

Catalysts of Change:
Scientists as Transnational Arms Control Advocates in the 1980s

by

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Abstract

In 1986 the Natural Resources Defense Council (NRDC), a U.S. non-governmental organization, began an unprecedented collaboration with the Soviet Academy of Sciences to establish three U.S. nuclear monitoring stations in the vicinity of the Soviet nuclear test site in Semipalatinsk. This transnational collaboration of scientists accomplished what U.S. administrations since Eisenhower had tried and failed, namely to place U.S. scientists and their seismic monitoring equipment on Soviet soil. This paper analyzes how, why, and to what extent these scientists from East and West succeeded in shaping national and international debates about nuclear arms control and a comprehensive nuclear test ban treaty. The paper places this project in a framework of transnational relations and highlights the importance of trust between the involved scientists, in particular between the project leaders, NRDC physicist Thomas Cochran and Soviet Academy physicist and vice-president Yevgeny Velikhov.

*“Our objective is to get some movement in the arms control arena. We want to show that American and Soviet scientists can set aside their differences and work together to prove that verification is not an obstacle to a nuclear test moratorium or test ban treaty”*¹ Thomas Cochran, NRDC, 1986

Introduction

On May 28, 1986, the Natural Resources Defense Council, a U.S. non-governmental organization, signed an agreement with the Soviet Academy of Sciences to establish three U.S. nuclear monitoring stations near the principal Soviet nuclear test site at Semipalatinsk, Kazakhstan.² At the same time the two sides agreed to prepare Soviet

¹ Thomas Cochran quoted in Fred Kaplan, “Soviets to allow US scientists to build stations to monitor nuclear tests,” *Boston Globe*, 4 June 1986, 6.

² I thank Thomas B. Cochran for access to the unprocessed NRDC files, hereafter cited NRDC files. The NRDC-Soviet Academy collaboration is discussed in a number of publications, most prominently in Philip G. Schrag, *Listening for the Bomb: A Study in Nuclear Arms Control Verification Policy* (Boulder: Westview, 1989); Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca: Cornell University Press, 1999), 279-285. For Cochran’s own analysis see Thomas B. Cochran, “The NRDC/Soviet Academy of Sciences Joint Nuclear Test Ban Verification Project,” *Physics and Society* 16:3 (July 1987), 5-8. The project was widely covered in the news media, from which I draw for this article. Other important analyses of this project include Michèle A. Flournoy, “A Controversial Excursion into Private Diplomacy: The NRDC/SAS Verification Project,” in John Tirman, ed., *Annual Review*

monitoring stations in the vicinity of the U.S. Nevada Test Site. Only weeks later NRDC scientists arrived in Kazakhstan to set up three seismic monitoring stations in an area usually off-limits to foreigners. In collaboration with their Soviet colleagues they operated these stations successfully from July 1986 to April 1989.

NRDC scientists accomplished what U.S. administrations since Eisenhower had attempted and failed to do, namely to put U.S. scientists and their monitoring equipment on Soviet soil to take seismic measurements of the test site and ultimately to control Soviet nuclear testing activities. At the same time the NRDC-Soviet Academy project brought a fresh impetus to the national and international debate about a comprehensive nuclear test ban treaty. Soviet leader Mikhail Gorbachev had announced a nuclear test moratorium in August 1986 and sought to convince U.S. president Ronald Reagan to join. For Gorbachev and his informal science advisor Yevgeny Velikhov, a physicist and vice president of the Soviet Academy, the collaboration with the NRDC offered an opportunity to demonstrate to U.S. policymakers that the new Soviet leadership was serious about arms control. In fact, they were willing to change the traditional Soviet position on nuclear test ban verification and on-site measurements. Suddenly it appeared as if the Soviets offered a way out of the arms control stalemate.

The transnational effort between scientists from East and West challenged hardliners within the Soviet Union as well as the U.S. administration: for Soviet

of Peace Activism (Boston: Winston Foundation for World Peace, 1989), 11-24; Leslie Y.

Lin, "Gaining Ground Zero," *Sierra Journal* (January/February 1987), 33-36; for a

hostile view see Rael Jean Isaac, "The Nuclear Test Ban Hoax: Brought to you by the NRDC and its Soviet friends," *The American Spectator* (May 1987), 21-26.

hardliners, especially in the Ministry of Defense, any suggestion of American scientists taking measurements close to the Soviet nuclear test site was utterly unacceptable; for U.S. hardliners, who were convinced that nuclear testing had to continue to develop the next generation of nuclear warheads, any initiative that strengthened arguments for a comprehensive nuclear test ban were equally abhorrent.

The project turned out to be a public relations coup for the NRDC as well as for the Soviets. Gorbachev in particular used the project against critics in his own administration. At the same time the project turned out to be a serious embarrassment for the Reagan administration, since the NRDC with a \$7 million annual budget essentially outmaneuvered the Department of Defense on a question of importance for national security.

This transnational collaboration between scientists from East and West was widely covered by the media, discussed, supported, and often attacked by policymakers in the United States and the Soviet Union. It changed Soviet foreign policy and U.S. domestic debates about a comprehensive nuclear test ban, because it demonstrated that test ban verification was possible, that Soviet leaders had changed their minds about on-site inspections, and that U.S. administration arguments against a nuclear test ban were disingenuous.

This paper analyzes how, why, and to what extent this coalition of U.S. and Soviet scientists succeeded in shaping Soviet foreign policy and at the same time altering the nuclear test ban debate in the United States. It seeks to understand why scientists were able to change the terms of the national and international arms control debate at a time when diplomats on both sides failed to make progress in their negotiations.

Furthermore, it explains how and why this “private diplomacy” effort succeeded despite strong opposition from parts of the U.S. and the Soviet administration. Why did the Soviets change their nearly thirty-year policy on on-site verification, and to what extent did the transnational scientists cause this policy change? Was this agreement simply a Soviet propaganda coup, as some suggested, in support of Gorbachev’s arms control policies? In other words, did Soviet officials use the NRDC? Alternatively, did the NRDC use Velikhov and even Gorbachev to change the U.S. test ban debate?

Political scientists and political commentators have suggested a variety of factors that led to this unprecedented project and its success. Political scientists, in particular, have analyzed the conditions under which states change their policies. While many political scientists highlight the constraints imposed on a state’s policy-making by the international system and domestic pressures, some have analyzed to what extent groups of experts, the so-called “epistemic communities,” have shaped a state’s policies.³ Peter

³ On the concept of “epistemic communities” in political science see Peter M. Haas, ed., *Knowledge, Power, and International Policy Coordination*, which appeared as a special issue of *International Organization* 46:1 (Winter 1992). See in particular Peter M. Haas, “Introduction: epistemic communities and international policy coordination,” *ibid.*, 1-35; Emanuel Adler, “The emergence of cooperation: national epistemic communities and the international evolution of the idea of nuclear arms control,” *ibid.*, 101-145. For a critical discussion of the concept see Sheila Jasanoff, “Science and Norms in Global Environmental Regimes,” in Fen Osler Hampson and Judith Reppy, eds., *Earthly Goods: Environmental Change and Social Justice* (Ithaca, N.Y.: Cornell University, 1996), 173-197.

M. Haas's original definition characterized an epistemic community as "a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area."⁴ For the purpose of this paper, we can regard the participating scientists from East and West as an epistemic community, in which each member shared four core beliefs: first, they believed that scientists could and even should move the international arms control agenda outside of official government-to-government contacts; second, they believed that a comprehensive nuclear test ban treaty was an important step towards more substantial arms control agreements and détente in general; third, they believed that such a treaty could be adequately verified by seismic means; and finally, they believed that their partners from the other side of the Cold War divide shared the first three beliefs.

The second political science concept of relevance for this paper is the notion of "transnational actors."⁵ Transnational actors are entities that engage in transnational relations, that is, "regular interactions across national boundaries when at least one actor is a non-state agent or does not operate on behalf of a national government or an intergovernmental organization."⁶ As political scientists have shown, transnational actors

⁴ Haas, "Introduction," 3.

⁵ For a good overview see Thomas Risse, "Transnational Actors and World Politics," in Walter Carlsnaes, Thomas Risse, and Beth A. Simmons, eds., *Handbook of International Relations* (London: Sage, 2002), 255-274.

⁶ Thomas Risse-Kappen, "Bringing transnational relations back in: introduction," in Thomas Risse-Kappen, ed., *Bringing transnational relations back in: Non-state actors,*

such as the approximately 7,000 multinational corporations and 5,000 international non-governmental organizations, including Greenpeace and Amnesty International, have often played a significant role in international affairs and the behavior of states.⁷ The concept can be extended to collaborations between scientists from various countries, in which the scientists don't represent their nations (as in scientific exchanges between nations), but rather a non-state or transnational agenda.

Arguably the most relevant study of scientists as transnational actors for the purpose of this paper is Matthew Evangelista's book *Unarmed Forces: The Transnational Movement to End the Cold War*.⁸ Evangelista, a political scientist at Cornell University, concluded that transnational networks of scientists played a significant role in arms control affairs of the 1980s and in the end of the Cold War. However, he focused on the importance of Soviet domestic structure to explain the scientists' successes and did not analyze further why scientists accomplished these successes. I agree with Evangelista that the very hierarchical Soviet domestic structure provided a window of opportunity for transnational groups to shape Soviet foreign

domestic structures and international institutions (Cambridge: Cambridge University Press, 1995), 3.

⁷ Numbers based on Risse-Kappen, "Bringing transnational relations back in: introduction," 3. Ann M. Florini, ed., *The Third Force: The Rise of Transnational Civil Society* (Tokyo and Washington, D.C.: Japan Center for International Exchange and Carnegie Endowment for International Peace, 2000).

⁸ Evangelista, *Unarmed forces: the transnational movement to end the Cold War*.

policy, especially when they gained direct access to the top leadership such as Soviet General Secretary Mikhail Gorbachev and his Foreign Secretary Eduard Shevardnadze.

