**Atoms for Peace, Scientific Internationalism and**

**Scientific Intelligence**

by

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**ABSTRACT**

The promotion of the benign atom as an instrument of American foreign policy was important to scientists and policymakers alike who sought to win 'hearts and minds' in the early years of the Cold War. The distribution of radioisotopes to friendly nations for research and medicinal purposes in the late 1940s, was followed by Eisenhower's far more spectacular Atoms for Peace initiative announced at the United Nations in December 1953. This paper exposes the polyvalent significance of the diffusion first of radioisotopes and then of reactor technology, notably at the famous conference in Geneva in 1955, with particular emphasis on the role of scientists and their appeal to scientific internationalism to promote national scientific leadership. It is stressed that openness and security, sharing knowledge or technology and implementing regimes of surveillance, were two sides of the same coin.

On December 8, 1953 US President Dwight D. Eisenhower made a major speech before the General Assembly of the United Nations.[1] He had just returned from a meeting in Bermuda with his British and French allies. There Prime Minister Churchill and his science adviser Lord Cherwell had been informed of a new idea that was "designed to ease even by the smallest measure the tensions of today's world". This reduction of tension was not to be achieved by appeasing the Soviets, or by lowering the defensive shield. Any atomic attack on the US, he assured the American people, would lead to swift and resolute retaliation. But the consequences of such an engagement would be disastrous. The time had come for the "two atomic colossi" to work together to build a more peaceful world, failing which they were "doomed malevolently to eye each other indefinitely across a trembling world". Stalin was dead. The Korean War was over. The Soviet Union had shown a new willingness to hold a Four Power meeting without the "unacceptable preconditions [regarding disarmament] previously put forward". This was the moment to explore "a new avenue of peace" that was coherent with his country's wish to be "constructive, not destructive". The way he chose was 'Atoms for Peace'.

A new international atomic energy agency, set up under the auspices of the United Nations, lay at the core of Eisenhower's plan. The major powers, notably the US and the USSR, would be invited to "make joint contributions from their stockpile of normal uranium and fissionable materials […]" to the agency. Its most important function would be "to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind", notably in the areas of agriculture and medicine. Above

[1] Available on website www.eisenhower.utexas.edu/atoms.htm

all the material would be used "to provide abundant electrical energy in the power-starved areas of the world'. In this way, the American President concluded, "the contributing powers would be dedicating some of their strength to serve the needs rather than the fears of mankind". Eisenhower's proposal was greeted with rapturous applause; the President himself was almost moved to tears.

Atoms for Peace was a polyvalent propaganda exercise. It was intended to distract attention away from Eisenhower's commitment to the use, expansion, improvement of increasingly lethal nuclear weapons. To banalize the bomb, NSC162/2, officially approved on 30 October 1953, affirmed that if attacked the US would regard nuclear weapons to be munitions like any other, to be used if the situation called for them. To satisfy his 'New Look' military doctrine, that shifted the burden of defense from manpower to nuclear power, Eisenhower was engaged in the most massive weapons buildup in US history.[2] To ensure the efficacy of fusion devices, the *Castle* series was undertaken to test militarily realistic models of thermonuclear weapons. The first of

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[2] In '1952' the US nuclear weapons stockpile amounted to 841. By '1960' it had grown to 18,638 – Robert J. Watson, *History of the Office of the Secretary of Defense. Vol. IV. Into the Missile Age, 1956- 1960* (Washington D.C.: Historical Office, Office of the Secretary of Defense, 1997), 457, Table 6.

From 1952 to 1954, military spending was 70% of Federal government spending, reflecting the demands of the Korean war. By the end of Eisenhower's term it had dropped to 50%. For comparison, with demobilization after WW2 the figure from 1948 to 1950 hovered just above 30%, far less in both relative and absolute terms.

these tests, conducted on March 1, 1953, was a technological triumph and a human and public relations disaster. 'Bravo' obliterated the Bikini atoll in the Marshall Islands.[3] The explosive power of the bomb was equivalent to 15 megatons of TNT, over a thousand times the destructive force of the atomic bomb dropped on Hiroshima. The yield was far greater than expected and, coupled with unfavorable winds, dispersed radioactive material over a far wider area than anticipated. Military personnel and equipment had to be rapidly evacuated along with native islanders, some of whom were exiled from their homes for several years. A Japanese tuna fishing boat, the *Lucky Dragon*, was about 80 nautical miles east of the Bikini atoll where the bomb was detonated and was caught in the path of 'Bravo's' fallout. For nearly three hours white radioactive ash rained down on the boat, causing nausea, skin irritation and hair loss among most of the 23 crew members (one of whom died in September). The ensuing domestic and international protest was vociferous. It seemed to confirm that thermonuclear weapons were not just militarily superfluous, as some had said, but also morally repugnant instruments of genocide that could destroy 1000 square miles in one blast, and whose use would undermine the moral authority and leadership of any power that dared to detonate them. At a meeting of the National Security Council (NSC) shortly afterwards, on May 6, 1953, Eisenhower worried that 'Bravo' would lead the world "to

[3] Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War. 1953 – 1961. Eisenhower and the Atomic Energy Commission* (Berkeley, 1989), 172 et seq.

think that we're skunks, saber-rattlers and warmongers".[4] His Secretary of State John Foster Dulles confirmed that the US's image was becoming increasingly tarnished among her European allies "because they are all insisting that we are so militaristic".[5] Three weeks later, at a meeting of the NSC on May 27, Eisenhower again expressed concern about "a future which contained nothing but more and more bombs".[6] Something had to be done to project a more positive image of the United States abroad, something that showed the world that a country that had mastered the power of the nucleus to unleash unimaginable destruction, could contain that power and use it for human betterment.

Atoms for Peace was the answer. It would dispel the dread of the nuclear in the population at large, and combine awe for the good that the atom could do with gratitude and respect for the US's determination, not to destroy the world, as the Soviets would have it, but to make it a better place for all to live in. The peaceful atom was a weapon of what Eisenhower called "psychological warfare". It would help win the "struggle for the minds and wills of men", the struggle to get them to grasp one fundamental truth, "That truth is that Americans want a world at peace, a world in which all peoples shall

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[4] Peter Galison and Barton Bernstein, "In Any Light: Scientists and the Decision to Build the Superbomb, 1952-1954," *Hist. Stud. in the Phys. and Biol. Sci.* 19:2 (1989), 267-347, on 330-1.

[5] Galison and Bernstein, "In any Light", (cit. n. 4).

[6] Galison and Bernstein, "In any Light", (cit. n. 4).

have an opportunity for maximum individual development".[7] Eisenhower recruited C.D. Jackson from Time Incorporated to get this truth across. In Jackson's view Atoms for Peace serve as a "direct challenge to the Soviets' near monopoly of 'peace' propaganda", just the thing the US needed to "go on the moral and ideological offensive against the Communists […], give it a bite and a punch which would really register on both sides of the Iron Curtain".[8]

Atoms for Peace was not one, but an interconnected set of policy initiatives in the nuclear domain. Firstly, it was not an instrument for nuclear disarmament (as the Soviets were quick to point out), but a device to enhance American military supremacy. In planning for Eisenhower's proposal to the UN, his aides suggested that the amount of fissionable material to be donated to the atomic pool should be 'X' where "X could be fixed at a figure which we could handle from our stockpile, but which it would be difficult for the Soviets to match".[9] In fact the US contribution increased steadily from 100kg to 40,000kg without jeopardizing the parallel build-up of a mighty atomic arsenal.

