounding atomic energy were complicated by the 1954 hydrogen-bomb tests and questions about the hazards of radioactive fallout. The biological effects of radiation and the long-term consequences of the global development of nuclear power being then unknown, the debates provoked uncer-

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1. See Edward Teller, with Judith Shoolery, *Memoirs: A Twentieth-Century Journey in Science and Politics* (Cambridge, Mass., 2001), 566.

tainty about whether civilian atomic technology would be safe. The Atomic Energy Commission (AEC), which had managed all atomic matters in the United States since being created in 1946, found itself the target of criticism at home and abroad.[2] Skepticism about the future of atomic energy prompted the National Academy of Sciences, Britain's Medical Research Council, and the United Nations (UN) to sponsor major studies on fallout, radioactive wastes, medical radioisotopes, and food irradiation. Meanwhile, President Eisenhower moved to fulfill his promises, pushing for the creation of an international body to make Atoms for Peace a reality. This body, the International Atomic Energy Agency (IAEA), was ultimately founded in 1957.[3]

From the 1950s onward, a common response to those criticizing the peaceful uses of atomic technology, whether it be by individual reactors or large-scale engineering projects, was that laypersons' views of the atom were emotional and irrational. To the chagrin of scientists in the AEC, debates often hinged upon subjective trust in their activities rather than objective analysis of strictly technical questions; the public's response struck them as irrational.[4] Some academic scientists shared this view: oceanographer Roger Revelle wrote in 1956 that "ignorance and emotionalism" characterized debates about dumping radioactive wastes at sea.[5] Teller offered perhaps the most strident criticism of public irrationality, deploring the fact that plans to use nuclear explosions for construction purposes (Plow-

2. This was especially true after the initiation of the Castle series of hydrogen-bomb tests in early 1954 that elicited criticism about the harmful nature of radioactive fallout from tests; see Robert A. Divine, *Blowing on the Wind: The Nuclear Test Ban Debate, 1954–1960* (New York, 1978), and Carolyn Kopp, "The Origins of the American Scientific Debate over Fallout Hazards," *Social Studies of Science* 9 (1979): 403–22.

3. There is very little secondary literature devoted to these studies, although they are mentioned in Divine, 221–25, and in Barton C. Hacker, *Elements of Controversy: The Atomic Energy Commission and Radiation Safety in Nuclear Weapons Testing, 1947–1974* (Berkeley, Calif., 1994), 185–89. The influences of these studies are addressed at length in J. Samuel Walker, *Permissible Dose: A History of Radiation Protection in the Twentieth Century* (Berkeley, Calif., 2000). For the official history of the creation of the International Atomic Energy Agency, see David Fischer, *History of the International Atomic Energy Agency: The First Forty Years* (Vienna, 1997).

4. The point that the AEC was better at addressing scientific than political questions is made in J. Samuel Walker, "The Atomic Energy Commission and the Politics of Radiation Protection, 1967–1971," *Isis* 85 (1994): 57–87. A discussion of the role of public trust and safety concerns can be found in Joan Aaron, *Licensed to Kill? The Nuclear Regulatory Commission and the Shoreham Power Plant* (Pittsburgh, 1997).

5. This statement, made for the National Academy of Sciences' 1956 "Report on the Biological Effects of Atomic Radiation" (the BEAR report), was eventually published in Roger Revelle and Milner B. Schaefer, "General Considerations Concerning the Ocean as a Receptacle for Artificially Radioactive Materials," in *The Effects of Atomic Radiation on Oceanography and Fisheries*, which is a report of the National Research Council, Committee on Effects of Atomic Radiation on Oceanography and Fisheries (Washington, D.C., 1957).

OCTOBER
2006
VOL. 47

share projects) were abandoned because "ignorance and prejudice prevailed."[6] This view of public fears also informed the historiography of nuclear issues. Spencer Weart's *Nuclear Fear*, for example, presented the proponents of atomic energy as sober experts, and its opponents as emotional masses venting their fantasies and fears through public activism.[7]

With some justification, many historians who have analyzed Atoms for Peace have focused on its technological feasibility, geopolitical stakes, and psychological importance.[8] This essay, however, will instead evaluate the positions and goals of those who helped put Atoms for Peace into action at the international level. It will focus particularly on the experts advising the UN, especially those who worked through the United Nations Educational, Scientific, and Cultural Organization (UNESCO). As the UN's specialized agency charged with studying the role of science in world affairs, UNESCO followed closely the promise made by the Eisenhower administration to internationalize nonmilitary uses of atomic technology. Initially, UNESCO's interest lay in assessing both the promise and the danger of the technology itself. Ultimately, however, it did not conduct a major scientific assessment and instead became a strong advocate of peaceful atomic energy, issuing statements that emphasized the irrationality of public fears about atomic power and, as one advisor put it, the need to exorcise the ghosts haunting the world.[9]

UNESCO's archives reveal a series of events—first political, then intellectual—that turned the agency into a firm promoter of the peaceful atom. The Eisenhower administration, however, perceived the agency as a potential critic and worked to prevent it from making an independent technical assessment of civilian atomic power. In response, UNESCO tried to play a role in atomic-energy affairs by amassing the expertise of leading social scientists around the world, thus fulfilling its commitment to education and culture. Natural and social scientists working under UNESCO and such

6. Teller (n. 1 above), 495.

7. Spencer R. Weart, *Nuclear Fear: A History of Images* (Cambridge, Mass., 1988).

8. The most thorough discussion of atomic-technology policy is offered by Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War, 1953–1961: Eisenhower and the Atomic Energy Commission* (Berkeley, Calif., 1989). Ira Chernus has described Atoms for Peace as part of a strategy of "apocalypse management" in which Eisenhower's initiatives were intended to maintain goodwill and prevent war; see Ira Chernus, *Eisenhower's Atoms for Peace* (College Station, Tex., 2002). Kenneth Osgood writes that Atoms for Peace must be understood as part of Eisenhower's effort at psychological warfare, offering a positive spin on a subject that had theretofore inspired only dread; see Kenneth A. Osgood, *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad* (Lawrence, Kans., 2006). A French perspective on the geopolitical stakes is given in Bertrand Goldschmidt, *The Atomic Complex: A Worldwide Political History of Nuclear Energy* (La Grange Park, Ill., 1982).

9. "Expert Meeting on the Social and Moral Implications of the Peaceful Uses of Atomic Energy," 15–19 September 1958, folder 620.992: 3A 06 (44), UNESCO Archives, Paris.

other bodies as the World Federation for Mental Health tried to make sense of the Atoms for Peace program and to integrate it into their understanding of technology's role in society and to prepare the world for the creation of the IAEA. The result was that UNESCO's evaluation of Atoms for Peace came almost entirely from the point of view of the social sciences and often focused on the role of technology in general rather than that of atomic power specifically. Through its Department of Social Sciences, UNESCO drew upon a host of existing notions about the relationship between social and technological progress; in general, these assumed that public fears of atomic energy stemmed from society's pervasive reluctance to accept ever-increasing automation in an array of human activities.