However, I argue here that Soviet domestic structure is only one factor for an explanation of the effectiveness of these groups and that two factors have been overlooked. The NRDC-Soviet Academy collaboration rested on the political activism of the involved American and Soviet scientists, in particular the leaders of the two delegations, the NRDC physicist and senior scientist Thomas Cochran and Gorbachev's informal science adviser, Yevgeni Velikhov, a physicist and Vice-President of the Soviet Academy. It took the daring and tenacity of both Cochran and Velikhov to overcome opposition in their own countries. And most importantly it took trust between these scientists, a trust that depended on shared beliefs and common goals about nuclear arms control. In other words, they belonged to the same epistemic community of arms control supporters and activists, who regarded it as crucial to work towards a relaxation of superpower tensions and, most importantly, to prevent the ultimate catastrophe, nuclear war. This trust stands in marked contrast to the deep suspicions both governments harbored.

Furthermore, U.S. scientists who participated in these exchanges were either able to build on longstanding professional contacts with Soviet scientists or they were able to develop close contacts during the 1980s when diplomats from both countries did not speak with each other. In other words, when scientists were the only open channel of communication on matters of arms control, nuclear policy, and international security, they were influential *de facto*. I also argue that these scientists from both sides found common ground where diplomats and politicians had failed, because they shared the

belief that arms control was desirable and manageable by a combination of technical and political approaches.

This paper analyzes the role of these scientists as transnational arms control activists and unofficial diplomats and raises some broader questions about the role of scientists in international affairs. What have scientists contributed to conflict prevention and resolution? To what extent was their contribution distinctive? In other words, to what extent were scientists able to address international problems which diplomats, business people, artists, athletes could not address, and what kind of groups or individual scientists did it take to effectively shape international affairs? Also, to what extent was technical expertise necessary for scientists to become influential, or were other skills and qualities significant as well?⁹

This paper does not suggest that scientists have changed or can change international affairs simply by the force of their knowledge claims. They operate within an international system and a domestic structure that constrains every actor. However, the paper suggest that in times of international instabilities input from transnational coalitions of scientists can and has been the proverbial butterfly wing that tips the balance. In the Soviet Union in the mid-1980s, a political system in flux, small-scale changes could have dramatic effects, and scientists became catalysts of change.

⁹ Similar questions have been raised by Allison L. C. de Cerreño and Alex Keynan, *Scientific cooperation, state conflict: the roles of scientists in mitigating international discord*, *Annals of the New York Academy of Sciences*, v. 866 (New York, N.Y., 1998).

The paper is divided into three sections and an epilogue. The first section highlights the two trends out of which the NRDC-Soviet Academy cooperation developed: first, the rich tradition of scientists as transnational arms control activists during the 1960s and 1970s, and second the efforts of governments to seek a complete, or comprehensive, nuclear test ban treaty. Then I turn to the immediate origins of the project and introduce the principal players, on the one hand Thomas Cochran and the Natural Resources Defense Council, and on the other hand Yevgeny Velikhov and the Soviet Academy of Sciences. The third section discusses the monitoring agreement and the actual establishment of stations in both countries. The epilogue returns to the core question: how, why, and to what extent were these scientists from East and West able to do what official diplomatic efforts had failed to accomplish.

Scientists as Transnational Arms Control Advocates

During the Cold War scientists from East and West have repeatedly worked together to discuss arms control measures and to seek solutions for complex technical-political problems of arms control verification.¹⁰ The NRDC-Soviet Academy project, arguably the most visible case of such cooperation during the Gorbachev era, can be seen in this tradition.

The most important transnational effort of scientists during the Khrushchev and Brezhnev eras is the Pugwash movement, which brought together scientists from the Soviet Union, the United States, and other countries to discuss fundamental problems of

¹⁰ Evangelista, *Unarmed Forces*, is the best source.

arms control and the survival of humanity. Pugwash's underlying assumption was that scientists would share a common language and therefore could find common ground where diplomats could not. Pugwash conferences, which began in 1957 and continue to this day, provided an influential and open communication forum, especially at times of tensions between the superpowers. They led to informal contacts between U.S. and Soviet scientists and to the generation of new ideas that have shaped foreign policy decisions, most notably in the case of the 1963 Limited Nuclear Test Ban Treaty and the 1968 Nuclear Nonproliferation Treaty.¹¹ In recognition of these accomplishments the 1995 Nobel Peace Prize was awarded to Pugwash secretary Joseph Rotblat and the Pugwash movement.

A second example of such transnational cooperation is the Soviet-American Disarmament Study Group, which met from 1961 to 1975. This group developed partly in reaction to the changing focus and participation of Pugwash conferences. While early Pugwash participants were predominantly nuclear physicists, who sought technical solutions to nuclear arms control matters, the conferences soon broadened to include more social scientists and topics such as world hunger. In addition, the conferences had swollen to more than a hundred participants, and had become in the eyes of some critics too unwieldy and unfocused. The new group returned to the origins of Pugwash and limited the membership to only a handful of politically well-connected experts on both sides, who focused on policy-relevant aspects of arms control. U.S participants were

¹¹ No scholarly history of the Pugwash conferences exists. A starting point is Joseph Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences* (Cambridge, Mass.: MIT Press, 1972).

affiliated with the Cambridge-based American Academy of Arts and Sciences, whereas members of the Soviet Academy of Sciences dominated the Soviet delegation. Among the Americans we find Harvard chemist Paul Doty and Harvard political scientist and later Secretary of State Henry Kissinger. Leaders on the Soviet side included influential Academicians Mikhail Millionshchikov, a vice-president of the Academy, and Lev Artsimovich, both physicists and committed supporters of arms control measures.¹² Bernd W. Kubbig has shown how this group succeeded in convincing Soviet officials to abandon their missile defense posture and accept instead the intellectual foundations of the Anti-Ballistic Missile Treaty in 1972.¹³

The early 1980s posed a particular challenge for transnational scientific collaborations, since relations between the United States and the Soviet Union had reached a dangerous low point.¹⁴ The Soviet occupation of Afghanistan in 1979, the election of Ronald Reagan, and the tensions about deployment of Pershing-II missiles in Western Europe led to a breakdown of official diplomatic channels between the

¹² Bernd W. Kubbig, "Communicators in the Cold War: The Pugwash Conferences, the U.S.-Soviet Study Group and the ABM Treaty; Natural Scientists as Political Actors: Historical Success and Lessons for the Future," Peace Research Institute Frankfurt Report No. 44 (1996).

¹³ Kubbig, "Communicators in the Cold War."

¹⁴ Raymond L. Garthoff, *The great transition: American-Soviet relations and the end of the Cold War* (Washington, D.C.: Brookings Institution, 1994); Don Oberdorfer, *From the Cold War to a new era: the United States and the Soviet Union, 1983-1991*, Updated ed. (Baltimore, Md.: Johns Hopkins University Press, 1998).

superpowers from 1983 to 1986. Concerned U.S. citizens sought contacts with Soviet groups to reduce tensions and to keep communication channels open.¹⁵ U.S. scientists reacted to these international tensions by discussing arms control again. For example, in 1980 alone the AAAS established an arms control group, the American Physical Society held a symposium on arms control, and the Physicians for Social Responsibility re-activated their arms control activity.¹⁶ Some groups of scientists sought direct contact with Soviet scientists. Three such efforts stand out: first, the close collaboration between the Federation of American Scientists leadership, that is, Jeremy Stone and Frank von Hippel, with Soviet physicists such as the ubiquitous Velikhov and his colleague, Academician Roald Sagdeev, the former director of the Soviet Space Research Institute;¹⁷ second, the formal meetings between the U.S. National Academy's Committee on International Security and Arms Control (CISAC) with its Soviet counterpart delegation from the Soviet Academy, chaired for the better part of the 1980s by Velikhov and

¹⁵ For efforts by other groups, especially the Dartmouth Conferences, see David D. Newsom, ed., *Private diplomacy with the Soviet Union* (Lanham, MD and Washington, D.C.: University Press of America and Institute for the Study of Diplomacy, Georgetown University, 1987).

¹⁶ Michael Heylin, "NAS, others take on arms control issues," *Chemical and Engineering News* (May 19, 1980).

¹⁷ The FAS collaborated with Velikhov and Sagdeev on issues such as nuclear winter and the critical response of Reagan's Strategic Defense Initiative. On Sagdeev see Roald Z. Sagdeev, *The Making of a Soviet Scientist* (New York: John Wiley, 1994).

Sagdeev;¹⁸ and third, the NRDC-Soviet Academy interaction, which is analyzed below in more detail.

The Test Ban Debates in the early 1980s

The second root of the NRDC-Soviet Academy project lies in the nuclear test ban debates of the early 1980s. After many years of negotiations the United States, the United Kingdom and the Soviet Union signed the Limited Test Ban Treaty (LTBT) in 1963.¹⁹ The treaty banned tests in the atmosphere, under water and in outer space, but not underground, since the U.S. felt that seismic monitoring capabilities were not

¹⁸ These meetings continue in the present. See Kai-Henrik Barth, “Policy Dialogues: The National Academies’ Committee on International Security and Arms Control, 1980-2005” (forthcoming).

¹⁹ For major works on the early test ban negotiations see George Bunn, *Arms control by committee: managing negotiations with the Russians*, Studies in international security and arms control (Stanford, Calif.: Stanford University Press, 1992); Jozef Goldblat and David Cox, eds. *Nuclear Weapon Tests: Prohibition or Limitation?* (Oxford: Oxford University Press, 1988); Harold Karan Jacobson and Eric Stein, *Diplomats, scientists, and politicians; the United States and the nuclear test ban negotiations* (Ann Arbor, Michigan: University of Michigan Press, 1966); Glenn Theodore Seaborg and Benjamin S. Loeb, *Kennedy, Khrushchev, and the test ban* (Berkeley: University of California Press, 1981).

sufficiently developed to detect small Soviet underground explosions.²⁰ With the signing of the LTBT the test ban issue faded from public interest and returned only in the last weeks of the Nixon presidency.

