A Common Language of the Earth:
American-Soviet Scientific Collaborations during the Cold War

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Abstract

Historians have characterized Cold War American-Soviet scientific projects as venues for top-down ideological warfare and as scientifically inefficient collaborations stunted by strict official control. This dissertation rewrites this history from the bottom up. It traces the development of the U.S.-U.S.S.R. scientific dialogue from limited and regimented inter-academy exchanges in the 1950s to highly productive collaborations between American and Soviet earth scientists in the 1970s and 1980s. Novel Russian and American sources reveal that the explanation for productivity of these bilateral projects lies with energy and commitment of participants, mostly mid-level professionals, as they overcame ideological and cultural barriers.

As earth sciences came to the forefront of research in the post-WWII world, a vibrant channel of communication opened between American and Soviet climatologists, geologists, and geophysicists. A professional, cultural, and personal experience for participants, collaboration in working groups became their way of developing joint expertise. Climate change, earthquake prediction, environmental hazards, and nuclear test verification took mid-level scientists to the field, lab, and symposia in both countries. The knowledge they shared and created contributed to scientific understanding of environmental issues and policy changes of the late twentieth century and their cultural rapprochement to bridging the Cold War gap between the American and Soviet (and post-Soviet) scientific communities.

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List of Abbreviations

ABM – Anti-Ballistic Missile Treaty

ACLS – American Council of Learned Societies

AS USSR or, informally, SAS – Academy of Sciences of the Union of Soviet Socialist Republics or Soviet Academy of Sciences

CFEP – (Agreement on) Cooperation in the Field of Environmental Protection

CEQ – Council on Environmental Quality

CIA – Central Intelligence Agency

EPA – Environmental Protection Agency

Gidromet – Soviet Hydrometeorological Service

IIASA – International Institute for Applied Systems Analysis

IPE – Institute of Physics of the Earth

IRIS – Incorporated Research Institutions for Seismology

JOIDES – Joint Oceanographic Institutions for Deep Earth Sampling

KGB – *Komitet Gosudarstvennoy Bezopasnosti* (Committee for State Security)

LANDSAT – Land Remote Sensing Satellite

NAS – National Academy of Sciences

NASA – National Air and Space Administration

NOAA – National Oceanic and Atmospheric Administration

NRC – National Research Council

NSF – National Science Foundation

POLYMODE – U.S.-U.S.S.R. Mid-Ocean Dynamics Experiment

SALT – Strategic Arms Limitation Treaty

TOMS – Total Ozone Mapping Spectrometer

U.S. – United States

USGS – United States Geological Survey

U.S.S.R. – Union of Soviet Socialist Republics

WG (I-XI) – Working Group (of the CFEP agreement)

WHO – World Health Organization

WWII – World War II

Introduction

They exchanged Christmas cards, learned each other's languages, endured harsh working conditions in the field, stood up for their joint work, and bonded over families, sports, music and literature. Yet many historians (and commentators at the time) have portrayed them as enemies with a "wall" between them, the Iron Curtain. This dissertation explores the dramatic development of American-Soviet scientific exchanges after the second World War and collaboration in earth sciences in the 1970s and 1980s as they were shaped by Cold War politics, international science, bureaucratic challenges, security issues, and cultural differences. The project traces the institutional, cultural, and informal individual dynamics of scientific exchanges.

This dissertation establishes that, in parallel with the multifaceted and fierce Cold War competition between the United States and the Soviet Union in politics, science, and technology, there were exchanges and collaborations that transcended political manipulations, science diplomacy bounds, and cultural barriers. In the peculiar circumstances of Cold War tensions, the international practices of earth sciences were challenged by top-down political directives to minimize or cease Eastern-Western bloc collaboration. But equally powerful were a myriad of initiatives for collaboration, which flourished in the Soviet-American scientific relationship perhaps more than between any other two countries from the opposite sides of the Cold War competition. These collaborations shaped the scientists who participated in them, personally and culturally and, also, scientifically. How did scientists themselves work within and actively shape U.S.-Soviet government-sanctioned communication? How did they overcome political

obstacles? How did they collaborate despite different modes of scientific training and practice, and very different cultural backgrounds?