What emerged from UNESCO's actions during the 1950s was not a convincing demonstration that atomic energy was indeed a subset of automation, although many of the social scientists held firmly to this opinion. Rather, the UN's primary agency for science, technology, and culture affirmed the view that, despite their unreasoning nature, public fears about technology could be overcome by education. Such assumptions led these experts to downplay the negative effects of atomic technology, embrace America's drive to export the peaceful atom, and do what they could to reduce public fears. To borrow a term from political science, experts involved in studies conducted by the United Nations constituted an "epistemic community" that shared notions of historical development, assumptions about the future of technology, and standards for valid knowledge. As such, they reinforced the idea that most objections to the peaceful atom were based not on knowledge, but on emotion.[10]

Taking the "S" out of UNESCO

When Dwight Eisenhower assumed the presidency in 1953, he received a report prepared by his predecessor's top scientific advisors that recommended he frankly acknowledge both the dangers and potential of atomic power. Only candor, it was thought, would allay American and global fears.[11] The new president decided to make atomic energy the cornerstone of a positive foreign-policy initiative that could discourage the proliferation

10. On "epistemic communities," see Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," *International Organization* 46, no. 1 (1992): 1–35.

11. These advisors were appointed by Harry Truman's secretary of state, Dean Acheson. The panel of advisors whose recommendations spurred Eisenhower's Operation Candor included J. Robert Oppenheimer, Vannevar Bush, John S. Dickey, Allen W. Dulles, and Joseph E. Johnson. See McGeorge Bundy, "Early Thoughts on Controlling the Nuclear Arms Race: A Report to the Secretary of State, January 1953," *International Security* 7, no. 2 (1982): 3–27. For the general thrust of the 1953 recommendations by Oppenheimer et al., see J. Robert Oppenheimer, "Atomic Weapons and American Policy," *Foreign Affairs* 31, no. 4 (1953): 525–35.

OCTOBER
2006
VOL. 47

of nuclear weapons while helping other nations benefit from the peaceful uses of atomic energy. On 8 December 1953, at the end of his first year in office, Eisenhower addressed the UN General Assembly in a speech soon known as "Atoms for Peace" and unfurled his plan to share information and materials with the rest of the world. It was possible, he announced, "[t]o hasten the day when fear of the atom will begin to disappear from the minds of people. . . ." "Atoms for Peace" was calculated to emphasize the great potential of nuclear power and to make the atom seem less an enemy of humanity and more a friend.[12]

A test case to verify whether foreign-policy speeches could be translated into international actions came in August 1955 at the First International Conference on the Peaceful Uses of Atomic Energy, convened in Geneva by the UN. Most of the attendees were scientists and engineers intimately acquainted with the difficulties related to radiation caused by occupational exposure and radioactive waste, but the conference focused on the promise of reactor technologies rather than their potential problems. The AEC ensured that even remote possibilities of criticism were quashed by, for example, canceling presentation of a paper on the genetic effects of radiation because it mentioned Hiroshima.[13] Most of the attendees considered the conference an unprecedented opportunity to foster an industry in its infancy rather than to oppose the development of an unknown technology, and to study and prevent environmental and health problems rather than letting them remain uncertain. Atomic energy, they hoped, could stand in stark contrast to the laissez-faire approach to industrialization during the early nineteenth century. Many of the scientists and engineers regarded the conference as evidence that the United States was serious about helping the rest of the world with technological progress.[14]

12. Many studies have analyzed Eisenhower's major addresses, such as "Chance for Peace" and "Atoms for Peace." In his memoirs, the president noted that his efforts with C. D. Jackson to write what became the "Atoms for Peace" speech hinged on his desire to instill hope rather than terror; see Dwight D. Eisenhower, *Mandate for Change, 1953–1956* (New York, 1965), 313. Works presenting this speech as part of a major propaganda initiative include Martin J. Medhurst, *Eisenhower's War of Words: Rhetoric and Leadership* (East Lansing, Mich., 1994), and Robert Bowie and Richard H. Immerman, *Waging Peace: How Eisenhower Shaped an Enduring Cold War Strategy* (New York, 1998). The speech itself, delivered to the UN General Assembly on 8 December 1953, is quoted here from Philip Cantelon, Richard G. Hewlett, and Robert C. Williams, eds., *The American Atom: A Documentary History of Nuclear Policies from the Discovery of Fission to the Present* (Philadelphia, 1984), 102. Recently, Ira Chernus has analyzed the links between Operation Candor and Atoms for Peace, arguing that Eisenhower wanted to prepare the public for any nuclear policy he might choose to adopt, even if it meant more reliance on nuclear weapons and no serious disarmament plan; see Ira Chernus, "Operation Candor: Fear, Faith, and Flexibility," *Diplomatic History* 29, no. 5 (2005): 779–809.

13. The exclusion of geneticist H. J. Muller is discussed in greater detail in Kopp (n. 2 above).

14. This enthusiasm was tempered by the realization, gained largely from this 1955 conference, that the Soviet Union had progressed further than expected in the field of

As AEC chairman Lewis Strauss told the National Security Council later, the conference was a "victory for our fundamental national policy" because everyone saw that the United States was committed to atomic technology and that Eisenhower was paying more than lip service in promoting the peaceful atom.[15]

Setting the tone for this cautious but hopeful attitude was the director-general of the World Health Organization (WHO), Brazilian physician Marcolino Candau. He argued that "time is short, and public health must fulfill its obligation by intelligent control so that general exposure to radiation background will not soon reach levels from which there is no return." Candau was particularly concerned with site selection for nuclear plants, the design of facilities, and working regulations. Despite its implied concern about possible dangers, his statement contained no hint of criticism of the future nuclear industry and implicitly sanctioned the large-scale, albeit internationally controlled, development of atomic energy as a natural component of technological progress. The WHO acknowledged the practical dilemma. While public health officials had to exercise intelligent control of long-term problems, possibly through genetics research, they also "must not be accused of hindering the development of nuclear power and thus depriving the world of its benefits."[16]

By mid-1955 UNESCO officials, who had received no requests from the UN to evaluate the scientific and technological aspects of international atomic energy, began to worry that the American Atoms for Peace plan would be implemented without them. In light of the "S" in the acronym UNESCO, officials felt that their agency had a clear mandate to consider questions related to the internationalization of science and technology. Before the Geneva conference, UNESCO's director-general, Luther Evans, had written UN Secretary-General Dag Hammarskjold to inquire why UNESCO had not been asked to participate in the creation of an international agency, given that this was a subject requiring the most efficient use of scientific cooperation. "As the Specialized Agency particularly concerned with scientific matters," he wrote, "it goes without saying that we are very much at your disposal to render assistance." Hammarskjold's lukewarm response was that he was uncertain of how to proceed.[17]

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atomic-reactor technology; see John Krige, "Atoms for Peace, Scientific Internationalism, and Scientific Intelligence," *Osiris* 21 (2006): 161–81.