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[7] Dwight D. Eisenhower, "Address by Dwight D. Eisenhower on Psychological Warfare, October 8, 1952", cited by Martin J. Medhurst, "Atoms for Peace and Nuclear Hegemony: The Rhetorical Structure of a Cold War Campaign," *Armed Forces and Society* 23:4 (1997), 571 – 593, on 572. Medhurst's paper provides a fine account of the place of 'Atoms for Peace' in Eisenhower's domestic and foreign policy thinking.

[8] For Jackson and the quote see Spencer R. Weart, *Nuclear Fear. A History of Images* (Cambridge, 1998), 156.

[9] Weart, *Nuclear Fear* (cit. n. 8), 158.

If the Soviets matched that they would seriously deplete their military capacity; if they did not they would lose the propaganda war to their arch-rivals.

The Atoms for Peace proposal also dovetailed with steps being taken by the Atomic Energy Commission (AEC) to pressure and immensely reluctant private sector to invest in a domestic civilian nuclear power program.[10] Although the idea had been in the air since 1947, its implementation was far from straightforward. As late as the end of 1952 nuclear reactor technology was still a military secret (embodied most notably in the Navy's nuclear submarine) and a government monopoly. Little technological information was available in the public domain, the engineering challenges were substantial, there was no one best process for power generation, and economic prospects were dismal. Firms like General Electric and Westinghouse were unwilling to develop the technology without financial guarantees. The AEC tried to generate enthusiasm by supporting studies of possible designs by different firms, using information released to select groups of engineers and acquired at various official training programs. But lacking any sound economic rationale, another kind of argument was needed to cajole industry into civilian nuclear power. Cold war rivalry and psychological warfare provided that argument: the program was essential to maintain the US's international prestige and scientific and technological leadership.[11] At a convention of electric utility companies in Chicago in October 1953 Commissioner Thomas E. Murray announced that the AEC

[10] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.3), chapter 7.

[11] Brain Balogh, *Chain Reaction. Expert Debate and Public Participation in American Commercial Nuclear Power, 1945 – 1975* (Cambridge, 1991), chapter 3.

would build a full-scale 60kW demonstration Pressurized Water Reactor at Shippingport in Pennsylvania to show the way to industry, and to stimulate the private sector to invest in civilian nuclear power. Murray was a devout Roman Catholic determined to do all he could to combat atheistic communism.[12] "For years", he proclaimed, "the splitting atom, packaged in weapons has been our main shield against the Barbarians – now, in addition it is to become a God-given instrument to do the constructive work of mankind". *U.S. News and World Report* was enthusiastic. "An international race for supremacy has started. Britain, with one atomic-powered project, is in the race. Russia is probably starting. Now the U.S. is jumping in".[13]

The development of a domestic civilian nuclear power industry, and the export of nuclear technology to foreign markets required that the extremely tight security restrictions embodied in the 1946 Atomic Energy Act be substantially relaxed. Three weeks before the President made his official proposal at the United Nations, the AEC sent two draft bills to this effect to the Bureau of the Budget. One broadened the legal base so as to enable private industry to develop nuclear technology; the other provided for a freer flow of information.[14] After considerable revision and debate these arrangements were enshrined in a new, less restrictive Atomic Energy Act that the President signed into law on August 30, 1954. A major effort was made to rapidly

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[12] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.3), 11.

[13] Murray is quoted and *U.S. News and World* Report is cited in Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 194-5.

[14] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 119 *et seq.*

declassify information for use by private firms, and by February 1956 no less than 25,000 technical reports had been reviewed. About a third were declassified completely and about a quarter were reclassified 'L' (limited clearance), and made available to engineers from industry.[15]

The relaxation of security surrounding the civilian aspects of nuclear energy was a condition for the success of the third facet of the Atoms for Peace Plan: an international scientific conference on the "benign and peaceful uses of atomic energy". The idea was first mooted by AEC Chairman Lewis Strauss in Bermuda in December 1953: he thought "that an international conference might have propaganda value in winning worldwide support among scientists for the President's plan".[16] The original plan was to hold a relatively small meeting in the United States sponsored by the National Science Foundation. In consultation with Isidor I.Rabi, Columbia University physicist, Nobel Prizewinner, and chairman of the AEC's General Advisory Committee, it was decided that the meeting should rather eschew overt political and ideological issues and serve as "a real forum for the exchange of information in biology, medicine, basic science and engineering".[17] In subsequent discussions in Europe, notably with Sir John Cockcroft in England, nuclear power reactors emerged as the main focus for the conference. Representatives from Britain, Canada and the United States would present "papers of real substance on the technical aspects" of reactor construction, and many features of the

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[15] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 252.

[16] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 232.

[17] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 233.

technology, from the social and economic aspects of nuclear energy, to medical, biological and industrial uses of radio-isotopes, would be discussed. The British also suggested that there be an exhibition of nuclear information and equipment to serve both as a trade fair and to explain the complexities of reactors and their applications to potential clients and the general public.[18] The meeting was to take place under the auspices of the United Nations in Geneva in August 1955. This would give the British and the Americans time to declassify significant amounts of information as permitted by the new Atomic Energy Act.

Historians of science and technology have paid little or no attention to Atoms for Peace. By and large their interest in postwar American nuclear science, notably physics, has concentrated on the transformations in the discipline and its practitioners needed for winning future wars and winning Nobel Prizes, not for winning hearts and minds. What is more, the propaganda and the popularization, the economics and the engineering might lead one to believe that the meeting in Geneva was of marginal scientific interest anyway, and that the leading world scientists who attended in their droves found little there to inspire them. "You probably saw the program", one Swiss physicist wrote to Max Delbrück after the meeting, "Nothing very interesting".[19] That said, it must be stressed

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[18] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n. 3), 233 – 234.

[19] Letter Jean Weigle to Max Delbrück, 30 August, 1955, cited in Bruno J. Strasser, *Les Sciences de la Vie a l'Age Atomique. Identités, pratiques et alliances dans la construction de la biologie moléculaire á Genève (1945-1970),* Ph D Thesis, Université de Genève, Université de Paris 7, September 2002, chapter 1, note 92.

that, even if the *content* was not scientifically riveting the event was an outstanding scientific success in other ways. An (anonymous) columnist in the British *New Scientist* remarked at the time that the meeting, "which started out as if it was going to be a dull and almost formal affair, was suddenly brought to life after about three days by the discovery that it was becoming the most momentous scientific occasion the post war world had ever seen".[20] It provided an opportunity for hundreds of scientists, engineers and technicians to be exposed to, and to learn about, nuclear reactors and their applications in non-military fields. It also lifted the veil of secrecy from the reactor programs in the industrialized countries, including the Soviet Union, and was the first time since the war that Soviet and American researchers had met and exchanged views on such matters relatively openly. As our otherwise disappointed Swiss physicist put it, "Did not see many people who had come for the Atomic Conference. They were so very busy with one another. The few Russian physicists [were] very nice and open: pleasant to talk to about everything […]".[21] It was, said Soviet accelerator expert Vladimir Veksler "not only the first truly international conference in the field of physics; we can certainly claim, as regards scope and significance, that it was a conference of scientists unique in history".[22]

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[20] Geminus, "It Seems to Me," *New Scientist,* 4 September, 1955, 742.

[21] Quoted in Strasser, *Les Sciences de la Vie a l'Age Atomique* (cit. n.19), chapter 1, note 92.

[22] Library of Congress, Washington D.C. (LoC hereafter), Rabi Files, Box 55, Folder 7, "Atom Conference 'Tremendous Success'," Statement by Vladimir Veksler, USSR International Service, September 8, 1955.