In 1974 President Nixon, under pressure at the height of the Watergate affair, met with Brezhnev in Moscow. To make the summit worthwhile, Nixon needed a bilateral arms control agreement of some significance. After a few days of negotiation, both sides agreed to limit their underground tests to a maximum yield of 150kt. Two years later both sides extended this Threshold Test Ban Treaty (TTBT) to cover the so-called peaceful nuclear explosions, or PNEs, as well, resulting in a Peaceful Nuclear Explosions Treaty (PNET).²¹

While the US had signed both the TTBT and the PNET in 1974 and 1976 respectively, both treaties were left hanging in the Senate Foreign Relations committee and languished in the no-man's-land of non-ratified treaties. With Gorbachev's push for a comprehensive nuclear test ban, the Reagan administration, determined to continue testing, used the ratification issue of the TTBT and PNET as a stumbling block for a comprehensive nuclear test ban treaty (CTBT). Reagan officials argued that the TTBT and PNET had to be ratified first before serious consideration of a CTBT could begin. However, ratification of the two treaties was again held up by the alleged uncertainty of seismic verification: to what extent was the U.S. able to detect Soviet small underground

²⁰ On the history of the LTBT see Jacobson and Stein, *Diplomats, scientists, and politicians*; Seaborg and Loeb, *Kennedy, Khrushchev, and the test ban*.

²¹ David B. Thomson, *A Guide to the Nuclear Arms Control Treaties* (Los Alamos: Los Alamos Historical Society, 2001), 38-41.

explosions?²² Reagan administration officials assumed that Soviet leaders would never allow onsite inspections of their nuclear testing facilities or the direct onsite monitoring of nuclear explosions. And without onsite monitoring, testing proponents continued to claim that a nuclear test ban was not verifiable.

Test ban supporters realized that access to Soviet test grounds would eliminate this argument. But would the Soviets let U.S. monitoring experts set up seismic stations around their test site at Semipalatinsk? It took the daring of Velikhov to overcome the traditional suspicions of Soviet hardliners. He outmaneuvered internal dissent of leading policy makers and presented Gorbachev essentially with an accomplished fact of U.S. seismic experts on the ground in Kazakhstan.

The official bilateral negotiations about a comprehensive nuclear test ban treaty broke off in November 1980, and the Reagan administration left no doubt that a resumption of nuclear test ban talks was not desirable. At a July 19, 1982, National Security Council meeting Reagan “formally decided to end U.S. participation in international efforts to ban all nuclear tests.”²³ With this decision the Reagan administration ended the effort of U.S. presidents since Eisenhower to reach an agreement for a CTBT. What kept the public discussion of such a treaty alive was the

²² “Small” in this context meant nuclear yields of about 1 kiloton. In comparison, the yields of the Hiroshima and Nagasaki bombs were 13kt and 22kt. See Richard L. Garwin and Georges Charpak, *Megawatts and Megatons: A Turning Point in the Nuclear Age?* (New York: Knopf, 2001), pp. 59-60.

²³ Len Ackland, “Testing – who is cheating whom?” *Bulletin of the Atomic Scientists* (October 1986), 9-11.

powerful Nuclear Freeze movement, which made it politically costly for Reagan to simply walk away from the nuclear testing debate. But instead of negotiations he chose to highlight the verification problems.

By 1985 the two superpowers disagreed sharply about the value and usefulness of a CTBT. Leading defense officials in the Reagan administration rejected a CTBT for a variety of reasons. Not only was such a ban not verifiable, they argued, but further nuclear tests were necessary to guarantee the safety and reliability of the existing stockpile. Critics argued that the Reagan administration wanted to keep the testing option open, including testing of new nuclear weapons designs for the Strategic Defense Initiative. Reagan and his security advisers had repeatedly refused to join Gorbachev's test moratorium, dismissing it as a propaganda gimmick. For supporters of continued testing, the verification issue provided a convenient and powerful argument against a test ban. They argued that a test ban without adequate verification measures would be against U.S. interest, since the U.S. would never be sure whether the Soviets would test nuclear devices clandestinely and thereby improve the quality of their nuclear arsenal and even possibly shift the balance of power.

Test ban supporters, in contrast, highlighted that a continued nuclear arms race could have only one outcome. In their view a test ban was verifiable, and they challenged the notion that further testing for the safety and reliability of warheads was in

fact needed. Some academic seismologists in particular challenged official government statements that the state-of-art in seismology did not permit a viable monitoring system.²⁴

With no movement in sight, a number of scientists thought about initiatives to break the impasse and push for a test ban. It took a very unconventional approach of test ban supporters in East and West to change the debate.

The Origin of the NRDC-Soviet Academy Collaboration

In the sections above I highlighted two roots of the NRDC-Soviet Academy project: first, scientists as transnational arms control advocates, and second, efforts to negotiate a comprehensive nuclear test ban treaty. In this section we will focus first on the two organizations involved in the project, the NRDC and the Soviet Academy of Sciences, and the project leaders, Thomas Cochran and Yevgeny Velikhov. Then I discuss the origins of their collaboration.

Thomas Cochran and the NRDC

In the mid-1980s the Natural Resources Defense Council could look back to more than a decade of public interest activism, with a focus on environmental, public health and arms control causes. Founded in 1970 “by 50 lawyers and scientists,” NRDC claimed more than 60,000 members by 1986.²⁵ Headquartered in New York with branch

²⁴ Gregory E. van der Vink, “The Role of Seismologists in Debates over the Comprehensive Test Ban Treaty,” in de Cerreño and Keynan, *Scientific Cooperation, State Conflict*, 84-113.

²⁵ Philip Taubman, “New Yorkers Sign Soviet Test Pact,” *New York Times*, 29 May 1986, sec. A3.

offices in Washington, DC, and San Francisco, NRDC had the necessary staff, the scientists, the determination and the connections of a “heavy weight” non-governmental organization.²⁶ The NRDC-Soviet Academy seismic verification project, the “largest privately-funded scientific exchange ever undertaken with the Soviet Union,”²⁷ became NRDC’s largest project with an estimated cost of \$2.4 million for the first year alone, a large sum for a NGO with an annual budget of about \$7 million.²⁸

In 1973 NRDC hired physicist Thomas Cochran to establish a Nuclear Group. Cochran, born in 1940, had served in the Navy, had taught mathematics and physics at the U.S. Naval Postgraduate School, and received his Ph.D. in physics at Vanderbilt

²⁶ Besides Cochran, other NRDC officials played a major role in this project. Cochran shared responsibility for the project with NRDC Senior Staff Attorney S. Jacob Scherr; NRDC Board Chairman Adrian DeWind signed the original agreement and aided in the project’s implementation. Also, NRDC Executive Director John A. Adams helped with the fundraising.

²⁷ NRDC, Status Report, May 1987, 2, NRDC files.

²⁸ NRDC, Status Report, November 1986, 4, NRDC files. Major donors included the “John D. and Catherine T. Mac Arthur Foundation, the Carnegie Corporation of New York, Ploughshares Fund, the W. Alton Jones Foundation, J.M. Kaplan Fund, the Columbia Foundation, and an anonymous donor.” Jonathan Berger et al., “A New U.S.-U.S.S.R. Seismological Program,” *EOS* 68:8 (February 24, 1987), 105 and 110-111, see the Acknowledgements.

University.²⁹ In the 1970s he published a technical analysis of the Clinch River Breeder reactor project and demonstrated that the government's assumptions about the economic and environmental consequences of the reactor were faulty. Later he recalled "the Atomic Energy Commission people were fudging the information to make the breeder look good, when really it looked terrible."³⁰ Cochran fought the project and succeeded, when Congress canceled the project in 1983.³¹

At NRDC, Cochran and his small group of nuclear experts began to analyze nuclear weapons research and production, nuclear waste, arms control, proliferation, and nuclear energy policy. In particular, the group collected information about environmental effects of nuclear weapons production, testing, and possible use, which led to a series of volumes, the *Nuclear Weapons Databooks*. The five *Databooks*, which provided the most comprehensive unclassified information about U.S., Soviet, French, British, and Chinese nuclear weapons and their production facilities, made Cochran and his group famous among arms control experts.³²

As part of the Databook work, NRDC analysts collected data about each nuclear test, its yield and purpose. Earlier U.S. administrations had announced essentially all

²⁹ On Cochran see Tim Beardsley, "Rebottling the nuclear genie," *Scientific American* 278 (1998); Philip G. Schrag, *Listening for the bomb*, 11. René T. Riley, "A Physicist Blasts Away At Verification 'Myths'," *National Journal*, 31 January 1987, 273.

³⁰ Cochran cited in Riley, "A Physicist Blasts Away At Verification 'Myths'," 273.

³¹ Beardsley, "Rebottling the nuclear genie."

³² Thomas B. Cochran et al. *Nuclear Weapons Databook* 5 vols. (Cambridge, Mass.: Ballinger, 1984-1994).

nuclear tests, but in 1982 the Reagan administration decided to announce only selected tests to downplay the magnitude of the U.S. nuclear testing program. Cochran and his colleagues decided to produce a list of these unannounced U.S. nuclear tests, but information especially on the small tests were extremely difficult to obtain. Underground nuclear tests at the Nevada Test Site an hour north of Las Vegas would generate seismic waves similar to that of an earthquake and would be recorded by seismic stations of the U.S. Geological Survey. However, small explosions in the 1-2 kiloton range would evade detection by USGS stations. Cochran, however, learned about a number of unannounced small explosions at NTS from an analysis of an unclassified paper by Lawrence Livermore physicist Ray Kidder.³³

In early 1986 NRDC analyst William Arkin half-jokingly suggested to set up seismic stations around the Nevada Test Site to guarantee that there would be no more secret tests at NTS, but he dismissed the idea as a rather unpatriotic endeavor.³⁴ Based on a suggestion of NRDC scholar-in-residence Gary Milhollin, the group then developed a plan to set up seismic stations around the Soviet nuclear test site as well.³⁵ NRDC analysts agreed it was very unlikely that the Soviets would ever agree to such a plan, since they had never permitted on-site monitoring despite decades of U.S. insistence. At the same time the plan offered some rewarding policy options: if the U.S. rejected the plan, it would demonstrate that the Reagan administration was not interested in seriously testing the Soviets' position on verification. This, in turn, would demonstrate that the

³³ Lin, "Gaining Ground Zero," 33.