15. "Memorandum of Discussion at the 261st Meeting of the National Security Council, Washington," 13 October 1955, in John P. Glennon, ed., *Foreign Relations of the United States, 1955–1957*, vol. 20, *Regulation of Armaments; Atomic Energy* (Washington, D.C., 1990), 211–12.

16. M. G. Candau to Walter G. Whitman, 5 May 1955, and undated attached text titled "The General Problems of Protection against Radiations from the Public Health Point of View," folder 620.992:539.I6, in "Atomic Radiations," UNESCO Archives, Paris.

17. Luther Evans to Dag Hammarskjold, 24 June 1955, folder 620.992, in "Atomic Energy—General," UNESCO Archives, Paris.

OCTOBER
2006
VOL. 47

After the UN-sponsored Geneva conference, UNESCO officials consistently sought a formal declaration from the organization that would involve them in the creation of any new international atomic-energy agency. Despite these efforts, UNESCO failed to gain a significant role in the scientific assessment of peaceful atomic energy and was not clearly involved in the evaluation of nuclear technology or the support of scientific activities.[18]

At the time, the agency considered the reasons for this failure somewhat mysterious. Certainly the Americans were in favor of an international study. The U.S. Department of State understood the importance of international scientific bodies, reasoning that other countries were more likely to trust a scientific study done by the UN than one by the United States. As Brookhaven National Laboratory scientist W. A. Higinbotham put it, an international study would "prove that we have nothing to hide" and that Americans supported international cooperation. It also might assuage the global concern about weapons tests, reassure the world about peaceful uses of atomic energy, and "calm many of the present irrational fears on this score." Higinbotham emphasized the point: "No pronouncement by the US AEC or even by the [National] Academy [of Sciences] can carry such weight of authority outside our shores."[19] Instead of a UNESCO study, however, the UN circumvented the science-oriented agency and created the United Nations Scientific Committee on the Effects of Atomic Radiation, a high-level committee made up of political appointees.

It seems clear from internal documents later published by the State Department that, in 1955, it was the American government that sought to remove scientific responsibility from UNESCO and to replace that agency with the higher-level committee of government-nominated scientists. The AEC's chairman, Lewis Strauss, firmly objected to any international organization second-guessing Atoms for Peace, telling Secretary of State John Foster Dulles and others that an independent scientific body would act like a "packed jury."[20] Dulles agreed and noted that if any international organization should take over this subject, it should be the United Nations, which he believed would be easier to control. Eisenhower, who was also more comfortable with trying to influence the national delegations at the United Nations, deftly preempted action at UNESCO by sending Dulles to the UN General Assembly to recommend that all nations pool their knowledge under the organization's auspices.[21]

18. Dag Hammarskjold to Luther Evans, 7 July 1955, folder 620.992, in "Atomic Energy—General," UNESCO Archives, Paris. Other letters in this folder include correspondence between various officials in the months following the Geneva conference that focuses on UNESCO's potential involvement in atomic-energy matters.

19. W. A. Higinbotham to Detlev Bronk, 14 April 1955, folder "Pub Rel: General, 1955–1962," National Academies Archives, Washington, D.C.

20. For Strauss's "packed jury" comment, see "Memorandum of a Conversation, United States Mission at the United Nations, New York," 30 May 1955, in Glennon, ed., *Foreign Relations of the United States, 1955–1957* (n. 15 above), 90–92.

21. On the State Department's views, see "Telegram from the Department of State to

The Americans felt threatened by a UNESCO-sponsored scientific study because they believed that the scientists who would conduct such a study would criticize U.S. nuclear testing by highlighting the dangers of radiation. Their concern was not without merit. UNESCO had considered sponsoring a study drawn from the expertise of the International Council of Scientific Unions (ICSU), whose members were not political appointees; and at an April 1955 general assembly of one of these scientific unions (the International Union of Biological Sciences), geneticists led by Norwegian Knut Faegri drafted a resolution noting the "already demonstrated" hereditary damages weapons testing had caused the human race. Americans at the meeting sensed the hostility of an international scientific community alert to the dangers related to weapons tests and suspicious that the United States was ignoring the hazards of peaceful atomic technology.[22] At an assembly in Oslo in August 1955, the ICSU resolved to take matters into its own hands, asking its members to conduct studies of radiation effects independently of the United States.[23] This was precisely the sort of arrangement that the Americans hoped to avoid.

The American proposal for a new scientific body composed of political appointees succeeded in marginalizing these efforts and thus deprived UNESCO of a leading scientific role in evaluating Atoms for Peace. The political liability of nuclear testing did not disappear, of course, and critics continued to connect it to nuclear power. Some nations took advantage of debates at the General Assembly to highlight the dangers of atomic technology. India's delegate to the United Nations, V. K. Krishna Menon, for example, delivered long speeches with, as one UNESCO official summarized it, "quotation after quotation concerning the serious effects of atomic radiation."[24] U.S. delegates to the UN did not have to spend much time defending their country's policies, however. The British, Canadians, and, most importantly, the Russians also supported a committee whose scientists would be nominated by national governments, and the Swedes made a similar proposal. The administration thus headed off an independent and international scientific evaluation of radiation effects, and UNESCO was left without any clear involvement in international atomic-

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the Embassy in the United Kingdom," 10 May 1955, in Glennon, ed., *Foreign Relations of the United States, 1955–1957*, 75.

22. "Excerpt from Report by Paul Weiss on the 12th General Assembly of IUBS Held in Rome, Italy," 12–16 April 1955, n.d., folder "IR: 1955–1960," National Academies Archives, Washington, D.C. On the relationship between ICSU and UNESCO, see F. W. G. Baker, *ICSU–UNESCO: Forty Years of Cooperation* (Paris, 1986).

23. "International Council of Scientific Unions, Seventh General Assembly [9–12 August 1955], Resolution," n.d., folder 620.992.539.I6, UNESCO Archives, Paris. On ICSU, see Frank Greenaway, *Science International: A History of the International Council of Scientific Unions* (Cambridge, 1996).

24. S. V. Arnaldo to Director-General, UNESCO, 1 November 1955, and S. V. Arnaldo to Director-General, UNESCO, 8 November 1955, folder 620.992:539.I6, in "Atomic Radiations," UNESCO Archives, Paris.

energy affairs.[25] Ironically, this agency soon chose to focus not on natural science, but social science—a course that would align it much more fully with American policies than the Eisenhower administration could have hoped.