At Geneva international scientific exchange flourished, winning hearts and minds and building mutual respect between very different, even rival scientific communities. However, for scientists (and the states they represented) the occasion was not simply an opportunity to share knowledge and build trust and credibility. It was also a way to probe into the laboratory life of others, to learn about their research techniques, to access their research results, and to assess the quality of what they were doing. The Geneva conference helped scientists situate their work with respect to the (declassified) research frontier. It also helped them gauge the strategic significance of what their rival's were doing and the implications it had for the security of their country. It was a site of scientific exchange and of scientific intelligence.

The use of international scientific exchange as an instrument of scientific intelligence gathering was officially promoted and sanctioned in the classified appendix to a report prepared by a panel established by Lloyd Berkner at the request of the State Department. Entitled *Science and Foreign Relations,* and partly released in May 1950, the Berkner report insisted that an awareness of foreign scientific developments was crucial to the progress of American science.[23] A classified appendix noted how difficult

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[23] International Science Policy Survey Group, *Science and Foreign Relations. International Flow of Scientific and Technological Information* (US Department of State Publication 3860, General Foreign Policy Series 30, Released May 1950), 3. For a description of the history of the report see Allan A. Needell, *Science, Cold War and the*

this was in the postwar era, when scientific capability was identified state power, and science was increasingly protected behind walls of secrecy. [24] In this situation, to know what others were doing the United States had to resort to indirect means of intelligence gathering. The "prime target" was, of course, the Soviet Union, but "other areas are also of major importance, first, because research and development results in those countries may contribute to our own scientific and technological advancement, and second, because such discoveries may become known to the Soviet Union and so be of potential use against this country".[25]

Science Attachés located in US embassies abroad were supposed to bear the main burden of scientific intelligence gathering. The system had its limits, however, since they generally lacked any scientific credibility.[26] Berkner and his panel stressed that it

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*American State. Lloyd V. Berkner and the Balance of Professional Ideals* (Amsterdam, 2000), especially 141-144.

[24] Needell, *Science, Cold War and the American State* (cit. n. 23), 145-9 describes this document at some length. I should like to thank him for making a copy available to me. For a general discussion of science and foreign policy see Ronald E. Doel, "Scientists as Policymakers, Advisors and Intelligence Agents: Linking Contemporary Diplomatic History with the History of Contemporary Science," in Thomas Söderqvist (ed), *The Historiography of Contemporary Science and Technology* (Amsterdam, 1997), 215-244.

[25] Doel, "Scientists as Policymakers," (cit. n. 24), 5.

[26] See also Wilton Lexow, "The Science Attache Program," *Studies in Intelligence,* Published 4/1/1966, Released 7/30/2001, 9pp. http://www.foia.cia.gov

was highly desirable that qualified American scientists be enrolled in scientific spywork and that they do so informally and without raising suspicions. "The emphasis should be on the free and open discussion of the content, procedures and mechanisms of the science involved", the panel wrote. More specifically, the panel suggested that the opportunities provided by the international circulation of scientific knowledge be exploited, from scouring publications to capitalizing on personal contacts at meetings of "UNESCO, the international scientific unions, and international scientific congresses and conventions […]".[27] In short for Berkner and his panel, in the context of Cold war rivalry, scientific internationalism and scientific intelligence were two sides of the same coin. The first pushed back the frontiers of security restrictions and mutual distrust, enabling scientists to build together a shared body of public knowledge. The latter exploited that trust to learn what others were doing, to establish the limits of what they could speak about freely, and to assess the dangers that may lurk behind they left unsaid. International scientific exchange is not just about sharing information. When the science concerned is also an affair of state, of immense importance for national strategic interests, international exchange is at once a window and a probe, an ideology of transparency and, by virtue of that, an instrument of control, a viewpoint which looks in and watches over. The Atoms for Peace Congress in Geneva in 1955 was such a panopticon.[28]

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[27] International Science Policy Survey Group, *Science and Foreign Relations* (cit. n.23), Classified Appendix, "Scientific Intelligence," 10.

[28] Informal intelligence gathering was common in the Cold War before sophisticated technologies like reconnaissance satellites could peer behind the iron curtain. In the late 1950s the CIA ran a program code-named REDSKIN in which it recruited nonofficial

The Geneva conference was not the first occasion on which the benign atom had served this dual purpose. The precedent had been set as early as 1947 when the AEC agreed, under immense pressure from scientists at home and in Europe, to make select `radio-isotopes produced in American reactors available to foreign researchers under controlled conditions. By looking briefly at this earlier program we can grasp better the specificities of Eisenhower's proposal in 1953, and appreciate the significance of the international scientific conference that it included as part of its propaganda offensive.

**The benign atom in the 1940s: the radio-isotope program**

At the 4th International Cancer Research Congress in St. Louis in September 1947, President Truman let it be known that the United States AEC would make selected radio-isotopes available to scientists abroad for research purposes. Truman's scheme was originally restricted to 28 different isotopes of 19 elements, to be used for research and therapeutic purposes only. Demand increased so sharply that in February 1950 the AEC put into operation "a sort of atomic pharmacy" at Oak Ridge that "puts radioisotope processing, packaging and shipping on an assembly-line basis, eliminating for the most

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travelers from the US, Europe and "Third World nations", including "tourists, businessmen, journalists, scientists, academics, athletes, chess players, and church leaders […]." These visitors provided important information about Soviet infrastructure and industrial capabilities (e.g. by buying Soviet merchandise). See Jeffrey Richelson, *American Espionage and the Soviet Target* (William Morrow, 1987), 53-4.

part the time-consuming method of handling radioisotope shipments manually […]".[29] In 1951 the program's scientific scope was expanded further. Researchers abroad were now also permitted to use the material in industry, and all domestically available isotopes except for tritium were made available to them.[30]

The program owed its immense success to the Manhattan project. Shortly after the war the AEC decided that it could use the nuclear piles that had produced plutonium for the bomb as a source of radio-isotopes for biomedical research and therapeutic purposes. In the 1930s particle accelerators were used to produce 'artificially' radioactive substances. Piles rendered the cyclotrons obsolete. The AEC estimated that the reactors at Oak Ridge, for example, could produce 200 millicuries of carbon-14 in a few weeks for about $10,000; it would take 1000 cyclotrons, and operating costs of well

[29] NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, "Information for the Press and Radio," 2-1-50. This was also an invitation to press, radio and periodical representatives to visit the site.

[30] For details of this program see Angela N.H. Creager, "Tracing the Politics of Changing Postwar Research Practices: the Export of 'American' Radioisotopes to European Biologists," *Studies in the Hist. and Phil. of Biol. and Biomed. Sci.* 33 (2002), 367-88; See also Angela N.H. Creager, "The 'Industrialization' of Radioisotopes by the U.S. Atomic Energy Commission," in Karl Gradin (ed), *Science and Industry in the 20th Century. Nobel Symposium, Stockholm, 21-23 November , 2002* (in press), and John Krige, "The Politics of Phosphorus-32. A Cold War Fable Based on Fact," in Ron Doel and Thomas Söderqvist, *Writing Recent Science* (in press).

over $1 million, to do the same.[31] As soon as the word was out that the laboratory was in the business of providing radio-isotopes for American scientists, domestic demand soared. By summer 1947 researchers and medical centers in the US and Hawaii had received more than 1000 shipments of 90 regularly available radioisotopes.[32] The AEC had also received almost a hundred inquiries from 28 foreign countries, 75% of them for radioisotopes for medical research and therapy.[33]

Foreign researchers, notably in Europe, expected their requests to be met without difficulty. Before the war it was usual for them to receive isotopes for research from American cyclotron laboratories. The mechanism was formalized in the 1940s, when the cyclotron facility at Massachusetts Institute of Technology was given the task of providing most radio-isotopes to people who were not on the bomb project, including scientists abroad. The relocation of radio-isotope production from a university cyclotron to a pile in a national laboratory of the Atomic Energy Commission, and the immensely

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[31] Creager, "Tracing the Politics," (cit. n.30), 375.

