Physicists in Politics

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PHYSICISTS IN POLITICS

Through their public opposition to the nuclear arms race and human rights violations, US physicists have played a pivotal role in setting the national and international political agenda.

Kurt Gottfried

With the creation of the atomic bomb, physicists acquired a sudden and unprecedented entry into global politics. That the relationship between physicists and politicians would be a difficult one was apparent long before Hiroshima, when Niels Bohr sought to convey his prescient insights about the bomb's political implications to Winston Churchill, and was harshly rebuffed.[1]

Although Bohr had tried to influence public policy from the inside, much of the political activity of American physicists has been from the outside. What follows is a personal (and by no means complete) sketch of such efforts. Of course, the border between inside and outside is not clear-cut. Hans Bethe, Richard Garwin and others before them have worked both sides of the border, as high-level advisers to the US government and as critics of government policies. In some cases, insiders have quietly laid the groundwork that later has made the outsiders' activities effective. And professional organizations such as the American Physical Society (APS) have been indispensable in sustaining and promoting the efforts begun by individuals.

The fallout from Hiroshima

It is instructive and sobering to revisit 1945. Everyone knows that scientists were unable to postpone, let alone prevent, the escalation from fission to thermonuclear weapons, or the grotesque growth in the size and lethality of the nuclear arsenals. But few still remember that the core political issues attending nuclear weapons were recognized from the start by many physicists; that great obstacles to having these issues properly addressed by the US government arose immediately; that the effort to overcome these obstacles thrust the physics community at large into the political arena for the first time; and that the means used by those early activists to advance their cause have, in essence, changed but little, just as the differences between scientific and political discourse continue to pose ethical dilemmas for those who stray from the ivory tower.

The most influential scientific insiders in US history were Vannevar Bush and James Conant, the leaders of the wartime R&D effort. Although few knew it then, they and Henry Stimson, the US secretary of war, viewed the bomb in much the same way as did the scientists actually working on the Manhattan Project. Some ten weeks before the bombing of Hiroshima, Stimson, an exceptionally sensitive leader of men at war, jotted in his diary that the still-untested bomb "may *destroy* or *perfect* International *Civilization* . . . [a] *Frankenstein* or means for World Peace" (emphasis in original).[2] Nevertheless, in the critical period surrounding the defeat of Japan, even those insiders could not get the Truman Administration to seriously address the foreign policy issues raised by the bomb.

The broad implications of the bomb were first examined by a group of Manhattan Project scientists at the University of Chicago led by James Franck, Glenn Seaborg, Leo Szilard and Eugene Rabinowitch, acting largely on their own initiative.[3] The result, the so-called Franck Report, was finished by the time Stimson wrote the words just quoted, but he never saw this freelance document. It was known, however, to Arthur Compton, Enrico Fermi, Ernest Lawrence and J. Robert Oppenheimer, the members of the technical panel advising Stimson. The Franck Report's conclusions of most long-lasting significance turned out to be that

> the way in which nuclear weapons . . . are first revealed to the world appears to be of great, perhaps fateful importance. . . . [I]f no efficient international agreement is achieved, the race for nuclear arms will be on in earnest not later than the morning after our first demonstration. . . . [N]uclear bombs cannot remain a 'secret weapon' at the exclusive disposal of this country for more than a few years [and therefore] the use of nuclear bombs in this war [should] be considered as a problem of long-range national policy rather than of military expediency and that this policy [should] be directed primarily to the achievement of . . . effective international control of the means for nuclear warfare.

Within a week of Japan's surrender on 14 August, a brief along these lines was conveyed to Stimson by his technical panel. It concluded that "far more effective" weapons (that is, thermonuclear bombs) would become available; that no adequately effective defenses would be found; that the US nuclear hegemony could not be ensured for long; whence "the safety of this nation as opposed to its ability to inflict damage on an enemy . . . can be based only on making future wars impossible. It is our unanimous and urgent recommendation to you that . . . all steps be taken, all necessary international arrangements be made to this one end."