³⁴ Schrag, *Listening for the bomb*, 12.

³⁵ Lin, "Gaining Ground Zero," 33.

real reasons behind the Reagan administration's opposition to a nuclear test ban was not the verification problem, but rather the determination to develop and test the next generation of nuclear weapons. Such a position was politically costly in the mid-1980s in the light of the popular Nuclear Weapons Freeze Campaign.³⁶ On the other hand the NRDC plan could also call the Soviets' bluff: the Soviets had repeated often that technical means of verification were sufficient to monitor a nuclear test ban. If they rejected the NRDC's proposal, it demonstrated to the world that the Soviets were not willing to seriously consider a test ban either. Both the U.S. and the Soviet administration relied on the posture of the other side as an explanation of why they rejected a test ban, and a movement by one side would call the bluff of the other side.

Cochran began to shop this concept around. Not surprisingly, the initial response from Vitalii Zhurkin at the Soviet Embassy was negative.³⁷ He also contacted officials from U.S. nuclear weapons laboratories, who apparently saw no problems for national security, if Soviet scientists would set up monitoring stations in the vicinity of the Nevada Test Site.³⁸ Cochran also presented his idea to U.S. Deputy Secretary of State John Whitehead and Paul Nitze, special adviser to the president for arms control and one

³⁶ About the Freeze movement see Lawrence S. Wittner, *The Struggle Against the Bomb, volume three, Toward Nuclear Abolition: A History of the World Nuclear Disarmament Movement: 1971 to the Present* (Stanford, CA.: Stanford University Press, 2003), 175-177

³⁷ Cochran phone interview, May 14, 2001.

³⁸ Cochran to Velikhov, January 23, 1987. I thank Tom Cochran for making this document available to me.

of the nation's most experienced arms control negotiators. Whitehead replied in a letter to NRDC chairman Adrian DeWind on March 4, "there is potential that private citizens could draw conclusions about Soviet compliance with testing constraints that differ from the judgments of U.S. government officials with access to more sources of information. There is obvious potential here for confusion." Furthermore, he concluded that "the establishment of such seismic stations would not resolve the current uncertainty in measuring the yield of nuclear tests, nor would it alter our national security need for on-site measurements of nuclear tests."³⁹

Cochran did not give up, however, and presented his idea to a group of Soviet scientists visiting the Federation of American Scientists in April 1986. At the meeting he raised his idea with FAS chairman Frank von Hippel, who had developed a close working relationship with Velikhov. Von Hippel discussed Cochran's idea with Velikhov, who in turn suggested holding a workshop on verification methods in Moscow in May 1986.

Yevgeny Velikhov and the Soviet Academy of Sciences

Yevgeny Velikhov, born in 1935, graduated from Moscow State University in 1958, and began a long career as a physicist at the Kurchatov Atomic Energy Institute,⁴⁰ In 1971 he joined the CPSU, and during the same year he became deputy director of the

³⁹ Whitehead cited in Michèle Flournoy, "A Controversial Excursion into Private Diplomacy," 14

⁴⁰ As of this writing (December 2004), Velikhov continues to be president of the Kurchatov Institute, which was renamed in 1992 as the Russian Research Center Kurchatov Institute. See <http://www.kiae.ru/eng/str/direct/vep.htm> [accessed December 5, 2004]

Kurchatov Institute. In 1974, at the unusually young age of 39, he was elected a full member of the Soviet Academy. Three years later he became the Academy's vice-president for applied physics and mathematics. Velikhov's work on nuclear fusion brought him into direct contact with Soviet military organizations. By the late 1970s he was involved in internal discussions on space-based missile defenses and laser weapons, which prepared him for his later role in challenging Reagan's Strategic Defense Initiative.⁴¹

How did Velikhov get involved in arms control issues? In 1982 Velikhov was one of the Soviet delegates to the Pontifical Academy of Sciences. The Pope had invited an international group of scientists to discuss the dangers of nuclear war. At the Academy he worked with Manhattan Project veteran Victor Weisskopf on a declaration, which included "some of the ideas we now call the new thinking – the need for a nuclear-free world, the impossibility of nuclear superiority or of a defense against nuclear weapons."⁴² The declaration appealed to national leaders, scientists, religious leaders and "people everywhere" to make nuclear war impossible. It urged scientists specifically "to apply their ingenuity in exploring means of avoiding nuclear war and developing

⁴¹ Yevgeniy Velikhov, interview by Kai-Henrik Barth, Moscow, Kurchatov Institute, Moscow, May 25, 2001.

⁴² Velikhov, interview by Barth; Yevgeniy Velikhov, "Chernobyl Remains on Our Mind," in Stephen F. Cohen and Katrina vanden Heuvel, *Voices of Glasnost: Interviews with Gorbachev's Reformers* (New York: W. W. Norton, 1989), 160. For the "Declaration on Prevention of Nuclear War" see Yevgeni Velikhov, ed., *The Night After...: Climatic and biological consequences of a nuclear war* (Moscow: Mir, 1985), 155-158.

practical methods of arms control.”⁴³ It was this conviction that Velikhov shared with arms control physicists from East and West.

Also in 1982 Academician Inozemtsev invited Velikhov to join a high level Soviet Academy delegation, which met regularly with a delegation of the U.S. National Academy of Sciences, the above-mentioned Committee on International Security and Arms Control, to discuss arms control matters. When Inozemtsev passed away unexpectedly in August 1982, Velikhov became the Soviet delegation’s chairman and remained in this position until 1986.⁴⁴

In 1983, in response to Reagan’s “Star Wars” speech, Velikhov founded with other arms control scientists and political scientists the Committee of Soviet Scientists against the Nuclear Threat, modeled after the Federation of American Scientists.⁴⁵ As CSS chairman he played a leading role in the Soviet response to Reagan’s Strategic Defense Initiative.⁴⁶ Out of this initiative he developed a close working relationship with the FAS’s chairman Frank von Hippel, which culminated in joined research projects between the FAS and CSS. This collaboration led to a new journal, *Science and Global*

⁴³ Velikhov, ed., *The Night After...*, 157-158.

⁴⁴ Velikhov, interview by Barth. National Academy of Sciences, CISAC files, Notes of Meeting Records.

⁴⁵ On the Committee of Soviet Scientists for Peace see Frank von Hippel, “The Committee of Soviet Scientists Against the Nuclear Threat,” *F.A.S. Public Interest Report* vol. 37:1 (January 1984), 1-4. For a membership of CSS see *ibid.*, 8.

⁴⁶ Frank von Hippel, “Arms Control Physics: The New Soviet Connection,” *Physics Today* (November 1989), 39-46.

Security, which became a unique publication on scientific-technical aspects of arms control.⁴⁷

By the mid-1980s Velikhov was an accomplished nuclear fusion physicist with extensive international contacts, a vice-president of the Academy, and arguably the most politically influential Soviet scientist of his generation, comparable to the position his teacher and mentor Lev Artsimovich had occupied in the 1960s.⁴⁸ He had close working relationships with all leading U.S. arms control scientists, including Frank von Hippel, Wolfgang Panofsky, and Richard Garwin.⁴⁹ He worked with Senator Ted Kennedy and Carl Sagan on the possible catastrophic climate changes after a nuclear war, which became popularized as “Nuclear Winter.”⁵⁰ In short, by 1985 he had an established

⁴⁷ The outcome of this collaboration is captured in Frank von Hippel and Roald Z. Sagdeev, *Reversing the Arms Race: How to Achieve and Verify Deep Reductions in the Nuclear Arsenals* (New York: Gordon and Breach, 1990). For *Science and Global Security* see <http://www.princeton.edu/~globsec/publications/SciGloSec.shtml> [accessed December 5, 2004].

⁴⁸ Relevant books and articles by Velikhov include Velikhov, ed., *The Night After...*; Evgeny P. Velikhov, “Science and Scientists for a Nuclear-Weapon-Free World,” *Physics Today* (November 1989), 32-36; autobiographical information is in Velikhov, “Chernobyl Remains on Our Mind,” 157-173; see also Velikhov, interview by Barth.

⁴⁹ For the collaboration with Frank von Hippel see von Hippel, “Arms Control Physics.”

⁵⁰ On Sagan and Nuclear Winter see Lawrence Badash, “Nuclear Winter: Scientists in the Political Arena,” *Physics In Perspective* 3 (2001), 76-105.

record of unconventional approaches to arms control and had won the trust of Western arms control scientists.

As an Academician and vice-president of the Academy Velikhov had access to high-level policy-makers. His defense-related work gave him access to the top-military leadership such as Marshall Sergei Akhromeev, first deputy chief of the General Staff.⁵¹ In addition, he had developed a relationship with Mikhail Gorbachev, whom he first met in 1978, years before the latter's rise to power.⁵² In the early years of the Gorbachev era, Velikhov was part of the Gorbachev's inner circle and advised him predominantly on "nuclear issues, strategic weapons, and computers."⁵³ According to Velikhov, the relationship was so close that he could call Gorbachev with an idea about arms control.⁵⁴ He accompanied Gorbachev on important foreign travel and in particular summit meetings with the American president.⁵⁵ Most notably, Gorbachev trusted Velikhov with organizing the immediate response to the April 1986 Chernobyl nuclear disaster, and Velikhov became well known for his daring efforts to curb the reactor's fire.⁵⁶

Velikhov was the prototype of the scientist as political entrepreneur, a political operator who was able to move things quickly in an otherwise inflexible bureaucracy. To

⁵¹ Velikhov, interview by Barth.