[32] NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Majority submission to the State Department, "Foreign Distribution of Radioisotopes," undated, but following on the meeting of the Commissioners on August 19, 1947, 1-2.

[33] "Foreign Distribution of Radioisotopes," (cit. n. 32), 2. On Clinton laboratory's biomedical activities, and those of the AEC in general, see Peter J.Westwick, *The National Laboratories. Science in an American System, 1947 – 1974* (Cambridge, 2003), chapter 7. On the medical aspect see C.P. Rhoads, "The Medical Uses of Atomic Energy," *Bull. of the Atomic Sci.,* (1948), 22 – 24.

restrictive Atomic Energy Act of 1946, completely changed the situation, however. Foreign scientist found their requests for radio-isotopes deflected, pending a policy decision by the Commissioners.

The AEC's main preoccupation was, of course, security. It was suggested that "some shipment abroad could fall into the hands of capable persons who wish to develop atomic weapons". [34] And even if the restricted variety and small quantities of isotopes that were under consideration could never be used to make a bomb, might they not indirectly strengthen the military capability of a foreign power? Surely, Commissioner Lewis Strauss pointed out, the isotopes "would be useful as tools in biological research, metallurgical research, petroleum chemistry, and other areas which are part of the war-making potential of nations". [35] As far as Strauss was concerned in August 1947, without a satisfactory international regime for controlling atomic energy, the United States "could not help scientists who may work for a putative enemy one jot or tittle without displaying naivete and imperiling our own security". For Strauss 'putative' enemies was a broad term. He regarded scientists as politically fickle and willing to "work just as zealously for dictatorships of the Right and Left as they were for

[34] NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Atomic Energy Commission, Minutes of Meeting No. 95 at Bohemian Grove, August 19, 1947.

[35] For Strauss's views here see NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Atomic Energy Commission, Minutes of Meeting No. 95 at Bohemian Grove, August 19, 1947 and letter Lewis L. Strauss to Carroll L. Wilson, "Foreign Distribution of Isotopes," 25 August 1947.

democracy". In subsequent skirmishes he successfully contested the shipment of a small amount of Phosphorus-32 to the University of Helsinki on the grounds that it may fall into Soviet hands. He was also deeply concerned by a request from NATO-ally Norway for one millicurie of Iron-59 for metallurgical research, since it came from a military laboratory, and one member of the research team "could be described as a Communist".

The security roadblocks on the free circulation abroad of small quantities of 'civilian' radio-isotopes frustrated many European scientists, especially on the continent. They desperately wanted to get back to research after the war. Their cities had been bombed, their laboratories had been destroyed or pillaged, and, with the population cold, miserable and short of basic necessities, their governments had far more important priorities than supporting scientific research. Scientists turned to the United States for material support. There was "a crying, insistent need" to restart the supply of isotopes that had halted since the war, one correspondent wrote in July 1947 after speaking to Niels Bohr: "*even the bottle-washings* we throw away can be used literally for months of research over there" (emphasis in the original).[36] Without even the crumbs from the rich man's table Europeans felt resentful and rebuffed.

The frustration was that much more intense since for many on the continent the atom had a quite different significance to that which it held for their peers in America. In

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[36] Quoted in Creager, "Tracing the Politics," (cit. n. 30), 374, Albert Stone to US Naval Research Attaché, 1 July 1947, copy in AEC Records, RG326, E67A. Box 46 Folder 3, Foreign Distribution of Radioisotopes, Vol. 1.

the United States 'atoms for peace' was haunted by atoms for war, which dwarfed it. As Spencer Weart has pointed out, the nuclear industry "dealt with uranium-235 and plutonium by the ton, while Atoms for Peace imagery relied upon a stock of isotopes that could have been stored in a closet".[37] Not so in much of Europe in the first years after the war. In countries whose scientists and governments had no interest in preparing for a third world war, but rather in rebuilding themselves on the ruins of the second, the atom was an opportunity, a symbol of modernity and a better world to come, nuclear power a promise for energy and independence. Hiroshima heralded the dawning of a new age.[38] It was a (ghastly) scientific experiment that showed conclusively that scientists, given the resources and the social authority, could successfully harness the awesome power of the nucleus to constructive ends. To deny a few millicuries of radioactive iodine or phosphorus to European scientists on the grounds that they constituted a security risk was simply absurd, from this point of view. It showed an abysmal lack of understanding of

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[37] Weart, *Nuclear Fear* (cit. n.8), 172; Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.3), Appendix 2 , gives financial data for the AEC for 1952 to 1961 inclusive.

[38] For the following see notably Gabrielle Hecht, *The Radiance of France. Nuclear Power and National Identity after World War II* (Cambridge,1998); David Pace, "Old Wine – New Bottles: Atomic Energy and the Ideology of Science in Postwar France," *French Historical Studies* 17:1 (Spring 1991), 38-61; Strasser, *Les Sciences de la Vie a l'Age Atomique* (cit. n. 19), chapter 1. Strasser insists that "the social, political and intellectual history of the Atom in America […] cannot be transplanted to Europe, whatever many historians seem to think" (33, my translation)

the hopes and aspirations of European scientists and their peoples to build a better world, an uninformed projection abroad of the meaning that the atom had in America, and a failure to decouple the benign atom from its military uses, to disentangle Atoms for Peace from atoms for war.

European disenchantment was reinforced by the conviction that American science was becoming compromised by its increasing dependence on military support, which was rendering the freewheeling discussion of one's research increasingly impossible, as well as fueling paranoia about infiltration and subversion. Charles C Lauritsen from the California Institute of Technology reported to AEC Commissioner Robert F. Bacher that Europeans seemed to have "a somewhat exaggerated idea of the control which the Army Navy exert over science in this country".[39] Exaggerated or not, many were disturbed by President Truman's Executive Order 9835, signed in March 1947, that required all federal employees undergo loyalty and security checks, including of course scientists working in federal laboratories. In the ensuing campaign to weed out 'disloyal and subversive elements' many scientists, notably those of liberal-left political persuasion were suspected of being unreliable or a security risk, often on the basis of extremely flimsy not to say irrelevant evidence.[40] The image of the United States as a democratic society that respected individual liberty and freedom of expression began to crumble.

[39] Quoted in Richard G. Hewlett and Francis Duncan, *Atomic Shield, 1947-1952* (A History of the United States Atomic Energy Commission, Vol. 2), (Berkeley, 1990), 97.

[40] This is discussed at length in Jessica Wang, *American Science in an Age of Anxiety. Scientists, Anticommunism and the Cold War* (Charlotte, 1999).

Some foreign scientists went "as far as to class us in somewhat the same light as Russia on scientific and political matters", wrote one American scientist "certainly not a flattering comparison but one cannot deny many of the facts brought out", wrote another.[41]

The refusal to provide 'civilian' radio-isotopes to foreign researchers was generating hostility towards the US, was embarrassing American scientists in their dealings with European colleagues, and was breeding suspicion and distrust about US intentions in the nuclear field. In this context of deteriorating US-European scientific relationships, the circulation of select radio-isotopes for research and for therapeutic purposes, was imperative to win back 'hearts and minds'. American scientists were in favor of it. Four of the five AEC Commissioners (Strauss being the exception) were in favor of it. The State Department was in favor of it. Acting Secretary Richard Lovett enthused that "these valuable products of the United States atomic energy plants will now be available in the services of mankind and […], to this extent at least, we are able to advance towards the beneficient (sic) use of this new force. This initiative", Lovett added, "should promote harmony and good feeling among nations".[42]

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[41] For these sentiments see Creager, "Tracing the Politics'" (cit. n. 30), 376, 373. The last two quotations are by scientists Paul Aebersold and Lorin Mullins in letters written early in August 1947.