OCTOBER
2006
VOL. 47

Automation and Mental Hygiene

After returning to Paris from these debates at the General Assembly, UNESCO's liaison to the UN, René Maheu, sought to reestablish some productive role for an agency outmaneuvered in the scientific realm. Eager to ensure that his organization would not be totally marginalized in the internationalization of atomic energy, he concentrated on the social sciences, setting into motion a major appraisal of the entire problem of atomic energy that would assess its effects on the social, cultural, and moral aspects of civilization.[26]

Maheu soon discovered that most UNESCO officials did not believe that atomic energy was significantly different from the industrial technologies of the past. The biggest problem was not atomic energy, it was widely felt, but rather the threat of automation to the world's peoples and economies. As French physicist Pierre Auger, in the natural sciences division, assured his colleagues in the social sciences, there were no major, immediate problems related to peaceful atomic energy. Automation was a far more significant challenge. Although ostensibly the new UN committee on the effects of atomic radiation was supposed to address the problem of nuclear power, one official reported Auger as saying that it really "had been emotively conditioned by the problems of the atomic bomb." Equally dismissive, the mass communication department said that rather than conducting a serious study, it would be content to issue periodic progress reports about atomic energy. Jean Guiton of the education department saw little role at all for his unit, mainly because there appeared to be few real differences between the beginning of the steam age and this era of atomic energy. Of course, there would be problems, he said, but these were familiar, and atomic energy should not be treated as a singular case.[27] Atomic energy, it seemed, was important only because the atomic bomb had captured the world's imagination.

The project was nevertheless taken seriously because Maheu wanted to

25. Dulles's statement and UNESCO's reactions can be found in S. V. Arnaldo to Director-General, UNESCO, 22 September 1955, folder 620.992:539.I6, in "Atomic Radiations," UNESCO Archives, Paris.

26. See Maheu's description in "Problèmes sociaux, moraux, et culturels que posent les applications pacifiques de l'énergie atomique," 11 June 1956, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

27. H. M. Phillips to Mr. Marshall, M. de Lacharrière, and M. Radchenko, 18 May 1956, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

use social impact as UNESCO's entrée into international atomic-energy matters. After all, if UNESCO's mandate was to promote the application of science and culture for peace and the benefit of mankind, what was a better way to do this than to assess the social impact of a technology that might bring cheap energy to the world? The job fell to the Department of Social Sciences. At UNESCO, this department was broadly conceived, including not only sociology, but also economics and any of the myriad subjects with the "social" appellation, such as social psychology and social anthropology. English sociologist and economic historian Thomas H. Marshall, who left the London School of Economics to become the department's director in 1956, was amused to find that the department seemed to be left with all the issues that did not fit anywhere else, but was perhaps less amused to find that the department sacrificed rigor for breadth. As he later recalled, "the problems left to us were chiefly those for which no quick or precise solution can be found by any of the social sciences, and certainly not by sociology." Naturally enough, then, social problems from atomic energy became the responsibility of his department.[28]

Like the other UNESCO units mentioned above, Marshall's Department of Social Sciences downplayed the novelty of atomic energy. In the 1920s, Marshall had written a biographical study of James Watt, the eighteenth-century inventor of a more-efficient steam engine; and he thought he knew something about the social effects of energy production. Examining atomic technology through a historian's lens, he concluded that it represented the latest in a long string of efforts to harness the power of nature. When instructed by Maheu to undertake the task of treating the atom as something novel, Marshall predicted that atomic energy would be a small problem compared to those of automation and a shortened workweek. He also objected to the use of the term "moral problem" and wondered if Maheu meant that genetic damage would one day change the whole character of human personality. If so, he said, he would certainly bear the question in mind, but would "subsume this factor under the general social and cultural factors, rather than give it special prominence unless clear advice to the contrary should come from the natural scientists."[29]

For Marshall, the opportunities of atomic energy outweighed its dangers. If he and his colleagues recognized those dangers at all, they assigned them to the general rubric of industrialization and technological change, all of which posed risks that had to be accepted if civilization were to advance. Although atomic energy would pose challenges, Marshall contended that these would be akin to other serious "implications" that required fuller

28. On Marshall's background, see T. H. Marshall, "A British Sociological Career," *British Journal of Sociology* 24, no. 4 (1973): 399–408, quote on 406.

29. The biography was T. H. Marshall, *James Watt (1736–1819)* (London, 1925). T. H. Marshall to René Maheu, 12 March 1957, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

OCTOBER
2006
VOL. 47

attention, among them "[s]elf-defeating factors such as traffic congestion, fatigue, tension and a mechanisation of cultural pursuits."[30]

Marshall was not alone among intellectual figures in seeing automation as the dominant theme connecting technology and society. In his 1948 *Mechanization Takes Command*, Swiss historian Siegfried Giedion warned of the perils of automation and urged not an escape to a preindustrial life, but rather an enhanced effort at accommodation, the problem with a mechanized society being man's inability to adapt and fashion a new symbiosis with each changing technology.[31] Historians of technology familiar with Lewis Mumford will remember that his postwar work dealt explicitly with this problem: *The Conduct of Life* (1951), the fourth in a series begun during the 1930s, tried to find the means to renew life amidst complex modern problems. The great threats, Mumford pointed out, were the trends to reduce human moral and spiritual life to quantitative, mechanistic, impersonal, and purely automatic relationships.[32] The 1950s witnessed a spate of books by historians and social scientists that pointed to automation as the dominant challenge in human society, some of the areas of concern being the effects of a shorter workweek, the size of the workforce, employment opportunities, and other social consequences of the widespread development of automated labor.[33]

The real culprit in the problems of modern society, Marshall believed, was that automation on the job and at home was transforming society into a self-defeating machine whose conveniences did not improve life's quality, but simply quickened its pace and intensified material needs. True, the automatic and mechanistic character of future atomic power plants would exacerbate the long-term puzzle of the evolving human personality in a mechanized society, but the problem was not atomic energy per se; rather, "the spread of automation itself is really the problem, since the social impli-

30. For a general statement from the department, see "Meeting on Programme Matters in Connexion with the Planning of the 1959–1960 UNESCO Programme and Budget," 9–11 July 1957, Social Sciences, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

31. See Siegfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York, 1948). A discussion of Giedion's influence can be found in Arthur P. Molella, "Science Moderne: Siegfried Giedion's *Space, Time, and Architecture* and *Mechanization Takes Command*," *Technology and Culture* 43 (2002): 374–89.