⁵² Velikhov, "Chernobyl Remains on Our Mind," 160. Velikhov, interview by Barth.

⁵³ Velikhov, "Chernobyl Remains on Our Mind," 161.

⁵⁴ Velikhov, interview by Barth.

⁵⁵ Velikhov accompanied Gorbachev on his trip to Great Britain in December 1984.

Archie Brown, *Gorbachev Factor*, 76

⁵⁶ Velikhov, "Chernobyl Remains on Our Mind," 162.

what extent was he, or any Soviet Academy leader for that matter, able to influence Soviet foreign policy decisions?⁵⁷ To answer this question, we have to look briefly into the Soviet foreign policy making process. Soviet foreign policy making, and more narrowly arms control decision-making in the early 1980s, was primarily the domain of five institutional actors: the General Secretary and his close advisers; the Politburo; the relevant branches of the Central Committee of the CPSU;⁵⁸ the Ministry of Defense; and the Ministry of State.⁵⁹ A detailed analysis of the Soviet arms control process is beyond

⁵⁷ The influence of the Soviet Academy of Sciences on Soviet foreign policy making during the 1980s was clearly limited. However, the Soviet Academy of Sciences included political science departments that acted as think tanks on issues ranging from international economic developments to arms control. Most important for international affairs and in particular arms control matters were two Soviet Academy branches, the Institute for Studies of Canada and the United States, ISKAN, run by the influential adviser Georgi Arbatov, and the Institute of World Economy, IMEMO, directed by Academician Inozemtsev.

⁵⁸ The most relevant departments are the International Department and the Department for Relations with Communist and Workers' Parties of Socialist Countries.

⁵⁹ Archie Brown, "The Foreign Policy-Making Process," in Curtis Keeble, ed., *The Soviet State: The Domestic Roots of Soviet Foreign Policy* (Boulder, Colorado: Westview, 1985), 191-216; Aleksandr' G. Savel'yev and Nikolay N. Detinov, translated by Dmitriy Trenin, edited by Gregory Varhall, *The Big Five: Arms Control Decision-Making in the Soviet Union* (Westport, Connecticut: Praeger, 1995); for the role of the Central Committee's International Department see Mark Kramer, "The Role of the CPSU

the scope of this paper. Here it suffices to emphasize that direct access to the leading policy-makers gave transnational actors an opportunity to shape arms control policies, if, and only if, the policy-maker decided to use their information and agenda for his own purposes. Political scientists have pointed out to what extent Gorbachev, in contrast to some of his predecessors, was willing to engage new ideas and to learn from others, including from Western scientists and physicians about the dangers of a nuclear arms race and the consequences of a nuclear war.⁶⁰

International Department in Soviet Foreign Relations and National Security Policy,” *Soviet Studies* 42:3 (July 1990), 429-446; on the role of Shevardnadze see John Van Oudenaren, *The Role of Shevardnadze and the Ministry of Foreign Affairs in the Making of Soviet Defense and Arms Control Policy* (Santa Monica, CA: Rand, 1990). Unlike his predecessor Gromyko, Shevardnadze’s inexperience prevented him from shaping Soviet foreign policy in the first year or two of his term. Later he built up his own think tank in the Ministry of Foreign Affairs and became more influential. No documentary evidence suggests that Shevardnadze was involved in the decision to permit American scientists on Soviet soil. On foreign policy making under Gorbachev see Archie Brown, *The Gorbachev Factor* (Oxford: Oxford University Press, 1996), in particular 212-251.

⁶⁰ For Gorbachev’s willingness to listen to new ideas see Brown, *The Gorbachev Factor*; Sarah E. Mendelson, *Changing Course: Ideas, Politics, and the Soviet Withdrawal from Afghanistan* (Princeton, New Jersey: Princeton University Press, 1998); Janice Gross Stein, “Political learning by doing: Gorbachev as uncommitted thinker and motivated learner,” *International Organization* 48:2 (Spring 1994), 155-183.

The following picture emerged: Gorbachev was open to learn, and he was willing to listen when his trusted science adviser Velikhov had an unconventional idea. The placing of U.S. scientists near the Semipalatinsk test site was clearly unconventional and would have been impossible under Gorbachev's predecessors. Gorbachev, deeply worried about nuclear weapons especially after the radioactive catastrophe of Chernobyl, agreed with Velikhov that the NRDC-Soviet Academy collaboration offered an opportunity to push nuclear arms control forward. He adopted the idea developed by Cochran, Velikhov and others and made it his own, thereby allowing the project to succeed against resistance in the Politburo and the military.⁶¹

The 1986 Moscow Meeting and the Monitoring Agreement

The NRDC-Soviet Academy project developed out of a flurry of initiatives aimed at reducing the danger of nuclear war.⁶² First, in conversations with FAS chairman Frank von Hippel in fall 1985 Velikhov suggested that it might be possible to get foreign seismologists on Soviet soil.⁶³ Von Hippel then talked with officials of the

⁶¹ Velikhov, interview by Barth. On the role of ideas in foreign policy making see Jeff Checkel, "Ideas, Institutions, and the Gorbachev Foreign Policy Revolution," *World Politics* 45 (1993); Jeffrey T. Checkel, *Ideas and international political change: Soviet/Russian behavior and the end of the Cold War* (New Haven, 1997); Mendelsohn, *Changing Course*.

⁶² Von Hippel, "Arms Control Physics."

⁶³ Len Ackland, "Testing – who is cheating whom?" *Bulletin of the Atomic Scientists* (October 1986), 9-11, on 11.

Parliamentarians for Global Action, an interest group of about 600 representatives, who according to von Hippel “already had the idea of setting up something like that.”⁶⁴ In 1985 the Parliamentarians for Global Action developed a Five Continent Peace Initiative, in which six non-aligned countries, Argentina, Greece, India, Mexico, Sweden, and Tanzania, proposed to jointly monitor a nuclear test moratorium.⁶⁵ As part of the proposal the six nations suggested to place seismic monitors near the American and Soviet test sites. A group of U.S. scientists, including seismic verification specialists Charles Archambeau, Jack Evernden, and Lynn Sykes, provided technical guidance about how such a limited moratorium might be monitored.⁶⁶ However, the proposal required approval of both the U.S. and Soviet governments, and since the Reagan administration

⁶⁴ Ackland, “Testing – who is cheating whom?,” 11.

⁶⁵ See Natural Resources Defense Council, “Proposal to Place Seismic Monitoring Stations Near the Soviet Nuclear Test Site,” June 26, 1986. NRDC Files.

⁶⁶ These advisers included leading geophysicists Charles Archambeau, a professor of geophysics at the University of Colorado; Jack F. Evernden, a senior scientist at the U.S. Geological Survey, and Lynn Sykes, a professor of geophysics at Columbia University; also included were Frank Barnaby, the former director of SIPRI; Princeton physicist and former FAS president Frank von Hippel; Carson Mark, retired director of the theory division of Los Alamos; and Robert Socolow, the director of Princeton’s Center for Energy and Environmental Studies. “Technical Experts Assisting in the Development of the New Delhi-Six Moratorium Monitoring Proposal,” NRDC files. Charles Archambeau, Lynn Sykes, and Jack Evernden, “Monitoring of a Nuclear Test Moratorium by Seismic Methods,” NRDC Files.

was openly hostile to a test ban, the proposal was “dead on arrival,” as Cochran put it.⁶⁷ Also, US Geological Survey seismologist Jack Evernden, a nuclear test detection specialist and longtime critic of test ban opponents, had suggested to set up a “an experimental network of seismic monitoring stations at up to 18 sites within the Soviet Union.”⁶⁸ Compared to the NRDC’s plan, Evernden’s proposal was significantly more expensive and would take longer to implement.

These various initiatives came together at a Moscow workshop (May 22-23, 1986) on test ban verification, organized by von Hippel and Velikhov. At the meeting Archambeau presented the technical basis of the Five Continents Peace Initiative, Evernden advocated his verification plan, and Cochran presented the NRDC plan. The participants agreed “that the current state of geophysical knowledge gives reasonable confidence in the detectability, using practical seismic networks, of nuclear weapons tests down to yields at, or below, one kiloton.”⁶⁹ At the meeting it became clear that Velikhov was looking for a quick political statement and that he favored the NRDC proposal,⁷⁰ which suggested installing three seismic stations in Semipalatinsk and three in the United States. Cochran later recalled “when we made the proposal to the Soviets [at the May

⁶⁷ Cochran phone interview by Barth, May 14, 2001

⁶⁸ Jack Evernden, interview by Kai-Henrik Barth, Golden, Colorado, June 16, 1998. R. Jeffrey Smith, “Soviets Agree to Broad Seismic Test,” *Science* 233 (1 August 1986), 511-512.

⁶⁹ Agreement between NRDC and Soviet Academy of Sciences, May 28, 1986. NRDC Files.

⁷⁰ According to Cochran, at this point Evernden dropped out. Cochran interview.

1986 meeting], in a sense we were shooting from the hip. We didn't have any seismologists organized. We didn't have any money. We just challenged them.”⁷¹

Velikhov took up the challenge. At this time he still enjoyed easy access to Gorbachev and informed the General Secretary of the various arms control initiatives presented at the workshop. According to Velikhov, Gorbachev gave his science adviser “freedom of action,” and Velikhov decided in favor of Cochran's plan, arguably the most political of the three major proposals.⁷²

The tireless Velikhov and von Hippel followed the May workshop with a larger International Forum of Scientists for Stopping Nuclear Tests in July 11-13, 1986, in Moscow. The meeting brought together about 150 scientists from 34 nations, who opposed nuclear testing and lobbied that Gorbachev should extend the moratorium and thereby put pressure on the Reagan administration to join. On the day after the meeting, a delegation of Western and Soviet scientists, including von Hippel, Velikhov, and Cochran met with Gorbachev.⁷³ In an open conversation some scientists, including von Hippel and Velikhov, praised the unilateral Soviet moratorium and appealed to Gorbachev to extend the moratorium yet again, beyond the August 6 expiration date. Gorbachev in return praised the scientists and declared that “Convincing arguments saying that the monitoring of halting nuclear tests is possible rang out both in the

⁷¹ Cochran quoted in Michèle Flournoy, “A Controversial Excursion into Private Diplomacy,” 14

⁷² Velikhov interview

⁷³ TASS, “Gorbachev, Scientists Discuss Issues At Forum,” FBIS 15 July 1986, USSR International Affairs, Arms Control and Disarmament.