These questions arose from a body of scholarship in political and diplomatic history, Cold War history, history of science, environmental history, and cultural studies. Some historians (for example, Jacob Hamblin, Simone Turchetti, and Olga Nagornaya) argue for competition in science and technology during the Cold War, for intellectual disconnect and lack of communication between these scientific communities, Soviet scientific inferiority, and attempts at using science and science diplomacy for political and economic gain. The sources analyzed in this dissertation suggest that the competition and opposition do not account for everything in the progression of this scientific dialogue. Competing was a powerful motivation but not the only one. I draw on the work of historians who have recently begun to explore Soviet interactions with global science and collaboration between them and Western colleagues highlighting the Soviets' contributions. These studies, which require fluency in multiple languages, are turning our understanding of Cold War scientific history into a more nuanced analysis of the intellectual, cultural and social lives of scientists in the Soviet and American systems. Elena Aronova has explored the professional lives of Soviet earth scientists. Jonathan Oldfield and his co-authors and Julia Lajus and her colleagues have commented extensively on Soviet environmental thought and involvement of Soviet scientists in international discussions of the global warming and climate change during the Cold War. They point out the originality of Soviet research and the degree of independence that the earth sciences enjoyed in the Soviet Union. My research builds on these historians' work

by closely analyzing the spaces *between* Soviet and American science, and how earth scientists created shared experiences and language to enable collaboration.

This dissertation is not a political history, nor is it an attempt to rewrite the Cold War history of science. It is an exploration of interdependences and mutual influences of political environments and scientists as representatives of their nations, fields, institutions, and cultures. The concepts of "porous empires" and a "penetrable Iron Curtain" have been quite popular recently with scholars who explore cultural exchanges and other interactions between professional groups, tourists, and individuals from the eastern and the western blocs during the Cold War.[1] Building on these concepts, I argue that U.S.-Soviet government-sanctioned communication was shaped and actively used by scientists. To do this, I follow the people in my research as much, if not more, than documents and ideas. Through oral interviews and online communication (especially during the "pandemic" year of 2020 and 2021), sharing documents from home archives, photographs, drawings, correspondence with family members, poems, private jokes, and personal anecdotes, the participants of these collaboration gave this story the dimension it lacked—the perspective of mid-level practitioners of the earth sciences who were engaged on the ground in collaborations. It is part of their personal journeys and the history of their disciplines as well as new pages in the book of Cold War history.

Structure. The narrative proceeds chronologically from the broader context of post-WWII U.S-Soviet scientific dialogue beginning in the late 1950s to a shift toward

[1] Sari Autio-Sarasmo and Brendan Humphreys, eds., *Winter Kept Us Warm: Cold War Interactions Reconsidered* (Helsinki: Aleksanteri Institute, 2010); Simo Mikkonen and Pia Koivunen, *Beyond the Divide: Entangled Histories of Cold War Europe* (New York, London: Berghahn, 2015); Alex Hazanov, "Porous Empire: Foreign Visitors and the Post-Stalin Soviet State." (PhD diss.: University of Pennsylvania, 2016).

cooperation in the early 1970s and zooms in on collaboration projects in earth and environmental sciences in the 1970s and 1980s as case studies. Chapter one analyzes the U.S.-Soviet program of scientific exchanges under the Lacy-Zaroubin cultural exchange agreement of 1958. This agreement came as the first post-WWII official initiative to break the cultural boycott between the United States and the Soviet Union. It gave the National Academy of Sciences (NAS) and the Academy of Sciences of the U.S.S.R. (AS U.S.S.R. or SAS) the challenging task of bringing experts together despite rampant political controversies and ideological and bureaucratic pressures. The launch and structure of the formal Agreement on Cooperation in the Field of Environmental Protection (CFEP) and an overview of its projects are the focus of chapter two. Moving from the perspective of top-level politicians and scientific advisers into the world of mid-level scientific practitioners, chapters three and four analyze the histories of two working groups under the CFEP agreement in the 1970s and 1980s. The goal is to gain a deeper understanding of how the agency of the scientists themselves factors into international scientific collaboration. These chapters demonstrate how individual contacts, interpersonal relationships, and cross-cultural communication established and maintained professional ties and enabled the co-production of knowledge.