Stimson had already arrived at similar conclusions on his own, and shortly before leaving office on 21 September, he personally read a memo to President Truman that emphatically advocated direct negotiations with the Soviets. Truman's cabinet never even considered following this advice. Given Stalin's character, and the manner in which the bomb was first revealed, it seems unlikely that such negotiations would have borne fruit. Nevertheless,

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THE NIELS BOHR ARCHIVE, COPENHAGEN

LOTTE MEITNER-GRAF

AMONG THE FIRST politically active physicists were Niels Bohr (far left), J. Robert Oppenheimer (near left) and James Franck (below). Bohr's early attempt to convey his concerns about the atomic bomb to Winston Churchill was rebuffed. Oppenheimer expressed strong reservations about the hydrogen bomb and was eventually stripped of his security clearance. Franck led an independent group of physicists to consider the broad implications of the atomic bomb. (Photos courtesy of *Bulletin of the Atomic Scientists*.)

a policy based on the views held by Stimson and the authors of the Franck Report might have led to a far less dangerous arms race.

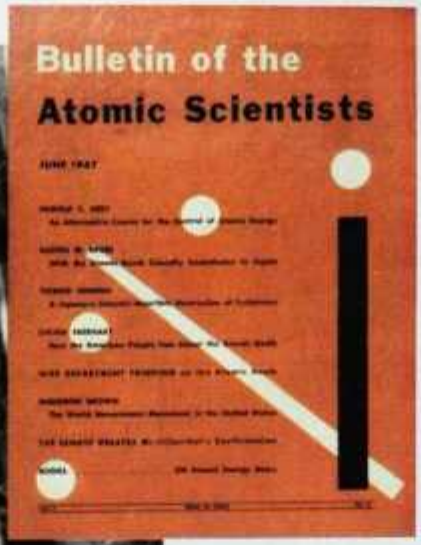
Intense political discussions among Manhattan Project scientists spread rapidly after Japan's capitulation. Amidst a rapidly changing political scene, it was difficult for these scientists, of independent mind and new to public relations, to express their views to a world in shock. Nevertheless, by 4 October, scientists at Chicago, Los Alamos and Oak Ridge had issued public statements echoing the Franck Report and emphasizing the vital importance of setting international nuclear controls.

Truman made his first pronouncement on nuclear policy on 3 October. His domestic policy, in particular, shocked most scientists: Truman proposed establishing a commission that would have potentially full control over all research involving nuclear physics, and that would be open to military dominance.

Opposition from various quarters, not just nuclear scientists, led the US Senate to set up the Special Committee on Atomic Energy, to examine the merits of Truman's proposed commission. The contest between the Administration and the Senate created a stage on which scientists testified before Congress, held press conferences, conducted radio interviews and addressed citizens' groups. The scientists' arguments proved instrumental in persuading the Senate to establish the purely civilian Atomic Energy Commission (AEC) in July 1946. A student of lobbying later described the scientists' campaign as "a thrilling and heartening example of how a democratic government can function. . . . The victory of the scientists was a great one, and even more astounding when we realize that here was a pressure group that had come into being for no reason except the general welfare."[4]

In December 1945, during the course of this campaign, the Federation of American Scientists was formed by a dozen associations based at the wartime labs, universities and other institutions. The first chairman of FAS was Willy Higinbotham, an electronics expert at Los Alamos who moved to a shabby office in Washington, DC, from which he led FAS for two years before joining Brookhaven National Laboratory. During Higinbotham's tenure, FAS membership reached 3000. Also in December 1945, Rabinowitch founded the *Bulletin of the Atomic Scientists*; by 1947, it had a circulation of about 20 000 in 17 countries.

Success on the AEC issue had no counterpart in arms control. The first US proposal to control nuclear weapons, the so-called Acheson–Lilienthal Report, was crafted in part by Oppenheimer and enjoyed wide support among nuclear scientists. It was not intended as a US–Soviet agreement, however, but as a highly invasive United Nations verification regime covering all states. Whatever the plan's merits, the Administration pursued it only half-heartedly, and it was formally rejected by the Soviets in March 1947. Many physicists soon recognized that in simply establishing a civilian AEC, they had failed to rein in the nuclear threat. Thereafter, FAS almost disappeared, as its members discovered that to be effective in both research and politics takes more than 24 hours a day.



EUGENE RABINOWITCH, founding editor of the *Bulletin of the Atomic Scientists*, was an early advocate for a coherent national policy on nuclear arms. (Photo courtesy of *Bulletin of the Atomic Scientists*.)

The political impotence of the arms control advocates was underlined in 1954 by "the matter of Dr. J. Robert Oppenheimer," wherein the AEC lifted his security clearance—not because he was found to be a security risk but because he had expressed reservations about the H-bomb.[5]

March 4: A day without research

The next large-scale participation of physicist–outsiders in politics occurred as the Vietnam War was turning into a debacle. Although most of the protests occurring nationwide revolved around the war, physicists largely focused on the nuclear arms race.