[42] NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Letter Richard Lovett to David E. Lilenthial, August 28, 1947.

The appeal to scientific internationalism was crucial in promoting this change in policy. It pushed the US administration to redefine the limits of security surrounding the distribution of isotopes abroad. America was 'morally' obliged to share material with Europe, said J. Robert Oppenheimer in Congressional Hearings in 1949, because

> [Isotopes] were discovered in Europe; they were applied in Europe; they are available in Europe, and the positive arguments for making them available […] lie in fostering science; in making cordial effective relations with the scientists and technical people in western Europe; in assisting the recovery of western Europe; in doing the decent thing.[43]

That said, international scientific exchange not only redrew the boundary between the permissible and the off-limits. It was *also essential to ensuring that that boundary was respected.* In doing the 'decent' thing, in "restor[ing] the international fraternity of knowledge" (Lilienthal), one was also guaranteeing American scientists access to radio-isotope research in foreign laboratories – and access was an insurance against abuse. The transparency that was intrinsic to international scientific exchange was also the means to monitor what the other was doing, to ensure that security was not being breached.

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[43] J. Robert Oppenheimer, testimony, "Investigation into the United States Atomic Energy Project," Hearings before the US Congress Joint Committee on Atomic Energy, 81st Congress, Part 7, 13 June 1949, 283.

The AEC put a complex set of procedures in place to ensure that benefactors did not abuse the radio-isotopes that they were given. The request had to be made officially through the State Department (rather than directly from one scientist to another), and complete transparency in terms of intended use and results were expected. The client had to provide the Commissioners with three copies of a report every six months on the progress of the work, which had to be published in the open scientific or technical literature if possible. Recipients also had to agree "that qualified scientists irrespective of nationality will be permitted to visit the institutions where the material will be used and to obtain information freely with respect to the purposes, methods and results of such use, in accordance with well-established scientific tradition".[44]

Scientific internationalism opened doors and loosened tongues. It enabled US 'inspectors' to ensure that the radio-isotopes sent abroad were not being used for purposes for which they were not intended. It would benefit American science by contributing to the shared pool of knowledge and, by ensuring that US scientists had access to any major discoveries, enhanced "our national security, which depends on continued progress in the field". Finally it would strengthen American leadership and supremacy: "With its superior technological potential", the Commissioners favoring the

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[44] NARA, AEC Records, AEC Records, RG 326, E67A, Box 46, Folder 3, *Radioisotopes for International Distribution. Catalog and Price List. September 1947.* (Isotopes Branch, United States Atomic Energy Commission, P.O. Box E, Oak Ridge, Tennessee), 15.

policy pointed out, "the United States can expect to profit more quickly and more fully than any other nation from the exploitation of published findings […]". In short, by trading on the taken-for-granted conventions of scientific internationalism the foreign isotope program would reinforce, rather than undermine, "the common defense and security of the United States".[45]

A footnote. The AEC's radio-isotope program was not only used to win the allegiance of scientists abroad, but also to woo the hesitant at home. It was intended to dispel the antipathy some American scientists were beginning to feel towards nuclear science, encouraging "the wholehearted support of United States scientists and medical doctors for our national program for atomic energy […]".[46] It could also help wean the general public from its nuclear fear. In 1949 the first "American Museum of Atomic Energy" was opened at Oak Ridge National Laboratories, in the shadow of the massive uranium enrichment plants built there during the war. Its mission was described as "to serve as an exhibition and education center for advocating the peaceful uses of atomic

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[45] These arguments are found in NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Majority submission to the State Department, "Foreign Distribution of Radioisotopes," (cit. n.32), and Atomic Energy Commission, Minutes of Meeting No. 95 at Bohemian Grove, August 19, 1947.

[46] NARA, AEC Records, RG 326, E67A, Box 46, Folder 3, Atomic Energy Commission, Minutes of Meeting No. 95 at Bohemian Grove, August 19, 1947.

energy".[47] The "atomic pharmacy" opened in February 1950 (cf above), reinforced the message. It was not only a stockpile of irradiated materials for scientific use; it was also accessible to the press and the public. The production and distribution of radio-isotopes for research, medicine and, soon, industry, was the vector which carried the image of the United State as the promoter of the benign atom into hearts and minds at home and abroad.[48]

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By the time Eisenhower made Atoms for Peace an official plank of US foreign policy, with the full weight of Presidential authority behind it, the idea that nuclear science could be advanced, and foreign policy objectives could be promoted, without threatening, but actually enhancing, US national security, was already well-established. This is not to

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[47] Art Molella, "Exhibiting Atomic Culture: The View from Oak Ridge," *History and Technology* 19:3 (2003), 211-226. There is photograph of the museum on 215. One of its main attractions seems to have been to irradiate dimes which people could keep; the gift shop sold small pieces of uranium ore. One could also buy an American Museum of Nuclear Energy ashtray. The net effect was surely to familiarize and banalize the nuclear, making it seem less threatening and dangerous by reducing it to the familiar and everyday. There are internet sites now which discuss the likelihood that these materials were in fact radio-active.

[48] Krige, "The Politics of Phosphorus-32," (cit. n. 30) is an extended essay on what capturing hearts and kinds with the isotope program might mean.

belittle the significance of Eisenhower's initiative: on the contrary, it was a huge step forward in three notable respects.

Firstly, it went beyond merely sharing isotopes to promoting the proliferation of the technology needed to produce them: nuclear reactors. One important reason for this was that the United States no longer had a monopoly on reactor technology or on the radio-isotopes that were one of its byproducts. Britain, Canada, France and the Soviet Union all had reactors in various stages of development. Already in 1951 the first two were making radio-isotopes available on far less restrictive and security-conscious terms than was Washington. Atoms for Peace needed a new technological platform and research reactors provided it for both superpowers.

Reactors were also important to win hearts and minds in new states gaining their independence and sovereignty. Some twenty new nations came into being between 1945 and 1955; another thirty were established in the next decade.[49] The US administration "anticipated" that the Soviet Union would use atomic energy "not only for military and industrial purposes, but also as political and psychological measures to gain the allegiance of the uncommitted areas of the world".[50] If America wanted to seize the initiative and to retain its advantage in what was becoming "a critical sector of the cold

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[49] Akira Irye, *Cultural Internationalism and World Order* (Johns Hopkins University Press, 2001).

[50] NSC 5507/2, Peaceful Uses of Atomic Energy, approved by Eisenhower on 12 March 1955, cited by Medhurst, "Atoms for Peace and Nuclear Hegemony," (cit. n.7), 588.

war struggle" it had to be present in these countries. The growing pressure inside the AEC to place the development of nuclear power in the hands of private industry, provided an additional economic and ideological rationale for proliferation abroad. In Medhurst's purple prose "the reactor program functioned as a form of industrial imperialism whereby an advanced technology could be embedded in a culture not yet ready to exploit its full potential as a means of getting both a technological and economic foothold."[51]

Reactors had another purpose: they could be used as bargaining chips with friendly governments so as to ensure the smooth expansion of America's nuclear stockpile in line with the 'New Look' and the nuclearization of NATO.[52] Access to world-wide deposits of uranium and thorium had to be assured. NATO members that had little experience with nuclear science, and few local skills for handling dangerous nuclear materials had to be familiarized with the techniques. Foreign bases had to be secured and an icon around which to rally pro-American sentiment had to be paraded.