Primary sources. Primary evidence for this project comes from three kinds of sources: the archive, the brochure, and the memory. The search for relevant archival sources was a fascinating educational exercise in institutional history. Systematization of records reflects the differences in institutional structures. In Russia, all research institutions and facilities that belong to the Academy of Sciences deposit their records to the Russian Academy of Sciences Archives. This centralized repository became the

largest source of archival data on the Soviet segments of exchanges and collaboration. The Russian Hydrometeorological Survey, however, is not part of the Academy. I managed to find some of its records on site at a facility of interest, at the discretion of its employees.

In the United States, the National Academy archives its own records, and the rest is preserved in individual academic institutions' archives on various campuses. Government bodies such as the Environmental Protection Agency (EPA) and the United States Geological Survey (USGS) submit their papers to the National Archives. Grey literature (reports, brochures, diaries of events, drafts, testimonials, and government documents) was another important source of evidence. I came across some of them in the archives and libraries, and scientists whom I interviewed generously shared them with me as well.

This project relies heavily on interviews with scientists who participated in these collaborations over the years. This dissertation foregrounds the voices of ordinary mid-level American and Russian scientists, making an effort to provide equal representation from both sides. This turned out to be more challenging than anticipated. Twenty-three American participants readily agreed to interviews and generously shared their memories, scientific expertise, and materials. During interviews, there was very little information they chose to withhold. Very few declined the interview. One United States Geological Survey researcher declined, giving the reasons that his participation was insignificant and because "having had several agonizing interviews with journalists trying to stir up fights and hard feelings, I am now allergic to any kind of interview."[2]

[2] Email correspondence, February 2019. If I disclosed this person's name, his aversion to interviews would become quite understandable.

Eleven Russian participants were willing to be interviewed and to share documents, photos, and other material evidence. Several people who played crucial roles in these projects were deceased, and their personal papers either did not survive or were never deposited to an archive. Those who are still professionally active have often been reluctant to communicate with me. Under pretexts such as being out of town or extremely busy with work, they would either agree to answer questions "if they are very short" and send written responses via email or divert me to a colleague who "knew much more about this" (even when my only question was "how were you personally involved in this project?").

Part of the explanation for the imbalance in responses is in the different meanings and challenges of this collaboration for the American team and the Soviet one. Speaking the same scientific language, they still came from two drastically different cultures. This did not merely imply the ideological differences between the capitalist United States and the socialist Soviet Union but deeper cultures of morals and manners, communicating ideas, expressing emotions, making plans, all of which are integral to continuous human interaction. Basic shared standards of scientific practice provided mutual understanding and foundations for joint work, yet each team had expectations and faced challenges specific to their own environment. Their perceptions of experiences also differed. For some American participants, projects with Soviets were career milestones, a matter of pride, and a source of positive memories. For Soviet participants, working with Americans could be a stressful experience. They had to jump through many bureaucratic hoops for joint work; had to carefully interact with the "competent authorities" (a colloquial term for the KGB and GRU); and many had difficulty communicating in

English.[3] Soviet geophysicists could not fully ignore the system. They had to make professional choices that some of them were questioned about or even came to regret.[4] It was not so much a worry that their science would not be as good but the challenge of communicating it spontaneously in a system with potentially severe consequences.[5] Sharing stories of their past now, after the drastic change their lives underwent with the dissolution of the Soviet Union in the 1990s, may have its own challenges connected with the sense of loss. The processing of Soviet memories in post-Soviet times is only beginning to be explored in history, cultural and memory studies, anthropology, and sociology, but it is already painfully clear how complex and fraught with tangled emotions this issue is. Therefore, going back to those memories in interviews may not be as comfortable for Russian geophysicists as it is for their American colleagues.[6]

To make up for the deficit of Russian oral sources, I turned to published and unpublished memoirs of Soviet scientists, even those outside the immediate circle of

[3] KGB – Committee of State Security, GRU – Central Intelligence Directorate.
[4] Vyacheslav Martynov, interview by author, March 2019.
[5] "Spontaneous" here is a linguistic category meaning unrehearsed speech generated in real time as opposed to manufactured (prepared, rehearsed, or written in advance) discourse.
[6] Processing controversial or traumatic historical memories as an issue is not unique to the former Soviet Union and is generally associated with deep emotional responses. Svetlana Boym, *Common Places: Mythologies of Everyday Life in Russia* (Cambridge, MS, and London: Harvard University Press, 1994), Alexander Etkind, *Warped Mourning: Stories of the Undead in the Land of the Unburied (Cultural Memory in the Present)* (Stanford: Stanford University Press, 2013); Nikolay Epple, *Neudobnoye Proshloye: Pamyat o Gosudarstvennyh Prestupleniah v Rossii I Drugih Stranah* [An inconvenient past: memory of the state crimes in Russia and other countries] (Moscow: Novoye Literaturnoye Obozrenie, 2020).