In 1967, the Johnson Administration announced that it intended to deploy an antiballistic missile (ABM) system to defend against an attack from the People's Republic of China. Why China, which had no intercontinental missiles? Because Lyndon Johnson felt compelled to respond to the Soviet's ABM defense of Moscow, but knew that an effective defense against the Soviet arsenal could not be devised! Johnson's decision went against the advice of PSAC, the President's Science Advisory Committee, and so in March 1968, Bethe and Garwin, both of whom had served on PSAC, broke through the curtain of secrecy in a *Scientific American* article that presented powerful technical and strategic arguments against ABM deployment.[6]

In the fall of 1968, Alan Chodos and Joel Feigenbaum, two Cornell University graduate students who were visiting MIT with me, joined several MIT students to draw up a proclamation calling for a "research strike" to protest US foreign and defense policy. Herman Feshbach and Francis Low, both professors at MIT, and I redrafted their document and solicited faculty support. Some 50 senior MIT professors, including the heads of the biology, chemistry and physics departments, eventually signed the manifesto, which remains relevant today:

> Misuse of scientific and technical knowledge presents a major threat to the existence of mankind. Through its actions in Vietnam our government has shaken our confidence in its ability to make wise and humane decisions. There is also disquieting evidence of an intention to enlarge further our immense destructive capability.
>
> The response of the scientific community to these developments has been hopelessly fragmented. There is a small group that helps to conceive these policies, and a handful of eminent men who have tried but largely failed to stem the tide from within the government. The concerned majority has been on the sidelines and ineffective. We feel that it is no longer possible to remain uninvolved.
>
> We therefore call on scientists and engineers at MIT, and throughout the country, to unite for concerted action and leadership . . . toward a more responsible exploitation of scientific knowledge. . . .
>
> As a first step . . . we ask our colleagues—faculty and students—to stop their research activity at MIT on March 4 [1969] and join us for a day devoted to examination of the present situation and its alternatives.

(The full text of the statement is available on the Web at http://www.ucsusa.org/about/faculty.html.)

The MIT campus was at that time home to a number of classified research projects, the most important being at the Instrumentation Lab, where the inertial guidance systems for ballistic missiles were developed. Much student attention was therefore focused on the university itself, causing friction between students and faculty that led to the formation of a separate faculty organization called the Union of Concerned Scientists (UCS), with Feshbach as its chair.

The events of March 4 at MIT, and many other campuses, drew national media attention. One session at MIT was devoted to Andrei Sakharov's portentous *samizdat* essay, which revealed that the ideas expressed on 4 March also existed in the nuclear heart of the Evil Empire. Looking to the future, UCS put out a broadside entitled "Beyond March 4," which took a Churchillian jeremiad as its motto:

> The Stone Age may return on the gleaming wings of Science, and what might now shower immeasurable material blessings upon mankind, may even bring about its total destruction. Beware, I say; time may be short.

Churchill had come to understand Bohr!

The question, of course, was whether it would be true that "March 4 is not a day but a movement," as one enthusiast told the *New York Times*. As it turned out, the period of 1968–70 proved to be a watershed for physicists in politics because the public-interest groups that arose during this time continue to thrive.

Among those groups was FAS, which was resurrected by Jeremy Stone, a mathematician who played a key role in the development of the 1972 Anti-Ballistic Missile

Treaty. Under his full-time leadership, FAS became a permanent and effective Washington presence focused primarily on arms control. UCS, for its part, nearly disappeared before being revived by Henry Kendall of MIT, who, with James MacKenzie, organized working groups on environmental and public health issues.