[scientists'] declaration and here at our meeting. This is of enormous significance as it reflects the view of people who know what they were talking about."⁷⁴ In short, transnational scientists had access to Gorbachev and were able to put their views of arms control directly to him.

In sum, the forging of this transnational collaboration depended on three factors: Frank von Hippel's close working relationship with Velikhov; second, Velikhov's easy access to Gorbachev and the Secretary's particular leadership style; and third, Cochran's plan that promised rewards for the Soviet leadership in demonstrating glasnost and its seriousness about a nuclear test ban.

A few days after the Moscow meeting, on May 28, 1986, the NRDC's chairman Adrian W. DeWind and Velikhov signed a simple two-page agreement, a marked contrast to official treaty documents. The agreement, vague on technical details, specified that the Soviet Academy of Sciences and NRDC would set up three seismic stations adjacent to the Semipalatinsk and Nevada test sites. The six stations would be manned jointly by the two organizations, and the equipment would be obtained by the NRDC. The agreement specified that the project should begin before the end of June 1986.⁷⁵ After returning from Moscow, De Wind and Cochran started the fundraising drive with a press conference on June 3.⁷⁶

Cochran, backed by a well-oiled public relations machine at NRDC, gave numerous talks about the "Verification Breakthrough" with the Soviet Academy and

⁷⁴ Ibid.

⁷⁵ Agreement between the Soviet Academy and NRDC, May 28, 1986.

⁷⁶ "\$500,000 is Needed to Verify A-Tests," *New York Times*, 4 June 1986, sec. A13.

placed a number of op-ed pieces in newspapers and journals.⁷⁷ Cochran and NRDC Senior Staff Attorney S. Jacob Scherr informed leading newspaper editors, including Nicholas Wade of the *New York Times*, and Stephen Rosenfeld of the *Washington Post*, about this “very significant citizen arms control initiative and a major breakthrough in American-Soviet relations.”⁷⁸ Consequently, the project was covered prominently in major newspapers,⁷⁹ magazines,⁸⁰ as well as radio and TV shows.⁸¹ As Scherr put it, “Certainly, we were buoyed by the tremendous response of the general public. We seem to have struck a chord in a population tired of waiting for arms control progress.”⁸²

The publicity clearly was an embarrassment for the Reagan administration. Tom Wicker blasted President Reagan on the editorial pages of the *New York Times* and

⁷⁷ See for example flier announcing talk by Cochran on October 1, 1986, at the University of Chicago under the title “Clearing the Way for a Nuclear Test Ban: NRDC’s Verification Breakthrough”. NRDC Box 1 folder 2. For an op-ed piece see Robert S. Norris and Thomas B. Cochran, “Why Not a Test Ban?” *Washington Post*, 9 September 1986, sec. A 25.

⁷⁸ Cochran and Scherr, June 17, 1986, form letter to various editors, with list of editors attached, NRDC Box 1, folder 2 “Verification Project: Agreement and Draft Propos”.

⁷⁹ The original agreement of May 28, 1986, was reported in the *New York Times* and many other national newspapers. See Taubman, “New Yorkers Sign Soviet Test Pact.”

⁸⁰ See for example Smith, “Soviet, U.S. Scientists Reach Seismic Agreement.” Joseph Palca, “Private diplomacy emergent,” *Nature* (June 12, 1986), 638.

⁸¹ NRDC, Status Report November 1986, 3. NRDC files.

⁸² Scherr cited in Lin, “Gaining Ground Zero,” 35.

criticized the president's unwillingness to engage in serious arms control negotiations with the Soviets. Wicker noted that while Reagan did not believe Gorbachev's offer to accept on-site monitoring, the NRDC project was underway, raising the question whether Reagan was serious about arms control.⁸³

From the beginning of the project, Cochran sought to involve U.S. government officials. He regarded the NRDC "as an 'honest broker' to stimulate agreement between the U.S. and the Soviet Union."⁸⁴ Cochran consulted with various State Department officials before initiating the project. In particular, he had met with Deputy Secretary of State John C. Whitehead before the trip to Moscow and again after his return.⁸⁵ Whitehead remained skeptical about the use of private groups to conduct foreign policy initiatives, but noted that State had not decided how to respond to the NRDC initiative.

When DOD officials learned about the project it was too late to derail it. When Richard Perle, then Assistant Secretary of Defense, learned in press reports about the NRDC-Soviet Academy interaction, he was incredulous and called it "an absurd private excursion."⁸⁶ From his point of view, non-governmental groups had no business conducting such initiatives. He retaliated by preventing Soviet scientists to come to set up seismic stations in the United States.⁸⁷ Other DOD nuclear test supporters rejected the

⁸³ Tom Wicker, "A Dark New Identity," *New York Times*, 6 June 1986, sec. A31.

⁸⁴ NRDC, Nuclear Test Ban Verification Project, Status Report, November 1986, 2, NRDC files.

⁸⁵ "\$500,000 is Needed to Verify A-Tests"; Schrag, *Listening for the bomb*.

⁸⁶ David J. Lynch, "SALT Fallout Rains on Reagan," *Defense Week*, 9 June 1986, 8.

⁸⁷ See Schrag, *Listening for the Bomb*.

project as an NRDC publicity stunt and Soviet propaganda. For example, Frank J. Gaffney, Jr., a Deputy Assistant Secretary of Defense for Nuclear Forces and Arms Control Policy, defended the administration's nuclear testing policy and criticized the NRDC project in a widely cited conclusion: "We are under no illusion as to the mischievous and counterproductive purpose that Soviet authorities hope the NRDC experiment will serve: to confuse the domestic debate about the need for American nuclear testing and the reasons why we oppose the effort of the Soviet Union and others to promote an inequitable and unverifiable ban on nuclear testing."⁸⁸ In general, however, government officials treated the project in various ways, ranging from assistance (as in the case of the expedited export controls) to indifference to open hostility.⁸⁹ The media savvy NRDC essentially outplayed its critics in the DOD.

Cochran and others at NRDC were able to raise more than \$500,000 dollars in a matter of weeks, primarily from foundations such as Carnegie, Ford, and MacArthur. In addition, NRDC succeeded to get the necessary export licenses in a record time of four business days.⁹⁰ Besides fund raising and applying for permits, Cochran had to assemble a team of U.S. seismologists to set up the stations in Kazakhstan. He left the job of formulating a coherent seismic detection and research program to Charles Archambeau,

⁸⁸ Frank J. Gaffney, Jr., "Test Ban: The 'Quick Fix' Won't Work," *Washington Post*, 29 August 1986, sec. A 15. Gaffney's statement is cited for example in Edgar Ulsamer, "Nuclear Test Delusions," *Air Force Magazine* (October 1986), 16.

⁸⁹ Schrag, *Listening for the bomb*.

⁹⁰ For an analysis of why the Department of Commerce granted the export licences in an expedited way, see *ibid*.

an accomplished seismologist from the University of Colorado-Boulder, who had advised the DOD on nuclear test detection issues since the 1960s.⁹¹ In the 1970s Archambeau published articles in geophysical journals that highlighted new seismic detection techniques, and he became an outspoken test ban supporter.⁹² Archambeau took over the technical direction of the project and recruited James N. Brune and Jonathan Berger, two accomplished geophysicists from the Scripps Institution of Oceanography in La Jolla, California.⁹³ Brune was uniquely qualified since he had operated a network of portable seismic stations in the Soviet Union in cooperation with Soviet scientists from 1974 to 1980.⁹⁴ Berger, an instrumentation specialist, essentially ran the NRDC field operation, with the help of UNR and UCSD graduate students.⁹⁵ The participating Soviet geophysicists came from the Soviet Academy's Institute of Physics of the Earth (IPE) in

⁹¹ Charles Archambeau interview with Kai-Henrik Barth, Boulder, Colorado, June 18, 1998.

⁹² On Archambeau see Jeannine Malmsbury, "Surface Tension: Nuclear Verification no longer and underground issue," *Summit Magazine* (Winter 1987), 22-23.

⁹³ Both Brune and Berger worked at the Institute of Geophysics and Planetary Physics of the Scripps Institution of Oceanography at the University of California in San Diego. See Berger and Brune's research proposal from 10 June 1986 for "Seismic Studies of Nuclear Test Sites: Part I – Semipalantinsk", in which the two scientists apply for \$416,279. NRDC Box 1, folder 2 "Verification Project: Agreement and Draft Propos".

⁹⁴ Berger and Brune, *ibid.*

⁹⁵ Courtney Brenn, "Soviets in Reno to discuss data from nuke tests," *Reno Gazette-Journal*, 2 December 1987, 1.