CFEP participants.[7] With the focus on individual scientists, it is helpful to draw on their views and impressions, which I did using memoirs, photographs, unpublished reminiscences, articles in popular magazines, emails, websites—anything that would carry their own opinions in their own words. In both groups—American and Russian scientists—I had the privilege of communicating directly and through written sources with perceptive, analytically-minded, prescient intellectuals. Historians have been cautioned against putting trust in Soviet memoirs and biographies as historical documents. However, they can be rich and enlightening cultural sources when read by a historian with an understanding of the culture and context in which they were written.[8]

In our case, one may argue, memoirs and memories are bound to be clouded by scientists' unawareness of political plans to use them as diplomacy tools or for covert intelligence operations. To address this concern, I would like to emphasize the awareness among collaborators of political puppetry and hidden agendas. "We were no fools," the American geologist Bob Hamilton told me. "When the first group of three people from the Soviet Union came to the U.S. in 1973, we talked to them and saw that they were real scientists, not government hacks they sent abroad." In the late 1980s, the American side of Area IX was funded by the U.S. Department of Defense, and involved scientists knew

[7] In a recent paper on early Cold War science diplomacy, fellow historians from Denmark, Germany, and Russia noted: "Given that science diplomacy often works outside official diplomatic channels and, as in our case, merges with or is even camouflaged as circulation of scientific technologies, most sources were found outside foreign policy files. Yet, we hope our study encourages other historians to look at the history of Cold War science diplomacy from more nuanced perspectives that include not only the political powers, but also individual scientists and material objects." I wholeheartedly agree with these colleagues. Lif Lund Jacobsen, Irina Fedorova, and Julia Lajus, "The Seismograph as a Diplomatic Object: The Soviet–American Exchange of Instruments, 1958–1964," *Centaurus* 63 (2021): 292.

[8] Barbara Walker, "On Reading Soviet Memoirs: A History of the "Contemporaries" Genre as an Institution of Russian Intelligentsia Culture from the 1790s to the 1970s," *Russian Review* 59 (2000): 327-329.

it. On the Soviet side, seismology was always closely tied into military affairs and defense research. [9] There were no illusions among participants on either side about possible, or rather inevitable defense concerns and political interference. One of the motivations for these scientists was to overcome these concerns and barriers–to see if the work could be done despite political influences.

Methodology. The research interests of two historians who gave me the most valuable methodological tools lie far from the Cold War. Robert Darnton's work taught me to differentiate between ideology, official discourse, and actors' views. They are invariably present in any historical moment, partially overlap, and are important to investigate. Darnton's investigation of the agency of French peasants and artisans was also inspiring as a history from below, the approach I envisioned for this project.[10] I also took inspiration from Deborah Harkness, who detailed the fusion of collaboration and competition in Elizabethan London's scientific communities, which I found very relevant for the case of Cold War scientists. Harkness argued for an anthropological approach to historical actors, to achieve an understanding of their motivations as individuals and as groups of like-minded people. She successfully applied it to "interview" seventeenth-century actors, and they spoke to her. This gave me confidence to apply it to live twentieth-century actors, whom I interviewed in person or with whom I communicated

[9] Robert M. Hamilton, interview by author, June 2021; Report to the Chairmen, House and Senate Committees "Defense Research: Funding of the U.S./U.S.S.R. Joint Seismic Program," National Security and International Affairs Division B-244615, United States General Accounting Office (Washington, D.C.: United States General Accounting Office, 1991); Charles Archambeau, interview by Kai-Henrik Barth, July 24, 1998, AIP, www.aip.org/history-programs/niels-bohr-library/oral-histories/5899; David W. Simpson, interview by author, August 2018; A.P. Vasiliev, "Atomny Proekt SSSR i Razvitie Otechetsvennoy Geofiziki" [The U.S.S.R. atomic project and the development of Soviet geophysics], *Istoriya Nauk o Zemle* 2, no. 3 (2009): 20-33.