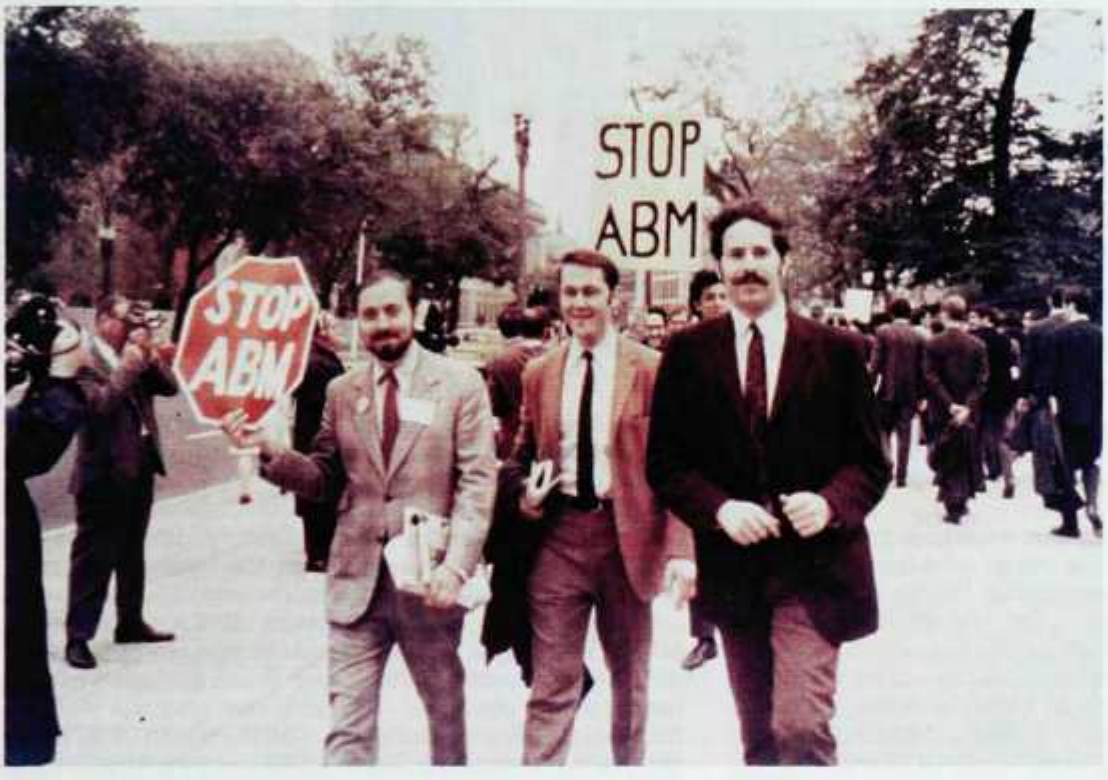
Questioning nuclear power

In 1971, Daniel Ford, a Harvard undergraduate, sought technical help from UCS on the safety of nuclear power plants proposed for the Boston area. Kendall and his colleagues discovered that there were important vulnerabilities in the emergency systems of those plants, and they published two reports, which received considerable press attention, delineating the consequences of a major accident and criticizing the AEC's safety criteria.

In light of these safety questions, UCS and the AEC agreed in 1972 to hold a rule-making hearing in Washington. Testimony by Ford and Kendall was greatly strengthened by documents from whistleblowers on the AEC staff, for it turned out that the AEC had been well aware of the problems disclosed by UCS. The hearing, scheduled for six weeks, lasted nearly two years and produced a huge body of testimony and documents (comparable in volume to that assembled by Kenneth Starr) that damaged the AEC's credibility and contributed to its breakup by Congress in 1975. The AEC's mandate to both regulate and promote nuclear power had required it to balance opposing imperatives, an act that bureaucracies can rarely carry off because they tend to be captured by those who benefit most directly.[7] Indeed, Congress recognized this conflict of interest when it reassigned the AEC's responsibilities to two separate agencies, the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration (what is now the Department of Energy).

Subsequently, another UCS critique, later confirmed by the APS study on "Light-Water Reactor Safety" (one of several studies sponsored by APS on politically controversial topics), led to the NRC's withdrawing the principal conclusions of an AEC study on the risks of a power plant accident. After the Three Mile Island accident in 1979, the governor of Pennsylvania asked UCS to form a panel to advise him on whether krypton-85 gas should be vented, a step endorsed by the panel despite local grassroots opposition.

These and other well-publicized activities increased the visibility and credibility of UCS, and allowed it to acquire a full-time staff, with offices first in Cambridge, Massachusetts, and later in Washington, DC, and Berkeley. But they also had the unhappy consequence of bringing UCS into conflict with physicists who, while agreeing with the group's stance on nuclear arms control, believed that its position on nuclear power was unjustified. Of these, Bethe was the most eminent and vocal; nevertheless, throughout the 1980s, he was an invaluable contributor to UCS's arms control work.



PHYSICISTS PICKETED the White House in 1969 to protest antiballistic missile deployment. Shown are Brian Schwartz (left), now at the City University of New York, Gilbert Nussbaum (middle), now at Washington University Medical Center in St. Louis, and Richard Frankel, now at California Polytechnic State University. (Photo courtesy of Brian Schwartz.)