32. Lewis Mumford, *The Conduct of Life* (New York, 1951).

33. For examples, see Maurice Rustant, *L'Automation: ses conséquences humaines et sociales* (Paris, 1959); Howard Boone Jacobson and Joseph S. Roucek, eds., *Automation and Society* (New York, 1959); and Georges Friedmann, *Industrial Society: The Emergence of the Human Problems of Automation* (Glencoe, Ill., 1955). Frederick Pollock went further than most by calling automation a second industrial revolution; see Frederick Pollock, *Automation: A Study of Its Economic and Social Consequences* (New York, 1957). A historical approach to the effects of automation that emphasizes the trend toward greater control of labor by management can be found in David F. Noble, *Forces of Production: A Social History of Industrial Automation* (New York, 1984).

cations of automation are much more extensive than those of the peaceful use of atomic power." Marshall wrote that only in the short term would atomic energy present a social difficulty "especially among the young," largely because people were unaccustomed to it. "I do not see that the introduction of atomic energy as a source of power is essentially different in kind from the introduction of other sources in the past," he wrote to a colleague back in London, even as he acknowledged that "public opinion in many countries thinks otherwise."[34]

This refusal to recognize any special dangers associated with atomic technology and the conviction that the public's attitudes were irrational ran so deep that they were unaffected by a major accident at the British nuclear facility at Windscale in October 1957. There, during a routine operation, technicians mistakenly allowed temperatures to rise to unsafe levels; some of the equipment ignited and the subsequent fire sent radioactive chemicals into the atmosphere. Having measured high levels of radioactive iodine in local samples, the plant ordered a ban on the sale of milk from nearby cows.[35] Marshall, whose interest lay in gauging and shaping public views, was intrigued (largely because his country home lay in the vicinity of Windscale), but his point of view remained unchanged. He wrote to a colleague that "the affair had something of the character of a laboratory experiment on public opinion, its anxieties and its sensitivities to the possible dangers of the use of atomic power."[36]

Rather than altering Marshall's conception of the public's irrationality, the Windscale accident instead sharpened his resolve, and that of like-minded social scientists, to study the psychological impact of atomic energy and to help society understand its proper relationship to the larger trend of automation. Marshall was explicit about this, writing that he wanted to study the younger generation to ascertain more clearly "what sort of mixture of hopes and fears was present in their minds" so as to help them adapt to the natural pace of technological change. Whereas his attitudes had previously been somewhat blasé, he now saw a clear avenue to making his Department of Social Sciences relevant in the realm of atomic energy.[37]

The archival records of UNESCO reveal that Marshall established a liaison with the World Federation for Mental Health (WFMH), a body that had started as the International Committee for Mental Hygiene. A nongovernmental organization with consultative status in the UN, the WFMH

34. Marshall set forth his own views and personal disclaimers about the project in T. H. Marshall to Sir Arnold Plant, 12 August 1957, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

35. For a detailed, day-by-day discussion of the Windscale fire, see Lorna Arnold, *Windscale 1957: Anatomy of a Nuclear Accident* (London, 1992).

36. T. H. Marshall to Richard Cowell, UNESCO National Commission for the United Kingdom, Ministry of Education, 29 October 1957, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

37. Ibid.

OCTOBER
2006
VOL. 47

provided advice to social scientists at UNESCO in the same way that the International Council of Scientific Unions might have done to natural scientists. It was the voice of the mental-hygiene movement, which conceptualized social problems as psychological maladjustment. Just as children needed to develop healthy personalities, and as adults and children might require "personality adjustments," entire societies needed proper guidance and corrective psychological action.[38] The president of the International Committee for Mental Hygiene's first congress in 1930, William White, observed that society ought to look to the mental-hygiene movement for guidance on censoring literature, art, the stage, and film, as well as for help in alcohol and drug addiction and even in international relations.[39] Approaching atomic energy from the perspectives of educational specialists, psychologists, and sociologists, the WFMH advocated behavioral control, personality adjustment, and "mental hygiene" as tools for helping society keep pace with technological change. Marshall thus linked his department with an international group of experts that had been studying technological change for over two decades and whose past activities reveal some of the deep roots of intellectual views about public irrationality among social scientists.

The mental-hygiene movement encouraged social scientists to take an active role in shaping human minds toward greater health and happiness. Its advocates believed they were facing up to a central human quandary first manifested after World War I, namely, the need to regulate society while still allowing it sufficient freedom. Many social scientists came to believe that behavior modification should be used to shape civilization itself for the better.[40] These social scientists believed they lived in a time of social crisis, largely because the "cultural lag" caused by industrialization and automation—the machine age—had led to widely divergent approaches to social problems and increasingly polarized political ideologies. In a 1940 speech, Walter Cannon, the retiring president of the American Association for the Advancement of Science, echoed these thoughts when

38. As historian Theresa Richardson has pointed out, the mental-hygiene movement contained an inherent conflict that pitted the use of knowledge for humanitarian purposes against abusive social control; see Theresa R. Richardson, *The Century of the Child: The Mental Hygiene Movement and Social Policy in the United States and Canada* (Albany, N.Y., 1989).

39. On censorship, see William A. White, "The Origin, Growth, and Significance of the Mental Hygiene Movement," *Science* 72, no. 1,856 (1930): 77–81.

40. The importance of the mental-hygiene outlook in shaping virtually all aspects of American education research and policy in the twentieth century is emphasized in Sol Cohen, "The Mental Hygiene Movement, the Development of Personality and the School: The Medicalization of American Education," *History of Education Quarterly* 23, no. 2 (1983): 123–49. A recent memoir about the WFMH that covers these years is Eugene B. Brody, *The Search for Mental Health: A History and Memoir of WFMH, 1948–1997* (Baltimore, 1998).

he lamented the basic dilemma facing civilization: the need to establish order while simultaneously preserving individual freedom.[41]

The tenets of mental hygiene influenced the leadership of international organizations and the way they treated atomic technologies. Canadian psychiatrist G. Brock Chisholm, who had played a leading role in the WFMH, was also the first director-general of the World Health Organization. Chisholm's strong beliefs on conditioning the mental health of society toward rational thinking gave him a mixed reputation in his home country. He was known in Canada as the man who tried to kill Santa Claus, having publicly argued in 1945 that parents were permanently damaging their children's ability to think by encouraging belief in this bearer of Christmas gifts. Chisholm and others believed that techniques of social adaptation had to be employed if society was to avoid debilitating anxieties and indulgence in self-deceptive, irrational-fantasy social adaptation. Technology, he pointed out, did not confer benefits alone.[42]

Chisholm tried to instill in social scientists a sense of responsibility for combating irrationality and for helping laypersons confront the challenging realities of the modern era. At the 1948 International Congress on Mental Health in London, a meeting of over two thousand attendees drawn primarily from the social sciences, Chisholm emphasized the importance of engineering society in ways that would help it to accept new technologies. Government agencies, he claimed, did not always share this sense of responsibility and were often reluctant to call for help. This was so true "that it becomes increasingly clear that the designing, building, and operating of modern civilization requires techniques different from those of a generation ago." The new techniques would incorporate sociology and psychology to help society constantly readjust to new realities.[43]

The United Nations tried to incorporate the WFMH's goals into its programs. During the early 1950s, for example, anthropologist Margaret Mead directed a WFMH study designed to inform the UN's technical-aid programs of the effects of technological change in five different cultures through a survey of the inhabitants of Greece, Burma, Nigeria, Palau, and

41. Cannon himself attempted to draw analogies between the body's ability to regulate itself—organic homeostasis—and the state's role in regulating the economy. On Cannon's efforts to adapt organic homeostasis to "social homeostasis," see Stephen J. Cross and William J. Albury, "Walter B. Cannon, L. J. Henderson, and the Organic Analogy," *Osiris* 3 (1987): 165–92.