[10] Robert Darnton, Introduction to The Great Cat Massacre and Other Episodes in French Cultural History (New York, Basic Books, 1984): 3-7.

online. I echo Harkness's caution that we are historians, not anthropologists; and I do not claim to practice anthropology in this dissertation.[11] The "anthropological approach" in my case means an attempt to gain insight into mid-level scientists' professional lives through understanding them as humans: representatives of their generation, intellectual circles, national cultures, and individual personalities.

These scientists are a group that ***lived*** the history of the agreement on cooperation in the field of environmental protection. At the same time, this work influenced many of their lives and work. Their private knowledge and human experiences are woven into the history of Cold War American-Soviet scientific relations in a very meaningful way, making them the group that has multidimensional expertise on this history—as witnesses, creators, and executors of a rapprochement endeavor in diplomacy, science, and human interaction. I see the goal of this dissertation as bringing together evidence from actor groups and social strata and exploring their interactions, to understand how the American-Soviet scientific exchanges and collaboration came about and developed over time, continuously redefined by the participating scientists.

[11] Deborah E. Harkness, Coda to *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven and London: Yale University Press, 2007), 254-260.

CHAPTER 1
Establishing bilateral contacts

Introduction. "The Focus is on People"[12]

In December of 1960 Professor Herbert Stanford Isbin of the University of Minnesota's Department of Chemical Engineering received a letter from a young man in the Soviet Union. The letter read: "Dear Mr. Isbin! Thank you very much for the miniature transformers you so kindly sent us and for all that great assistance you rendered to my father while getting the radio components. <…> I look forward to meeting you in Moscow someday soon."[13] The occasion for this display of appreciation was that the young man's father, academician Viktor Spitsyn, had visited the United States earlier in 1960 within the nascent program of U.S.-U.S.S.R. scientific exchanges. Spitsyn, the Director of the Institute of Physical Chemistry in Moscow, was among the first Soviet academic delegates to the US. While visiting the University of Minnesota, he was hosted by Isbin, and the two scientists developed a personal connection.[14] In an informal conversation they talked about their families, and at some point Spitsyn asked Isbin for assistance with purchasing spare parts for a miniature radio his son was building.

This chapter is an introduction to the history of state-sanctioned Soviet-American scientific communication during the Cold War. It tells the story of an exchange program

[12] Yale Richmond, "Academic and Cultural Exchanges," in *U.S.-Soviet Cooperation: A New Future*, ed. Nish Jamgotch Jr. (New York: Praeger, 1989), 11.
[13] Alexey Spitsyn to Herbert Isbin, 23 December 1960, box 1, collection 1246, Herbert Isbin Papers, University of Minnesota Archives (hereafter cited as UMN).
All identification categories were not uniformly available for collections discussed in this dissertation. The citations are given based on how records are organized and catalogued in each archive and collection. The structure of the cataloguing system for each repository and the order of search for materials are preserved to facilitate verification.
[14] Viktor Spitsyn to Isbin, 26 June 1968, box 1, collection 1246, Herbert Isbin Papers, UMN.

among three influential institutions in their fields, the Academy of Sciences of the U.S.S.R. (AS U.S.S.R), the National Academy of Sciences of the United States (NAS), and the American Council of Learned Societies (ACLS). The focus here, however, is not on institutional history. It is on how these institutions and individual participants of the exchanges found ways to communicate across the Cold War divide. This program began at the height of the Cold War against many odds and spanned four decades. Cultural differences, bureaucratic obstacles, and political and ideological controversies challenged this program in its "learning years," 1958-1971. Despite "fractious and frustrating negotiations" and "persistent problems," the scientific exchange program managed to create a stable channel of communication between American and Soviet scientists.[15] This foundational period, which historians have not yet discussed in detail, paved the way for American-Soviet scientific collaborations discussed in later chapters of this dissertation.