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[51] Medhurst, "Atoms for Peace and Nuclear Hegemony," (cit. n.7), 588.

[52] Medhurst, "Atoms for Peace and Nuclear Hegemony," (cit. n.7), 581- 586 stresses this point and notes that, immediately after the passage of the relaxed Atomic Energy Act of 1954, a new series of treaties for mutual defense were signed with NATO countries, loosening restrictions on armaments and nuclear facilities, and allowing West Germany to engage in atomic energy plans. Eisenhower saw these measures as essential to help NATO "evolve more effective defense plans concerning the use of atomic weapons than have heretofore been achieved", 586-7.

To secure these diverse US interests abroad, beginning in June 1955 the Eisenhower administration began to sign bilateral agreements with selected countries all over the world, undertaking to supply nuclear reactors for research, and sometimes for power generation. Typically, these research bilaterals provided the US partner with unclassified information on the design, construction, and experimental operation of nuclear reactors, as well up to 6kg at a time of uranium enriched to 20% uranium-235. The first was signed with Turkey; other NATO members Greece and Portugal soon followed. Belgium, Argentina and Brazil, all major suppliers of uranium, were also among the earliest beneficiaries of the scheme. Franco's Spain (which signed a mutual military assistance agreement with the US in September 1953), and apartheid South Africa (whose gold mines were rich in uranium ore) were not forgotten.[53] The US's addiction to nuclear raw materials and its determination to use research reactors as an instrument of foreign policy quashed any qualms about the political and ideological standing of the governments they dealt with. By August 1955 the AEC had negotiated two dozen research bilaterals; by 1961 the number had reached 39.[54]

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[53] For a discussion of the Spanish case see Javier Ordoñez and José M. Sánchez Ron, "Nuclear Energy in Spain: From Hiroshima to the Sixties," in Paul Forman and José M. Sánchez Ron (eds). *National Military Establishments and the Advancement of Science and Technology* (Amsterdam,1996), 185 – 213.

[54] There is a list in Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.8), 581, Appendix 6.

The Soviet Union was regarded as an essential partner in Atoms for Peace in 1953/4: it had been completely excluded from the earlier foreign radio-isotope program. This was partly a sign of the new, more relaxed relationship between Washington and Moscow. But it was also a recognition that 'the secret was out'. The USSR had exploded its first fission bomb in August 1949 and conducted its first significant thermonuclear test (*Joe -4)* in August 1953. Security assumed a new meaning in this context: it made no sense to try to seal all military knowledge and those who had it behind an impenetrable wall of secrecy. A greater degree of openness and exchange in the name of scientific internationalism would provide US scientists with a better idea of Soviet capabilities and help them to assess more realistically the extent of the Soviet threat. The scientific sessions and the informal coffee breaks and walks by the lake in Geneva were likely to be a boon in this respect.

**The 1955 Atoms for Peace Conference in Geneva**

The first International Conference on the Peaceful Uses of Atomic Energy opened at the United Nations' Palais des Nations in Geneva on August 8, 1955, a decade almost to the day after the first use of a nuclear weapon. The distinguished Indian nuclear physicist, Homi Bhabha, presided over the twelve-day meeting that was attended by over 1,400 delegates from 73 countries and by almost as many observers and by over 900 journalists.[55] Welcoming messages arrived from the heads of state of Britain, France, India, Switzerland and the United States. Eisenhower reaffirmed his pledge "to help find ways by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life".[56] The United States delegation was the largest: 259 people of whom 183 were scientists. They appointed Laura Fermi, Enrico Fermi's widow, to write an official account of the American contribution to the planning and proceedings of the meeting.[57] The British came second in terms of sheer size, followed by the Soviet Union: 78 official representatives, including physicists, engineers, students, government officials and "the usual KGB staffers".[58] .

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[55] For an analysis of Bhabha's opening speech see Itty Abraham, *The Making of the Indian Atomic Bomb. Science, Secrecy and the Postcolonial State* (London, 1998), 98-102.

[56] *New York Times,* August 9, 1955, 1.

[57] Laura Fermi, *Atoms for the World. United States Participation in the Conference on the Peaceful Uses of Atomic Energy* (Chicago, 1957). Notwithstanding its uncritical admiration and its irritating sexism (the heroic achievements of individual, identified men are described alongside the service activities (guides, translators, etc) of countless "pretty girls"), Fermi's book gives one a good idea of the planning, organization and evolution of the conference from the US point of view.

[58] Paul Josephson, *Red Atom. Russia's Nuclear Power Program from Stalin to Today* (New York, 2000), 174.

The conference was organized around three major themes: physics and atomic piles, chemistry, metallurgy and technology, and medicine, biology and radioactive isotopes. The United States delegation made a major effort to disseminate information about its nuclear reactors and their uses in biomedicine and agriculture. Of the 3000 scientific and technical papers published in the proceedings of the meeting, over 550 were from the US (selected from over 1000 submissions), and many of these were presented orally. Notwithstanding the limits imposed by security, full engineering details were provided on nuclear plants already operating or under construction in the country.[59]

The scientific papers were complemented by technical exhibits that were reserved for delegates until 4pm, when they were opened to the general public, and by a trade fair in downtown Geneva.[60] The centerpiece of the US exhibit was a working swimming pool fission reactor of the type designed and built at the Oak Ridge National Laboratory, and operated by the Union Carbide and Carbon Corporation for the USAEC. It was flown in from America in June and installed in a wooden chalet in the grounds of the

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[59] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.8), 250.

[60] This Atom Fair provided a forum for firms in ten countries to exhibit and sell their nuclear wares. The British were the stars. No less than 50 British companies (compared to 16 from the US) aggressively promoted nuclear technology. They reputedly received serious enquiries from 33 countries within days of the conference's opening, *New York Times,* August 8, 1955, 1

Palais des Nations, where it was seen by 50,000 visitors. It was sold to Switzerland for $180,000 after the meeting.[61]

The presentation of the US reactor in Geneva was a masterpiece of marketing. It was intended to demystify nuclear power, and to show that anyone and any nation could exploit it safely and to social advantage. It was designed to operate at a continuous power level of 10kW. This reproduced as closely the possible the kind of reactor that could be built under the Atoms for Peace plan. It was specifically designed to be fuelled with 18kg of uranium of which 20% was uranium-235, a composition "identical to that in the United States' allocation of 200 kilograms of fissionable material for the proposed International pool".[62] Operation was achieved with just three control rods, one raised more slowly than the others to fine-tune the chain reaction. The procedure was deliberately simplified so that "technically qualified visitors" did not simply have the opportunity to observe a functioning reactor but actually to operate it themselves (as did President Eisenhower on a visit to the reactor a few days before the show opened). A Union Carbide document explained that this was meant "to show that an efficient

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[61] Report, undated and unsigned, "Background of the Geneva Conference," LoC, Rabi Files, Box 55, Folder 7, 6-7. On the sale, see (Swiss) Départment Politique Fédéral, Berne, 31 mai, 1955, "Achat d'un réacteur nucléaire américain," Documents Diplomatiques Suisses, www.dodis.ch, DoDis 10835.