42. The only substantive treatment of Chisholm's life, including his views about global health (and Santa Claus), is Allan Irving, *Brock Chisholm: Doctor to the World* (Markham, Ont., 1998).

43. See George Brock Chisholm, "Social Responsibility," *Science* 109, no. 2,820 (1949): 27–30, 43. This 1948 congress marked the renaming of the organization to World Federation for Mental Health. The World Health Organization adopted it in the same year as a consultative body, giving it the right to make recommendations. See also "World Health Organization," *International Organization* 3, no. 1 (1949): 163–64.

OCTOBER
2006
VOL. 47

New Mexico. Incorporating the views of anthropologists, sociologists, physicians, psychologists, economists, and other specialists, the study sought to make experts sensitive to the effects of new technologies on mental health.[44]

With the establishment of the International Atomic Energy Agency (IAEA) on the horizon, the WFMH met in 1956 and 1957 to brainstorm ways in which it could help control public fear about atomic energy.[45] Chisholm and Mead led these meetings. Initially, they planned to evaluate human reactions to an array of such new devices and techniques as different reactor designs and waste-disposal methods. Ultimately, however, they took a more general approach, tackling the nature of negative reactions to any kind of atomic technology.[46] Some of the fears the public expressed seemed specific and personal, among them damage to the human body from ionizing radiation that might result in sterility. Vaguer fears included the possibility of mutation or even "race suicide." The global impact of atomic technology promised to be so great, Chisholm argued, that every act of the IAEA would have an impact on the public, and great care would be needed to promote public understanding. This could be done with the help of experts trained in the relationship between technology and human relations, whether they were psychiatrists, psychologists, anthropologists, or other social scientists. A "mental health" consciousness would be needed within the IAEA because its very existence depended on the climate of public opinion.[47]

Trying to fit atomic fear into their understanding of technological change, the WFMH insisted that public worries revolved around automation, machine domination, and shifts in power relations among nations. Such anxieties, WFMH's members agreed, should be openly expressed, both for therapeutic reasons and to help the IAEA "increase the ability to control irrational fear." They recommended establishing a unit for health education and policy that "would be essential to shape a sound program of public relations." Because the new atomic agency would depend heavily on the public's reception of its work, "its very existence might at times depend upon a staff unit oriented toward establishing a climate of opinion based upon public knowledge and understanding."[48]

44. On Mead's project, see the introduction to Margaret Mead, ed., *Cultural Patterns and Technical Change* (New York, 1955).

45. The results of these meetings have been criticized as "the most ludicrous kind of dime-store Freudianism," trivializing people's concerns about nuclear dangers. Stephen Hilgartner, Richard C. Bell, and Rory O'Connor, *Nukespeak: Nuclear Language, Visions, and Mindset* (San Francisco, 1982), 103.

46. "World Federation for Mental Health Executive Board, Sub-Committee on Mental Health Aspects of Atomic Energy, Minutes, Berlin Meeting," August 1956, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

47. "World Federation for Mental Health Executive Board, Sub-Committee on Mental Health Aspects of Atomic Energy, Minutes of Second Meeting," New York, 9 November 1956, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

48. Ibid.

The disturbing conclusion from the WFMH's advisory meetings was that public fear seemed too deep-seated to be dismissed; and that even if they could agree that atomic technology was not so significant a problem as automation, active propaganda would be necessary if most people were to reach this conclusion. Argentine psychiatrist Eduardo Krapf affirmed that there was a "magical aura surrounding everything connected with atomic energy which seemed similar to alchemy and witchcraft. . . ." This was only exacerbated by the fact that most atomic information remained secret, and that full knowledge was limited to a few. Such a situation could easily promote irrational fears.[49] The WFMH insisted that sustained fear of the atom had to be avoided: "Military experience indicates that any long-continuing fear, even if originally valid and rational, can become pathological and irrational unless expertly and effectively dealt with."[50]

In its recommendations to the United Nations, the WFMH outlined the particular ways in which popular perceptions of atomic power were colored by predominantly biological fears: genetic damage, loss of reproductive function, shortened life, malformed children, bodily mutilation. However "obviously irrational" these fears might be, they appeared to be rooted in genuine scientific concerns, particularly in the realm of genetics. The federation argued that "[n]ever before in human history has any generation been faced by such a weight of responsibility for the future of the race." The scale of public fear created problems "that go far deeper than those that confront the usual public relations or public information divisions in international agencies."[51] Although the WFMH experts recognized the pervasiveness and depth of the fear, they continued to label it irrational. More than the usual technological adjustment would be necessary to dispel the dark clouds of atomic terror. Something akin to psychiatric therapy for the entire world might be necessary.

Atomic Psychology

Armed with consultative advice from the World Federation for Mental Health, UNESCO's own activities echoed those of the mental health experts by highlighting a disparity between dramatic public fear and banal atomic reality. Rather than ignore the excitement on all matters connected to atomic energy, the organization began to promote studies investigating why

49. "Mental Health Executive Board, Subcommittee on Mental Health Aspects of Atomic Energy, Minutes of Third Meeting," New York, 7–8 January 1957, folder 620.992: 3, in "Peaceful Use," UNESCO Archives, Paris.

50. Draft prepared by a subcommittee of the "Executive Board of the World Federation for Mental Health on the Mental Health Aspects of the Peaceful Uses of Atomic Energy," New York, 8 January 1957, folder 620.992:3, in "Peaceful Use," UNESCO Archives, Paris.

51. Ibid.

OCTOBER
2006
VOL. 47

the lay public was so irrational and susceptible. Through the Expert Meeting on the Social and Moral Implications of Atomic Energy organized by Marshall's Department of Social Sciences, and after extended debate among influential academic figures, UNESCO would ultimately codify the twin concepts of public irrationality and technological accommodation.