Moscow, directed by Mikhail A. Sadovsky, who was one of the leading Soviet nuclear test detection experts.⁹⁶ Mikhail Gokhberg, IPE's deputy director, was responsible for the overall management, and Igor Nersesov, IPE's chief seismologist, headed the Soviet field team.⁹⁷

In early July the seismologists arrived in Moscow, but at that time they had no formal permission beyond Velikhov's word to install the stations. However, Velikhov's good relationship with Gorbachev and his ties to local party bosses paid off. In a meeting on July 3, 1986, in which Politburo members discussed the consequences of Chernobyl, Velikhov brought up the permission for the NRDC.⁹⁸ To his dismay, former ambassador to the U.S., Anatoly Dobrynin, and Central Committee member in charge of defense industries, Lev Zaikov, who had assured him of their support, voted against the NRDC plan and requested more discussion of this matter.⁹⁹ However, since the American

⁹⁶ On Sadovski, see Kai-Henrik Barth, "Detecting the Cold War: Seismology and Nuclear Weapons Testing, 1945-1970" (Ph.D. dissertation, University of Minnesota, July 2000), 136

⁹⁷ Cochran, "The NRDC/Soviet Academy of Sciences Joint Nuclear Test Ban Verification Project," 5.

⁹⁸ Velikhov interview. While Velikhov did not remember the exact date of the meeting, his description of the meeting's content fits the analysis given by Anatoly Chernyaev, Gorbachev's foreign policy adviser. See Anatoly Chernyaev, *My Six Years with Gorbachev*, translated and edited by Robert D. English and Elizabeth Tucker (University Park, PA: Pennsylvania State University Press, 2000), 66.

⁹⁹ Velikhov interview.

scientists were already in Moscow, Velikhov asked Gorbachev directly about what to do. Again, Gorbachev gave Velikhov the freedom to decide, and Velikhov essentially accepted responsibility for the project.¹⁰⁰ This unusual permission did earn Velikhov enemies, and he remembers that a Politburo member called him a traitor for allowing “U.S. intelligence equipment” close to the Soviet test site.¹⁰¹

As Michèle Flournoy has pointed out, the debate within the Soviet administration focused on the question whether the NRDC project would lead to an extension of the Soviet moratorium, and if NRDC scientists would be permitted to take data in case the Soviets returned to testing.¹⁰² In a memorandum signed by Cochran and Velikhov on July 5 both agreed “the recording of the tests of nuclear weapons is not necessary to the success of the joint research being undertaken.”¹⁰³ In addition, both sides limited the original agreement for the duration of one year. In other words, this additional memorandum addressed the two concerns expressed by critics in the Soviet government. After reaching agreement on July 5, the NRDC was allowed to continue to Kazakhstan.

¹⁰⁰ Velikhov interview

¹⁰¹ Velikhov interview.

¹⁰² Flournoy, 15

¹⁰³ Flournoy, 15

Americans in Kazakhstan

On July 9, 1986, Tom Cochran, James Brune, and their Soviet colleagues¹⁰⁴ flew in small biplanes to Karkaralinsk, Kazakhstan, about 1,800 miles southeast of Moscow. In the following weeks the NRDC team and their Soviet colleagues set up three seismic stations, each about 120 miles from the Soviet test site. They established the first station near Karkaralinsk, where the Americans stayed in trailers, nicknamed “Soviet Winnebagos.”¹⁰⁵ The other two stations, Bayanaul and Karasu, were operational by the end of August 1986 and recorded earthquake signals, which allowed a calibration of the geological setting.¹⁰⁶ This calibration in turn was necessary to determine the yield of nuclear explosions in this particular geological formation. With these measurements, NRDC and the Soviet Academy claimed to “[obtain] valuable information about the geological characteristics of the Soviet nuclear test site, data previously unavailable in the West.”¹⁰⁷ The seismic data seemed to confirm the geologic differences between the

¹⁰⁴ The Soviet team included Igor Nersesov, corresponding member of the Armenian Academy of Sciences, who was in charge of the experiment on the Soviet side; Mikhail Gokhberg, acting director of the Institute of Physics of the Earth of the Soviet Academy; and Institute of Physics of the Earth research associates Sergei Daragan, Oleg Stolyarov, Nikolai Tarassov, and E. Sutlov.

¹⁰⁵ Bob Guldin, “Glasnost prevails among pioneers of nuclear monitoring,” *Guardian*, 23 September 1987, 10-11. American and Soviet seismologists stayed in Shakhtyor, a small miners resort seven kilometers from Karkaralinsk.

¹⁰⁶ NRDC, Status Report, May 1987, 1

¹⁰⁷ NRDC, Nuclear Test Ban Verification Project, Status Report February 1987, 1

Nevada and the Semipalatinsk test sites, which led to very different seismic amplitudes for the same nuclear yields. As University of Nevada geophysicist Keith Priestley put it, “If two tests, one at Nevada and one at Semipalatinsk, are identical in size, the amplitude of the Kazakhstan test will show up twice as large.”¹⁰⁸

These results had direct consequences for the controversy about Soviet compliance with the 150 kiloton yield limit of the Threshold Test Ban Treaty. U.S. officials had charged that the Soviets had repeatedly violated the threshold and had tested weapons of higher yields, a violation with potential military significance. However, accusations of TTBT violations depended on the assumption that the geology around the Semipalatinsk test site was well enough understood to allow seismologists to determine the yield of a nuclear test based on the seismic waves generated by such an explosion. The NRDC measurements confirmed, as Tom Cochran pointed out that “preliminary analysis of our data, incidentally, is consistent with Soviet compliance [with the Threshold Test Ban Treaty].”¹⁰⁹

The scientists recorded seismic signals from small earthquakes and mining explosions at strip mine 25 kilometers from Karkaralinsk¹¹⁰ as well as signals from nuclear explosions at the Nevada Test Site, thousands of miles away. However, at first

¹⁰⁸ Keith Priestley, cited in Guldin, “Glasnost prevails among pioneers of nuclear monitoring,” 10-11.

¹⁰⁹ Tom Cochran, cited *ibid.*

¹¹⁰ Grigoryev, “U.S. Seismologists in Kazakhstan,” 2-3.

they did not record any Soviet nuclear tests, since the Soviet moratorium continued until February 26, 1987.¹¹¹

Why did the Soviets end the moratorium that had begun on August 6, 1985, the fortieth anniversary of Hiroshima? According to Soviet Foreign Ministry spokesman Gennady I. Gerasimov, speaking on ABC News, emphasized that Soviet nuclear tests would resume “because we waited, waited and waited, we waited for 560 days and 25 of your explosions. So our military people are saying to our politicians: ‘Look, we must do something because otherwise we’ll be behind.’ It’s that simple...”¹¹²

In a letter to Velikhov on January 23, 1987, Cochran wrote “I cannot overemphasis [sic] how disastrous it would be from a political point of view if we are required to turn off our equipment during a Soviet test.”¹¹³ He continued that

if we are not permitted to listen to tests the public perception will be that 1) the project won’t work; 2) the Soviet Union has something to hide; 3) the project was all a propaganda stunt; 4) now that you are resuming testing, it’s back to business as usual; and 5) the Soviets have given up on a [Comprehensive Test Ban] and are abandoning those of us who are continuing to fight in Congress this year for a moratorium on U.S. nuclear testing.¹¹⁴

¹¹¹ On Feb 5, 1987, the Soviets announced that the moratorium had officially ended, since the U.S. had continued to test.

¹¹² Gerasimov cited in “Soviets Confirm Move for Nuclear Tests,” *Los Angeles Times*, 23 February 1987, 5.

¹¹³ Cochran to Velikhov, January 23, 1987. NRDC files.

¹¹⁴ *Ibid.*

Cochran warned that essentially the credibility of perestroika was at stake: “It will be asserted by Administration officials and others that oppose a CTB that the Soviets were never really serious about verification and were merely using the American scientists.” He then appealed to his counterpart that “if we are not permitted to monitor tests, our chances of getting a moratorium adopted by Congress would be jeopardized.”¹¹⁵ And finally, he pointed out that future support from U.S. foundations and individuals was at stake. Cochran urged Velikhov to make arrangements so that Cochran and Archambeau “could meet with appropriate people in your government in Moscow on February 12 or 13 to discuss this issue further.” However, on February 21, 1987, Soviet officials ordered the NRDC instruments to be shut off. According to NRDC attorney Jacob Scherr, the scientists were told that they “had to stop work for three days and possible longer.”¹¹⁶ On February 26, the Soviet Union tested its first device since July 25, 1985.¹¹⁷

Cochran appealed directly to Gorbachev at a Kremlin reception for participants of the Moscow “International Forum For a Nuclear-Free World, For the Survival of Humanity” and met with former Soviet ambassador to the U.S., Anatoly Dobrynin, who

¹¹⁵ *Ibid.*

¹¹⁶ “Russia Planning Nuclear Test, U.S. Group Says,” *San Francisco Examiner*, 21 February 1987, 1

¹¹⁷ For information about the Soviet nuclear test program and a list of Soviet nuclear tests see Pavel Podvig, ed., *Russian Strategic Nuclear Forces* (Cambridge, Mass.: MIT Press, 2001), 439-566.

was now the Communist Party secretary for foreign affairs.¹¹⁸ Cochran was not successful. From February to April the Soviets exploded eleven nuclear devices and ordered the NRDC stations to be shut down a few days before each test or test series.¹¹⁹ This set-back destroyed hopes that NRDC would be allowed to measure a Soviet nuclear explosion yield at a close distance and disappointed U.S. participants.¹²⁰ In fact, the participating Soviet seismologists were not happy about this restriction, either, and they had to turn off their equipment as well.¹²¹ NRDC argued nevertheless “the scientific objectives of the Project are not compromised by this limitation, which we have, nonetheless, pressed Soviet officials to remove. The primary purpose of the Project is to demonstrate technology to verify the absence [emphasis in original] of nuclear tests.”¹²²

Despite this set-back, in June 1987 the NRDC signed a second agreement with the Soviet Academy, extending the project for another 14 months. This agreement determined that the three stations in Kazakhstan would operate until December 1987 and

¹¹⁸ Bill Keller, “Soviet Advance Notice of A-Blast Likely,” *New York Times*, 22 February 1987, sec. A 20.