[62] IACF papers, Regenstein Library, Chicago, Box 259, Series II, Folder 4, Memo, "Background Data. The United States Exhibit Reactor," prepared by the Union Carbide and Carbon Corporation, undated; Fermi, *Atoms for the World*, (cit. n. 57), 94.

working reactor can be designed, constructed, and operated in complete safety without elaborate preparations or complicated facilities". An accompanying panel explained how personnel could easily be protected from the damaging effects of radiation by combining sensitive detectors with shielding and special disposable equipment, like gloves, jackets etc.

The Geneva reactor was primarily a research tool. Provision was made to place capsules in the neutron flux either manually, manipulating them with special long tongs, or with compressed air that propelled them down tubes into or outside the core. A panel told visitors in four languages that "An Enriched Uranium-235 reactor has many uses". It itemized Education in Nuclear Science, Nuclear Physics Research, Reactor Design, Radioisotope Production, Activation Analysis, Radiation Effects, and Biomedical Research. The United States delegation also produced seven technical films, and installed a research library, so providing additional educational material for all those who wished to enter the realm of the peaceful atom.[63]

The Soviet Union came to Geneva equally determined to capitalize on the benign atom for propaganda purposes, and to distract attention away from its military program: "Let the atom be a worker, not a soldier",[64] as the slogan had it. They too were determined to demonstrate the success of their system, winning hearts and minds for the communist road. As Paul Josephson has put it, for the Soviet authorities

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[63] Fermi, *Atoms for the World,*(cit. n.57).

[64] Josephson, *Red Atom* (cit. n.58), 3.

> the peaceful atom showed that a nation whose citizens had been illiterate and agrarian less than forty years earlier, had become a leading scientific and industrial power. The achievements of science and technology, with nuclear energy at its summit, were symbols of the legitimacy of the regime both to Soviet citizens and to citizens of the world. The peaceful atom also allowed the USSR to score points with the conquered countries of Eastern Europe […] each of whom had a nuclear program based on Soviet isotopes, technology, and training programs and, in part, its largesse.[65]

It was somewhat galling for Moscow to see the spectacular demonstration of a working American research reactor in the gardens of the United Nations building, particularly when the Soviet Union had brought the first working power reactor on-stream the year before.[66] A model of the Soviet power plant was shown in Geneva: it obviously lacked the impact of the US exhibit. Not to be upstaged, the Soviet authorities made a heavy-handed attempt to hold their own international conference just before the Geneva meeting. In June 1955 they sent invitations to scientists from 41 nations, including the US, to a meeting in Moscow from July 1 to 5 on the peaceful uses of atomic energy, just a few weeks before the Geneva gathering. The members of the scientific

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[65] Josephson, *Red Atom* (cit. n.58), 174.

[66] The Soviet Union built the world's first power reactor which produced 5000kW for the national grid in 1954, Paul R. Josephson, "Atomic-Powered Communism: Nuclear Cultur in the Postwar USSR", *Slavic Rev.* 55:2 (1996), 297-324, 305.

academies in Britain and the US politely declined the invitation on grounds of timing. Those scientists who did attend were treated to a visit to the new power station.[67]

Notwithstanding superpower rivalry and mutual 'psychological warfare', the conference did apparently contribute to reducing public fear and political tension. It was widely reported in the press: ten of the twelve days of the conference made the first page of the *New York Times.*[68] Indeed the sight of scientists from rival power blocs and from different nations discussing (civilian) nuclear affairs ("It was not an unusual sight to see small groups having spirited conversations as they walked along the Rhone River at dusk"[69]) must surely have impressed those who previously saw nuclear science and nuclear scientists as major threats to world peace. Vladimir Veksler, leading Soviet accelerator physicist described the meeting as having "moved public opinion" and as having "strengthened the atmosphere of mutual understanding and good will born in every country following the Four Power Conference in Geneva" that had ended just a few weeks before the scientific gathering.[70] No formal mention was made of the international

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[67] Fermi, *Atoms for the World,* (cit. n.57), 21, 39-40. See also Abraham, (cit. n. 55), 88.

[68] The newspaper devoted most of its coverage to atomic power, using both fission and fusion, describing the technology and materials required, and sharing the general optimism about the long-term prospects of atomic energy as a viable alternative to fossil fuels.

[69] Report, "Background of the Geneva Conference," (cit. n.61), 7.

[70] Press Statement by Veksler, "Atom Conference 'Tremendous Success'", (cit. n.22). The Four Power conference (Britain, France, US, USSR) opened in Geneva on July 18

control of atomic weapons, but it was generally felt that the scientific cooperation and openness that it had fostered would help remove political barriers to such controls. Certainly US commentators felt it had enhanced Eisenhower's efforts to promote the international control of nuclear material through a new agency. An American report written after the meeting claimed that "as a focal point of nuclear cooperation, the International Atomic Energy Agency was given an enormous boost […]. Delegates began to realize that international cooperation through the Agency could now be placed on solid grounds".[71] The need for an Agency to "serve regulatory and developmental purposes" was also strengthened by the realization that more than thirty countries were actually embarking on nuclear programs.

For the scientists, the conference provided access not only to new knowledge, but also to nuclear researchers on the other side of the Iron Curtain. As one commentator put it, "Many scientists from the East and West met for the first time. There were many luncheons, dinners, and serious discussions over coffee at the Palais des Nations […] lasting friendships were formed among these scientists". Soviet scientists were equally enthusiastic. Veksler "noted with satisfaction that the scientists of the world easily found

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and ended on July 23, 1955. The final communiqué encouraged the hope of international détente. Within weeks, and in the midst of the Atoms for Peace meeting, the Soviet Union announced that it would reduce its armed forces by 640,000 by the end of the year.

[71] Report, "Background of the Geneva Conference," (cit. n.61), 1.

a common language; the significance of this fact is inestimable”.[72] In Geneva scientific internationalism blossomed.

That said the openness, familiarity and trust fostered at the meeting also provided an opportunity for scientific intelligence gathering as suggested by the Berkner report. Isidor I. Rabi who had actively promoted the Geneva conference was also a member of the panel that drafted the report and was surely aware of this possibility. The 1955 Atoms for Peace meeting opened eyes in the West to what the Soviets had achieved. It created a declassified space in which one could learn what others were doing, judge their competences, and assess their priorities – and take the necessary steps to ensure that, in the interests of keeping the peace, one maintained ‘leadership’ and superiority across the board in the nuclear field.

In 1955 much of the work of Soviet scientists had been virtually inaccessible to outsiders for almost a decade. The brief spring of international rapport, encouraged by Stalin’s determination to ‘catch up with West’, had come to an abrupt halt in 1947.[73] Many in the West had little regard for Soviet scientific and technological capabilities thanks to Soviet and Western propaganda, naïve assumptions about the incompatibility between science and communism, and the belief that Soviet scientific and technological achievements owed much to foreign help and to spies. Edward Teller was convinced that

[72] Report, “Background of the Geneva Conference,” (cit. n.61), 6-7; Press Statement by Veksler, (cit. n. 22).

[73] Nikolai Kremenstov, this volume

Klaus Fuchs' treachery had advanced the Soviet atomic bomb project by ten years: a ludicrous exaggeration.[74] At Geneva, write Hewlett and Holl, the US delegation was "surprised" by "the highly technical competence of Russian scientists and engineers generally, and the large numbers of students in training in universities and technical schools".[75] Until the Soviets launched Sputnik, General Medaris remembered afterwards, it was fashionable to think of the Russians as "retarded folk who depended mainly on a few captured German scientists for their achievements, if any. And since the cream of the German planners had surrendered to the Americans, so the argument ran, there was nothing to worry about".[76] Hence Veksler's pride: on returning home he reported that before the meeting many in the US "had believed that, with the isolation of the USSR, the development of science and technology there would be prevented. The Geneva Conference showed, however, that the USSR is very successfully advancing along its own road and has achieved great results both in science and technology". He was particularly happy with the impression that his own work had made. Veksler proudly told the press, "In the course of our conversations my foreign colleagues repeatedly declared how impressed they were by the new data concerning the construction in the USSR of a vast new accelerator of charged particles which is nearing

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[74] See David Holloway, *Stalin and the Bomb. The Soviet Union and Atomic Energy, 1939 – 1956* (New Haven: Yale University Press, 1994), 222-3.