Human rights

Beginning in the mid-1970s, campaigns of a very different sort were waged by physicists on behalf of peers who were being persecuted because of their political or religious beliefs. In good measure, this development stemmed from the Helsinki accords, in which the USSR had made human rights commitments. Although most Western diplomats viewed this part of the accords as mere window dressing, Yuri Orlov, a dissident Soviet physicist, saw them as an opportunity to highlight his country's human rights violations; for this purpose, he founded the Moscow Helsinki Watch in 1976.[8]

Orlov's actions did not go unpunished. Two years later, in highly publicized trials, he and the computer specialist Anatoly Shcharansky received long, harsh terms. Outraged, many Western scientists took action on their behalf, the most notable being a Berkeley-based effort led by physicist Morris Pripstein. This group, which had no staff or office, called itself SOS—Scientists for Orlov and Shcharansky; after Andrei Sakharov was exiled to Gorky in January 1980, SOS came to stand for all three men. SOS believed that only concrete actions would have an effect, and so it asked scientists and engineers to commit to a moratorium on professional cooperation with the Soviet scientific community. In March 1979, SOS announced that 2400 US scientists, including 13 Nobel laureates, had signed on; this received worldwide attention,

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PROTECTING SCIENTISTS' human rights has been a long-standing concern of the physics community. Two physicists whose cases have been championed are Soviet dissident Yuri Orlov (left), now at Cornell University, and Chinese dissident Fang Lizhi, now at the University of Arizona. (Photo of Fang courtesy of Hong-Yee Chiu.)

including front-page coverage by the *Washington Post*. Spurred by Sakharov's exile, SOS then extended its campaign abroad, and gained the support of 7900 scientists in 44 countries.

SOS's effort was just one of many human rights campaigns mounted by American scientists. FAS was vigorously engaged in supporting Sakharov and other persecuted scientists, and it led the effort to create a human rights committee within the National Academy of Sciences (NAS). The Committee of Concerned Scientists, based in New York, worked on behalf of Soviet refuseniks as well as dissidents. Other scientific organizations that began addressing human rights violations were the American Association for the Advancement of Science and the APS Committee on the International Freedom of Scientists (CIFS), which initially focused its efforts on physicists in the Soviet Union and in the Latin American countries under military dictatorship, but also worked on behalf of physicists in Turkey and the Israeli West Bank, and in one instance in support of an American physicist at a US nuclear weapons lab. In recent years, much of the CIFS docket has consisted of dissident physicists in China.

The rise and fall of Star Wars

In 1972, the Nixon Administration abandoned ABM deployment and signed the Anti-Ballistic Missile Treaty. The nuclear arms race then left the headlines but did not abate—nor did scientists' efforts on arms control. Behind the scenes, Paul Doty, a Harvard biochemist, led other US scientists in engaging leading Soviet scientists in seminal arms control discussions, which facilitated adoption of the ABM treaty and other agreements. Eventually, the NAS established a standing committee for this purpose, and with its counterpart within the Soviet Academy of Sciences, the NAS panel began exploring various arms control options; their joint discussions continue to this day.

Meanwhile, in early 1973, Nixon abolished the President's Science Advisory Committee, after committee members publicly opposed ABM, and Garwin, a PSAC member, testified before Congress criticizing Nixon's supersonic transport.[9] The dissolution of PSAC thus severed direct scientific input to the White House, and no President since then has sought such independent and ongoing high-level science advice.

The arms race returned to the front pages at the end of the Carter Administration, following the Soviets' deployment of new land-based missiles aimed at the US and its NATO allies, and the US's response with new missiles.

The real storm, however, arrived several years later and without warning. On 23 March 1983, President Reagan astounded the nation and the Pentagon (though not Edward Teller) by calling on "the scientific community ... who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete." Reagan's new program was the Strategic Defense Initiative (SDI), which the press promptly termed Star Wars. This reincarnation of the ABM system featured such physics exotica as a network of space-based laser weapons; however, it again offered no means for distinguishing decoys from warheads. And, according to its critics, SDI's strategic bottom line had two entries: First, as with the previous ABM, the offense would be cheaper at the margin than the defense, and would thereby intensify the arms race; and second, space-based missile defenses would put military satellites at risk and jeopardize crisis stability.[10]

Physicists opposed to SDI led several independent but mutually supportive public campaigns. UCS, for example, issued a critical report on Star Wars to Congress and the media, followed by magazine articles, books, television appearances and teach-ins.[11] Ashton Carter wrote a critical report under the auspices of the Congressional Office of Technology Assessment.[12] And at FAS, John Pike was an incisive critic whom the media cited with remarkable regularity. Lisbeth Gronlund and David Wright, then graduate students at Cornell (and now with MIT and UCS), and John Kogut and Michael Weissman, professors at the University of Illinois, organized a pledge "neither to solicit nor accept SDI funds"; the pledge was eventually signed by over 3000 graduate students and 4000 faculty members.