¹¹⁹ NRCD received orders on February 21, March 9, March 25, and April 12, 1987. See Warren Strobel and James M. Dorsey, “Soviets expected to conduct nuclear test by end of week,” *Washington Times*, 15 April 1987, sec. XX. The Soviets conducted tests at Semipalatinsk on February 26, March 12, April 3, and April 17. See Podvig, ed., *Russian Strategic Nuclear Forces*, 558-559.

¹²⁰ S. Jacob Scherr, “Karkaralinsk diary,” *The Amicus Journal* (Spring 1987), 4-7.

¹²¹ Guldin, “Glasnost prevails among pioneers of nuclear monitoring,” 10-11.

¹²² NRDC, Status Report May 1987, 1

then relocated to greater distances from Semipalatinsk (from 150 miles to 600 miles). After the relocation the stations were permitted to record Soviet nuclear tests, beginning in 1988. Subsequently, on February 6, 1988, American scientists took their first measurements of Soviet nuclear tests on Soviet soil with US made seismic instruments.

The NRDC experience in Kazakhstan highlighted that Soviet officials were divided in their views about the project: while the Soviet Academy and in particular Velikhov regarded the project as a unique chance to put pressure on the Reagan administration, opponents of glasnost in the military objected and emphasized security concerns. While Gorbachev and Velikhov won the battle and made the implementation of American stations possible, hardliners erected road blocks where they could. For example, Soviet officials would not release the exact coordinates of the three monitoring stations to the Americans, which the U.S. seismologists needed to accurately measure seismic wave properties from the test site.¹²³ Again, as in the case of equipment shut down during actual nuclear tests, security precautions won over glasnost.

Soviets in Nevada

Restrictions placed on NRDC scientists in the Soviet Union were minor compared to what awaited Soviet Academy scientists in the United States. The NRDC-Soviet Academy agreement was reciprocal, and both sides understood that Soviet scientists would set up similar seismic monitoring stations in the United States as well. Despite significant opposition from within the U.S. administration a Soviet delegation of scientists made it to Nevada, and they eventually established monitoring sites around the

¹²³ Guldin, "Glasnost prevails among pioneers of nuclear monitoring," 10-11.

Nevada Test Site. Philip G. Schrag has analyzed in detail how the bureaucratic fights within the U.S. administration, especially between officials in the Department of Defense and the State Department, led to significant delays in the granting of visas, permits, and licenses for the Soviets and their equipment.¹²⁴ Decision often depended on second or third tier agency officials who had the power to expedite, hinder, or simply ignore NRDC's requests for visas, permits, and licenses necessary to establish the Soviet stations. Here I am not concerned with the reasons for these delays, but with the actual establishment of Soviet monitoring stations on U.S. soil and the collaborative effort of the transnational group of scientists.

In November 1986, seismologists from the Institute of the Physics of the Earth of the Soviet Academy were scheduled to arrive in the United States to select sites for monitoring stations around the Nevada Test Site. The Soviets arrived in the U.S. but visa restrictions prevented them from visiting potential monitoring sites. However, NRDC circumvented this roadblock by providing the Soviets with data and rock samples from these sites. The Reagan administration placed unusual restrictions on the visas for the Soviet scientists: they could choose between two options; first, observe a nuclear test at Nevada and a demonstration of a new nuclear yield measurement favored by the Reagan administration, and be allowed to go to the potential test sites; or second, be restricted to a visit to Scripps Institution, but receive no permission to visit potential monitoring sites. As the NRDC pointed out, "In effect, the Administration is trying to compel the Soviets to accept their top agenda item on nuclear testing, which involves an agreement on

¹²⁴ Schrag, *Listening for the bomb*.

improved verification as a basis for ratification of the 1974 Threshold Test Ban Treaty....” The Soviets rejected the choice and did not come in November 1986.¹²⁵

In October 1987, scientists from the University of Nevada at Reno and the Scripps Institution of Oceanography began to install state-of-the-art seismic equipment for the Soviet monitoring stations. The three stations were located in the remote, “dry, boulder-strewn foothills of the Last Chance Range” near Deep Springs Valley, California, and two equally remote places in Nevada, at Nelson Valley south of Las Vegas, and Railroad Valley, 150 miles east of Tonopah.¹²⁶ In early December 1987 four Soviet scientists arrived in Reno, Nevada, greeted by 30 cheering peace activists. Felix Tregub, Mikhail Gokhberg, Nicolai Yukhnin, and Igor Nersesov met with seismologists Keith Priestley and James Brune of the University of Nevada-Reno to discuss the seismic data from U.S. stations in Kazakhstan and the Soviet stations in Nevada and California.¹²⁷ However, the Soviets were still not permitted to visit the monitoring sites. By January 1988 the permanent stations were operational, and in April the Soviet seismologists detonated three chemical explosions to measure the propagation and attenuation of seismic signals

¹²⁵ NRDC, Status Report November 1986, 3

¹²⁶ Kristine Moe, “Scripps scientists install devices to monitor U.S. N-tests for Soviets,” *The San Diego Union*, 20 October 1987, sec. A-3. For the Nevada stations see Courtney Brenn, “Soviets in Reno to discuss data from nuke tests,” *Reno Gazette-Journal*, 2 December 1987, 1.

¹²⁷ Brenn, “Soviets in Reno to discuss data from nuke tests,” 1.

in the vicinity of the Nevada Test Site.¹²⁸ These measurements demonstrated that the attenuation near the NTS was significantly larger than the attenuation near Semipalatinsk, an important result to counter charges of Soviet Threshold Treaty violations.

Overall, the Reagan administration placed visa restrictions on the Soviet scientists and prevented them for months from visiting the NRDC-Soviet Academy stations in California and Nevada. This led to the paradoxical situation that American scientists had greater degrees of freedom traveling in the Soviet Union than Soviet scientists traveling in the United States.

Epilog: Scientists as Transnational Arms Control Advocates

NRDC was active in the seismic verification business only from May 1986 to April 1989. Cochran and his colleagues never intended to become seismic monitoring specialists. Rather, they wanted to change the test ban debate and then hand over the stations to another agency. Ultimately, the five new stations in the Soviet Union continued to operate as part of a world-wide seismic detection network managed by the Incorporated Research Institutions for Seismology (IRIS), a non-governmental consortium of research universities. The Moscow Institute of Physics of the Earth owned the stations and operated them together with Scripps Institution.¹²⁹ While Cochran and

¹²⁸ NRDC, Update September 1988, 2. The explosions included two 10 ton and one 14 ton chemical explosion. Cochran, NRDC/Soviet Academy of Sciences, Nuclear Test Ban Verification Project. NRDC Box 1 folder 3, 1.

¹²⁹ Cochran, NRDC/Soviet Academy of Sciences, Nuclear Test Ban Verification Project. NRDC Box 1 folder 3, 2.

his group left the seismology project in 1989, they continued, often in collaboration with Velikhov, to conduct equally provocative scientific-political experiments, including unprecedented nuclear warhead detection measurements on a Soviet destroyer¹³⁰ and the surprising permission to visit one of the most secret Soviet installations, the Krasnojarsk radar.¹³¹

The NRDC project accomplished what US governments had attempted since President Eisenhower: to put American scientists on Soviet soil to monitor Soviet explosions and to gain data of the particular geological environment of the test site. These data were useful in determining if the Soviets had, in fact, violated the TTBT, as the Reagan administration had alleged. To get seismic data from a Soviet nuclear test area was unprecedented.

Returning to the original question that motivated this study: why were non-governmental scientists successful in shaping Soviet foreign policy? What kind of factors contributed to their success? Arguably the most important reason for the scientists' success was the structure of Soviet society and the emergence of a new leader, who was willing to listen to new ideas. As Matthew Evangelista has shown, access to Gorbachev turned out to be the way to shape Soviet foreign policy. Velikhov worked directly with Gorbachev in the early years of his restructuring of the Soviet political

¹³⁰ See Steve Fetter et al., "Gamma-Ray Measurements of a Soviet Cruise-Missile Warhead," *Science* 248 (18 May 1990),

¹³¹ On the Krasnojarsk radar visit see William J. Broad, "Inside a Key Russian Radar Site: Tour Raises Questions on Treaty," *New York Times*, 7 September 1987; Evangelista, *Unarmed forces*, 325-328.

system. He accompanied him as advisers to a number of summit meetings with President Reagan. When political professionals began to restrict access to Gorbachev about 1987 and Velikhov's influence receded, the window of opportunity closed.

Domestic structure, however, is a necessary factor, not a sufficient one. Other factors played a significant role as well. I argue that we have to understand the communication strategies of the scientists who sought to decrease the risk of nuclear war by opening backchannel communications with their counterparts. The point of this paper is that we find a whole spectrum of approaches among the scientists. Both Cochran and Velikhov were at heart political players with a keen sense of timing, masters of public relations, and pragmatists. Both were driven by concerns about the dangers of an extended nuclear arms race.

Returning to the paper's core question: why were these scientists able to reduce the dangers of nuclear war, where diplomats had failed for so long? Did scientists succeed because they found a common language that transcended national and ideological boundaries? I argue that while certainly scientists from East and West discovered similarities in outlook and approach to international affairs, it was this particular subset of non-governmental scientists that shared the belief in the responsibility of scientists and the desirability and technical capability of technical solutions to arms control problems. However, I also argue that the most significant factor for the scientists' success was the collaboration of activist-minded scientists such as Cochran and Velikhov with scientists such as von Hippel and Archambeau who shared the belief in the necessity of nuclear arms control and the responsibility of scientists. Cochran had a brilliant idea and the

stamina to pull it through, but of course he depended on the scientific expertise of geophysicists such as Charles Archambeau and Jonathan Berger and Jim Brune.

In other words, it is obviously not sufficient to be a well-trained scientist to establish successful transnational links to shape policy outcomes. It took a combination of factors, including the particular Soviet domestic structure; the existence of a large peace movement in Europe and the Freeze movement in the United States; the Gorbachev factor; the existence of a generation of professional full-time public interest physicists such as von Hippel and Cochran; and finally the media savvy scientists, who had become political players such as Velikhov.

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