The social scientists favored large-scale surveys as the best way to gauge public anxieties and help formulate policies. During the early 1950s, for example, the U.S. National Institute of Mental Health had recommended that surveys be used to reveal the misconceptions and prejudices impeding implementation of major policies. The institute's director, Robert Felix, had argued that such policies were too often based on rumor. Parents, for example, frequently spoke of children terrified at the thought of atomic war after they had participated in civil-defense drills, and described these youngsters as severely traumatized and unable to shut out horrible thoughts. Who had not heard such rumors or not had such conversations? Rumors, however, were not a firm basis for policy. "How prevalent are such anxieties in children? What kinds of children are most anxious and what do their parents do about their anxiety?" These and other crucial questions could be answered with general mental health surveys related to policy development and implementation.[52]

Unfortunately for UNESCO's experts, survey results made the prospects for peaceful atomic-technology acceptance seem bleak. True, psychologists working with the U.S. Army found that soldiers taking part in troop maneuvers with atomic weapons were less fearful and more trustful once they were thoroughly indoctrinated about the nature of the effects of the bomb on the battlefield.[53] For peaceful uses, however, a survey conducted in 1948 by Lillian Wald Kay and Irving J. Gitlin suggested that, despite efforts to change their minds, people continued to associate civilian uses of the atom with the destructive bombs that destroyed Hiroshima and Nagasaki.[54]

In the early 1950s, sociologists Elizabeth Douvan and Stephen Withey concluded that these unpromising results could be blamed on the fact that atomic energy was born in war and the world had yet to see an untroubled peace. They were certain that emotionally stable people would adapt to the peaceful atom. Those who were fearful were "something like chronic pessimists. . . . People who are ordinarily secure and confident are not suddenly given to defeatism and fearful anti-progress sentiments when atomic energy is introduced." Those with negative views were not actually afraid of

52. R. H. Felix and John A. Clausen, "The Role of Surveys in Advancing Knowledge in the Field of Mental Health," *Public Opinion Quarterly* 17, no. 1 (1953): 61–70.

53. Shepard Schwartz and Berton Winograd, "Preparation of Soldiers for Atomic Maneuvers," *Journal of Social Issues* 10, no. 3 (1954): 42–52.

54. Lillian Wald Kay and Irving J. Gitlin, "Atomic Energy or the Atomic Bomb: A Problem in the Development of Morale and Opinion," *Journal of Social Psychology* 29 (1949): 57–84.

the atom; rather, they were personally insecure and had irrational feelings of inadequacy in most realms of their lives. An implicit assumption in these studies was that fear of atomic technology was synonymous with anti-progress sentiment.[55]

For UNESCO's meeting of experts, researchers working under the auspices of the International Union of Scientific Psychology conducted a survey of two hundred students at the University of Hawaii. The students' sources of information about the subject ranged widely, including classes, magazines, newspapers, radio, television, and even comic strips. The study indicated that about half of the students "wondered" about something related to atomic energy, and that 38 percent of these were consciously afraid. The numbers were confusing. Most of those who worried about the dangers of atomic energy referred to the conflicting reports about radiation's harmful effects, yet over 80 percent of those surveyed believed that the peaceful development of atomic technology would raise their standard of living. A basic fear underlay this optimism, however: 32 percent expected a third world war to break out within twenty-five years.[56]

Some two-dozen "experts" convened at UNESCO in September 1958, just a few days after scientists and engineers had gathered in Geneva for a second Conference on the Peaceful Utilization of Atomic Energy. These experts represented a variety of intellectual backgrounds: some were atomic-energy officials, others academics from the natural or social sciences. Charter Heslep, public-information officer for the U.S. Atomic Energy Commission (AEC), argued that the participants' task was to develop a strategy for allaying irrational public fears about atomic technology. This conformed neatly with the general opinion of the group. If the AEC's experience was any indication, Heslep claimed, there were many ways to convince people of the safety of Atoms for Peace. Low-income workers, for example, could be persuaded if insurance policies in the atomic-energy industry cost about the same as those in other hazardous industries, such as chemicals and petroleum. Scientists and engineers were urged to think along similar lines and take active steps to reduce fears rather than focus on technical details that might add to people's anxiety. Heslep viewed public relations as an important aspect of scientists' social responsibility. French atomic-energy official Pierre Taranger agreed, complaining that scientific disagreements were too often exaggerated by the press, and that scientists should find common ground for the sake of the industry and the public's peace of mind.[57]

55. Elizabeth Douvan and Stephen Withey, "Public Reaction to Nonmilitary Aspects of Atomic Energy," *Science* 119, no. 3,079 (1954): 1–3.

56. This survey used a rather small sample size, a fault that the experts duly recognized. International Union of Scientific Psychology, "Attitudes toward the Peaceful Uses of Atomic Energy, a Pilot Study," n.d., folder 620.992:3A 06 (44), UNESCO Archives, Paris.

57. Charter Heslep, "Some Aspects of the Impact of the Nuclear Age in the United

OCTOBER
2006
VOL. 47

The social scientists held similar views, although they expressed them somewhat differently. Instead of dealing in "public relations" or "propaganda," they viewed themselves as managers of public health. Anxiety was a kind of neurosis to be treated. The prevalence of this view was largely due to the influence of Austrian psychiatrist Hans Hoff, whose research focused on the irrationality of fears prompted by cancer and who was well-attuned to the effects of deleterious disease upon public opinion. Such fear, he reasoned, could become a disease of the mind, easily fueled or abated by information.[58] He declared that nuclear technology posed a high risk for neurosis because it drew upon an energy source different from any previously known. Further, it was associated with world destruction and the lingering threat of genetic damage that would affect future generations. He noted that with the atom, man was introduced to previously unknown resources of enormous potential, and "if he uses them he is subject to punishment in almost all human mythology as witness the Faust, Pandora, and Prometheus legends."[59]

Other eminent participants agreed that an irrational, apocalyptic fear was embedded deeply in human culture and, unfortunately, atomic energy had tapped into it. French anthropologist Claude Lévi-Strauss argued that people were afraid because they accepted such platitudes as the possibility of destroying mankind. He had concluded this after completing an anthropological survey of the community adjacent to a French nuclear reactor. "This is not an objective response," he argued. "Can nuclear phenomena really destroy the world or the human species?" His compatriot, mathematician François Le Lionnais, offered the possibility that the public might not be completely in error: although "destroying mankind" might be an irrational expectation, atomic bombs were certainly capable of destroying quite a large proportion of mankind. There was little difference, at least in the minds of French people (so he said), between peaceful and military uses of atomic energy. It would be the experts' job to remedy that. He echoed a mantra of technological accommodation, cautioning: "Science does not bring about social and moral progress, only scientific progress." Active steps would be needed to bring society in line with scientific and technological change.[60]

The experts came to believe that their task was complicated by an array of circumstances that linked the peaceful atom to the atomic bomb. One problem seemed to be uncertainty. People did not know whom to trust, and so much secrecy surrounded atomic energy that they were bound to be

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States," n.d., folder 620.992: 3A 06 (44), "58: Expert Meeting on the Social & Moral Implications of the Peaceful Uses of Atomic Energy—France, 1958, Part III from 1/9/58," UNESCO Archives, Paris.

58. Hoff analyzed the "neurotic cancer fear" in Hans Hoff, "Die Neurotische Krebsfurcht," *Wiener Medizinische Wochenschrift* 101 (1951): 573–76.

59. "Expert Meeting on the Social and Moral Implications of the Peaceful Uses of Atomic Energy" (n. 9 above).