[75] Hewlett and Holl, *Atoms for Peace and War. 1953 – 1961* (cit. n.8), 250.

[76] Quoted in C. Lasby, *Project Paperclip. German Scientists and the Cold War* (New York, 1971), 6.

completion and is intended for the production of protons of 10-billion-electron-volt energy”.[77]

Veksler’s ‘impressed’ western colleagues were not just stunned, but panicked, by Soviet achievements. They demanded that the US immediately take steps to ensure that they did not lose their lead over their communist rivals. Melvin Price, the Chairman of the Subcommittee of the US Congress’s Joint Committee Atomic Energy that was responsible for research and development, drew the conclusion that America was not producing enough qualified scientists and engineers for both the peaceful and military atomic programs. “When the Committee attended the Geneva conference last summer”, wrote price in March 1956, “it gained a firsthand impression of this alarming fact”. Immediate and strenuous measures were needed to resolve the situation: “at stake”, said Price, “is not only our national defense and well-being but our ability to compete with the Soviets in the struggle for men’s minds throughout the free world”.[78]

Fred Seitz, a solid-sate physicist at the University of Illinois, was particularly disturbed by Veksler’s description of the 10BeV accelerator. For Seitz, his revelations were a call to arms. “High energy nuclear physics”, he wrote in April 1956, “is the principle frontier area of research in the physical sciences at the present time’. It produced new scientific results and new devices; “many of the most important

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[77] Press Statement by Veksler, (cit. n.22).

[78]American Institute of Physics, College Park MD, Barton files, Box 58, Folder 8, Letter Melvyn Price to Henry Barton, March 29, 1956.

innovations in modern engineering have found their origin in the nuclear laboratory", he claimed. It also produced what Seitz called "uniquely trained manpower", intellectually imaginative and daring nuclear physicists who had played a key role in the development of a whole range of weapons during the war, and who had "also demonstrated great aptitude in the planning of weapons systems […]". During the past five years "the Soviet has challenged our leadership through the establishment of several institutes devoted to high-energy physics". The 10 BeV accelerator would give them additional leverage. Pleading for a Department of Defense program in high-energy physics Seitz insisted that it was "essential that the United States retain its leadership in all essential parts of the field and that the Department of Defense profit as much as is conceivably possible from the development".[79]

We do not know how Soviet scientists and their administration used the information they gleaned from the British and the Americans in Geneva to strengthen and reorient their national nuclear programs: Veksler noted how impressed he was with Ernest Lawrence's account of accelerators and how much his colleagues liked Zinn's report on the boiling water reactor. But just as the state sought legitimacy and credibility, just as the Soviet Union sought to be respected as a modern, scientifically and technologically capable society, so too did their scientists and their engineers. The respect in which they were held in the United States after the meeting built their self-

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[79] Memo, "Proposal for Department of Defense Program in High Energy Physics," 31 October 1955, attached to letter George D. Lukes, to I. I. Rabi, 6 April 1955, LoC, Rabi papers, Box 25, Folder 8. Emphasis in the original.

esteem and their self-confidence. Scientific credibility, legitimacy and cognitive authority is a social accomplishment. It is constructed and consolidated in interactions between peers whose assessment of the plausibility of another's truth-claims is interwoven with an assessment of their competence. American scientists arrived in Geneva with a view of their Soviet colleagues as trapped in a closed, backward communist society that had little respect for science. They went home chastened. Soviet scientists arrived in Geneva awed by the achievements of their American counterparts and uncertain of the reception their work would be given. They went home reassured.

**Conclusion**

In a paper published over thirty years ago, Paul Forman showed how scientific internationalism in *Weimar* Germany was an expression of deeply-felt nationalistic sentiments. He remarked that historically these two apparently contradictory allegiances were reconciled "through the eminently simple formula that the fame and honor which the scientist wins accrues also to his nation and patron". Forman goes on:

> According to this classical conception – largely due to and propagandized by the scientists themselves – the contribution of science to national prestige is an automatic and inevitable byproduct of scientific achievement. It does not require a choice on the scientist's part between serving the interests of science and serving the interests of his nation, between behaving like a good scientist and behaving like a good patriot".[80]

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[80] Paul Forman, "Scientific Internationalism and the Weimar Physicists: The Ideology and its Manipulation in Germany after World War I," *Isis* 64 (1973), 151-180. See also

This paper has shown how the fusion between the invocation of internationalism and the pursuit of national interest was achieved in the nuclear field in the early Cold war. For the US (and the USSR) a demonstration of scientific and technological generosity and prowess on the international stage was intended to win hearts and minds and to confirm the credibility or even the superiority of rival politico-economic systems. To this vague and rather general cultural agenda were added more specific and tangible scientific and intelligence-gathering goals. Sharing knowledge and techniques would both advance understanding and scientific authority, and provide a window into the scientific life-worlds of allies and enemies alike. International scientific exchange deftly reconciled the universalistic appeal to the pursuit of truth with the particularist needs of national security. By weaving surveillance and security into the fabric of openness and internationalism in the Atoms for Peace program one could be both a good scientist and a good patriot. This double movement was indeed constitutive of scientist's behavior. One chord was struck when they spoke to their colleagues abroad, the other when they spoke to their patrons in Washington or Moscow.

The same logic informed the diffusion of nuclear technology to the less industrialized countries. The United States was prepared, through the IAEA, to share knowledge and nuclear technology with them.[81] However, the reactor on display in

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Daniel J. Kevles, "'Into Hostile Political Camps': The Reorganization of International Science in World War I," *Isis* 62 (1971), 47 – 60.

[81] The United States authorities explained to European scientists in December 1954 that, as far they were concerned, in nuclear matters a distinction had to be drawn between developed countries, like those in Western Europe, less developed countries like Turkey

Geneva, the model that United States wanted to diffuse to win hearts and minds used enriched uranium 235. As such it propelled the recipient up the "barometer of nuclearity" (Hecht) and inevitably embedded the 'benefactor' in a regime of surveillance implemented through the imposition of 'safeguards'.[82] Indeed it might be argued that the US's insistence on promoting a technology which contained fissionable material (while Britain, France and Canada marketed power reactors that used natural uranium as a fuel) was intended to combine sharing with surveillance. 'Autonomy' in the nuclear field was interwoven with dependence, a dependence which was reinforced for the less developed countries by coupling US economic aid to the acquisition of reactors using enriched uranium fuel and built by firms like General Electric and Westinghouse.[83]

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and Iran, and what a Swiss report called "des territories primitifs." As far as the US was concerned, it was the second-tier countries that would benefit from US economic aid and nuclear reactors using fuel made available through the IAEA: "Note pour le Chef du Département. Entretien avec le prof. Scherrer sur l'énergie atomique", 27 janvier 1955, Documents Diplomatiques Suisses, www.dodis.ch, DoDis-9598.

[82] Gabrielle Hecht (this volume).

[83] For a discussion of the dilemmas and contradictions faced by a 'self-reliant' India that was offered US reactor technology, see Abraham, *The Making of the Indian Atomic Bomb* (cit. n.55), 91-8.