From the technical perspective, the gravest blow against SDI was delivered in 1987 by the "APS Directed-Energy Weapons Study," prepared by a group chaired by Nicolaas Bloembergen and Kumar Patel.[13] The study

group had access to classified data, and 6 of its 17 members were engaged in military research. Their 200-page report drew conclusions that confirmed the central claims of the earlier critiques. This then made it much more difficult for SDI supporters to claim that missile defense R&D would overtake the inevitable evolution of offensive weapons, quite aside from the intractable issue of crisis stability.

With Mikhail Gorbachev's rise to power, the opportunities for open collaboration on arms control between US and Soviet scientists became far more promising than in the bleak era when scientists from many nations in the Pugwash movement pioneered East–West dialogue. Frank von Hippel of Princeton University, with his Soviet counterparts Roald Sagdeev and Evgeny Velikhov, exploited this opening most effectively.[14] Working on their own, under the auspices of FAS and in collaboration with physicist Thomas Cochran of the Natural Resources Defense Council, von Hippel and his Soviet colleagues implemented several imaginative ideas, the most remarkable being private-sector verification—seismic monitoring of underground nuclear tests and the measurement of gamma-ray and neutron emission from a cruise missile on a Soviet naval ship in the Black Sea.[15]

JAMES J. MACKENZIE

AT A PRESS CONFERENCE convened by the Union of Concerned Scientists in March 1984, Kurt Gottfried, Hans Bethe, Richard Garwin and Henry Kendall (shown left to right) addressed the technical and strategic problems attending a space-based ballistic missile defense system. (Photo courtesy of UCS.)

Where do we stand?

After a half-century of effort by the scientific community to influence political decisions attending nuclear weapons, it is fitting to ask how effective this attempt has been.

On the plus side of the ledger, some of the most dire post-Hiroshima predictions have not been confirmed. George Orwell's *1984* did not come to pass—modern communications technology doomed the totalitarian state instead of making it invincible. The fear that nuclear war would ensue unless international controls were quickly established proved to be exaggerated. Scientists have educated influential bodies of opinion about the implications of nuclear weapons, and physicists have played a central role in creating the system that exercises command and control over the prodigious arsenals.[16] This success depended, of course, on the remarkable proficiency with which the US and Soviet militaries discharged their awesome responsibilities. Even so, sheer luck has surely been on humanity's side, for a military posture that requires Presidential decisions of unimaginable consequence in at most 30 minutes is inherently insane.

In my view, as of today, the ledger's negative column shows a heavier total. Physicists have produced the means to kill millions in minutes, and that danger persists. The Soviet Union disappeared nearly a decade ago, yet enormous arsenals are still on alert—and under flimsier control in Russia. NATO expansion has exacerbated this dangerous situation and made it much less amenable to a political resolution. Furthermore, the US government asserts that nuclear proliferation has become a grave threat to national security, but it has failed to adopt new policies that would maximize the political obstacles to proliferation. It is now clear that during the cold war, the advocates of nuclear arms control and disarmament

KNUDSENS FOTOSENTER, OSLO

JOSEPH ROTBLAT and the Pugwash Conferences on Science and World Affairs received the 1995 Nobel Peace Prize for "their efforts to diminish the part played by nuclear arms in international politics and in the longer run to eliminate such arms."

were climbing a far higher mountain than they realized. While the mountain has shrunk, the physics community's current engagement with the issue is feeble in comparison to that of earlier years.

The nuclear problem is no longer our most serious problem, however, for nuclear weapons bestow a dubious benefit on their owners; were the weapons all to be eliminated by a stroke of the statesmen's pens, they would be missed by few. The most difficult problems now facing humanity stem from technologies that provide great near-term benefits coupled with severe long-term threats. Of these, the problem closest to the physical sciences is the tension between the risk of global climate change and the understandable demand for a tolerable living standard by impoverished billions. The forces that stand in the way of progress on this front are formidable, for they include all of us. A vastly greater effort by scientists and other citizens around the globe will be needed if this problem is to be resolved before nature takes the matter into its own hands.

I am indebted to Wolfgang Panofsky for a critique of my first draft.

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Further Reading

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