60. Ibid.

suspicious, if not afraid. Secrecy imbued peaceful atomic technology with the trappings of military enterprise. Further, atomic energy challenged civil liberties: there were background checks and dismissals that defied precedent in other industries. While these were not completely without historical precedent (Le Lionnais noted that fifteenth-century lace makers had been forbidden to travel to other countries), the peaceful use of atomic energy was made conspicuous by the transfer of military-style precautions to the public arena. Moreover, the public was uncertain about the nature of the harm radiation could cause. As Columbia professor Menelaos Hassialis pointed out, laypersons were confronting a force of mysterious nature: "It is invisible, it is black magic." Unlike atomic blasts, the pathologic and genetic effects of radiation rarely exhibited noticeable symptoms.[61]

Liability was also a cause for concern. The use of nuclear weapons would have dire consequences for both attacker and defender, and the attacker would be held accountable. Who, however, would be responsible for the harmful effects of radioactive waste? As German nuclear physicist Hans Kruse observed, "no law in the world concerns itself with genetic liability." In a realm where accountability was unknown, perhaps even unknowable, supposedly irrational feelings were bound to intensify.[62]

Perhaps worse than the uncertainties voiced by laymen were the disagreements among scientists and engineers, some of whom expressed increasing doubts about waste-disposal options, and reports by geneticists that even small amounts of radiation exposure should be considered harmful. The growing disparity in scientific opinion was bound to present a problem. Most psychological surveys indicated that people tended to trust conclusions expressed by experts; but as Hans Hoff complained, the biologist warns of genetic effects, while "the physicist tells us there is nothing to worry about." The common man, he said, "is disturbed and does not know what to believe." Taranger agreed, warning that UNESCO should do everything possible to establish a common position: "We must have agreement among truths; we must have conformity among scientific estimates."[63]

There were a few who disagreed with the notion of imposing uniformity on experts. German sociologist Ralf Dahrendorf, for example, believed that there should be more reporting of genuine disagreements among scientists and engineers, and mused that respect for experts was perhaps already more excessive than justifiable. Nuclear physicist Hideki Yukawa of Japan was also quick to point out that scientists should not necessarily be separated from the public. "Even scientists," he said, "are not entirely free from emotional reactions."[64] But despite Dahrendorf's and Yukawa's warnings that scientists should not rest on an isolated pedestal,

61. Ibid.
62. Ibid.
63. Ibid.
64. Ibid.

OCTOBER
2006
VOL. 47

most experts agreed that people had to receive unified, authoritative information from somewhere, and that this ought to come from natural scientists—especially if they could be persuaded to find common ground. Too much openness about disputes risked undermining the public's confidence in science and technology.

These insights from some of the world's leading intellectuals into the nature of fear and the nature of atomic energy resulted in agreement on at least one point: that anxiety was a more serious challenge to the peaceful use of atomic energy than was atomic technology itself. This meant that steps had to be taken to reduce the effects of fear: steps that included near-uniform views and actions by policy makers, advisors, and influential persons of every stripe—from the natural scientists and social scientists in the ivory tower to the politicians and journalists who dealt most directly with the public.

In their press statement, the committee of experts again downplayed the special status of atomic energy, describing it as "the continuation of a process that started before the splitting of the atom, to which the development of automation also belongs." The only genuine peril to society was its inability to adjust to changing technology in an increasingly automated society. In effect, the experts equated the public's fear of the atom to that of children irrationally haunted by thoughts of hidden threats lying in the dark or under the bed. Humanity, the UNESCO group observed, could not shake the "primitive fear of world destruction and of the punishment of those who violate divine edicts." One of the tasks ahead was to "exorcise such ghosts."[65]

Conclusion

It seems easy for historians at the dawn of the twenty-first century to view the atomic bomb, and the many civilian uses of atomic energy, as technological changes that radically altered relations among the peoples of the world after World War II. It is worth remembering, however, that many intellectuals living in the decade or so after the official beginning of the "atomic age" would not have agreed that this was the true stamp of the era. In a 1958 review of the literature on the social consequences of automation, English sociologist T. R. Gass warned of the world's shortage of social scientists who could deal with the pervasive challenge of automation and complained of troubling gaps in knowledge that would manifest themselves in coming years. As late as 1960, mathematician Norbert Wiener warned that machines were in a position to surpass human limitations and pose a real danger to mankind. Gass, Wiener, and other authors emphasized how important it was that society adjust to the many changes brought about by automation. Perhaps it should come as no surprise then that during the

65. Ibid.

1950s, the threat of automation so captured the imagination of intellectuals in international organizations that it diminished the importance of such specific technological developments as atomic energy.[66]

Understanding the obsession with automation helps to explain how Atoms for Peace found a receptive ear among the experts who worked for or advised the United Nations. The irony is that UNESCO was initially marginalized in international atomic-energy affairs because the United States regarded the "S" in its name as a potential source of criticism. UNESCO's turn toward the social sciences opened up a door to a world of experts who viewed the atom as one part of a long process of human development that UNESCO—with its mandate to serve humanity—was duty-bound to facilitate. Already accustomed to studying emotional responses to technological change, the organization readily agreed that opposition to peaceful atomic technology was little more than an expected irrational reaction that could be countered with good policies and rigorous study by responsible officials and scholars. Many of the experts involved had spent large parts of their careers in studying aspects of human adjustment to technology and had no reason to treat atomic energy differently. This was an "epistemic community" whose shared body of knowledge included a worldview about the direction of civilization, the notion of progress, and the imperative that public mental health be shaped to accommodate change. To stand in opposition to such change, they believed, would be inherently antiprogressive.

The result was not necessarily the triumph of atomic technologies, all of which encountered political and economic difficulties in subsequent decades. It may be that UNESCO's efforts helped to consolidate attitudes about the irrational public, to ground such attitudes firmly in the social sciences, and to propagate them internationally through reports, conferences, and press releases. The UN, through its various agencies, may well have helped to validate the peaceful atom and reinforce the view that the lay public was an irrational actor that had to be re-educated at every step in the progressive march of technology. More important, however, is what UNESCO's records reveal about the ways experts combined to dismiss or alter negative public perceptions of nuclear power. When we see such words as "irrational," "emotional," and "fear" ascribed to antinuclear critics, we must understand that these imputations have their own historical origins. In the case of the UN experts presented here, it is clear they assumed that fear of (in this case) atomic power was a surrogate for fear of technological change in general. Moreover, they appear to have made this connection long before the explosion of the first atomic device. Committed to the

66. T. R. Gass, "Research into the Social Effects of Automation," *International Social Science Bulletin* 10 (1958): 70–83; Norbert Wiener, "Some Moral and Technical Consequences of Automation," *Science* 131, no. 3,410 (1960): 1,355–58.

OCTOBER
2006
VOL. 47

"rational" view that the atom was just the latest in a series of technological changes that increased the power of automated devices, many social scientists (and natural scientists as well) dismissed public misgivings. To reshape the public view along "rational" lines, they employed such methods as surveys, propaganda, and even the suppression of contrary opinion so that society might accept the inevitability of change. Had they done otherwise, they could themselves have been accused of acting irrationally and succumbing to fear.