The significance of the letter from a Soviet teenager to an American academic is in the cultural aspect of this bilateral program, in informal connections, and gradual deepening of mutual understanding. The most functional operative approach to understanding the historical complexity and, at times, incongruity of their relationships, motivations, and accomplishments is two-fold. Embracing Audra Wolfe's recent suggestion to step away from the "black-and-white approach [that] merely reproduces the same ideological divisions that drove the Cold War in the first place" opens the floor to interpretations other than scientific, political, economic, or social superiority, ulterior Cold War motives, or the lens of cultural diplomacy.[16] At the same time, representing

[15] Richmond, "Academic and Cultural Exchanges," 16.
[16] Audra J. Wolfe, *Freedom's Laboratory: The Cold War Struggle for the Soul of Science* (Baltimore: Johns Hopkins University Press, 2018), 15.

both cultures and communities involved in the U.S.-U.S.S.R. scientific relationship appears a worthwhile solution to the problem of understanding a two-sided history of finding ways to communicate.

Section 1. Seal of approval

The U.S.-U.S.S.R. agreement on cultural, technical, and educational exchanges was a breakthrough in the diplomatic stalemate between the two countries after the death of Josef Stalin and the relaxation of McCarthyism. Signed on 27 January 1958 and popularly dubbed the "Lacy-Zaroubin agreement" after the principal negotiators and signatories, it was the first post-WWII bilateral accord between the United States and the Soviet Union.[17] The agreement required significant policy concessions from both governments and generated high hopes for successful communication between the two cultures while masking many grave suspicions and concerns over hidden agendas and propaganda goals of both sides.[18] It also initiated the U.S.-U.S.S.R. scientific exchanges which, in their turn, provided a foundation for earth science and other academic collaboration in the later détente years that this dissertation investigates. Rather than recounting the diplomatic history of the Lacy-Zaroubin agreement that has been well documented in scholarship, this chapter traces the history of its scientific exchange section through responses of the scientific communities to the agreements' tasks and

[17] The transliteration of Grigori Zaroubin's name is retained here as it appeared on the original agreement in 1958. Contemporary scholarship has shifted to simplified standard transliteration, "Zarubin".

[18] On the diplomatic steps that were taken on the governmental level to allow for the Lacy-Zaroubin agreement, contributions of the negotiators, and the aspirations behind it, see opening pages of chapter 6 in Walter L. Hixson, *Parting the Curtain: Propaganda, Culture, and the Cold War, 1945-1961* (New York: St. Martin's Press, 1997), 151-155.

challenges and the dynamics of the cultural climate it established between American and Soviet scientists.

Symbolically speaking, as some historians argue, the Lacy-Zaroubin agreement ushered in an era of direct real-life cultural communication between the U.S. and the U.S.S.R. and has been rightfully praised in primary sources and scholarly literature as the "agreement that shattered the Iron Curtain."[19] It opened doors for large-scale artistic exchanges that were thoroughly enjoyed by audiences in both countries. Such events gave people a taste of Soviet and American cultural riches and a sense of connecting to the other nation's way of expressing emotions, interpreting classics, and communicating ideas and skills through art.[20] The cinematic exchange provided an opportunity for the Soviet film industry to enter the post-WWII global film market.[21] Agricultural exchanges under the agreement were a helpful rekindling of Russo-American dialogue over the American business-like model of farming that had been adopted in Soviet Russia in the

[19] Norman E. Saul, "The Program that Shattered the Iron Curtain: The Lacy-Zarubin (Eisenhower-Khrushchev) Agreement of January 1958," in *New Perspectives on Russian-American Relations,* ed. William Benton Whisenhunt and Norman E. Saul (New York: Routledge, 2016): 229-239; Hixson, *Parting the Curtain,* 153.

[20] On the exchange under section VIII of the Lacy-Zaroubin agreement, "Exchange of Theatrical, Choral, and Choreographic Groups, Symphony Orchestras and Artistic Performers" and an overview of the ideological controversies in performing arts and the official rhetoric of the United States and the Soviet Union for pursuing them, see Cadra Peterson McDaniel, *American-Soviet Cultural Diplomacy: The Bolshoy Ballet's American Premiere* (Lanham: Lexington Books, 2015).

[21] Andrei Kozovoi, "A Foot in the Door: The Lacy–Zarubin Agreement and Soviet-American Film Diplomacy during the Khrushchev Era, 1953–1963," *Historical Journal of Film, Radio and Television* 36, no. 1 (2016): 21-39.

1920s and might have contributed to Premier Khrushchev's agricultural policies in the 1960s.[22]

Pragmatically, the particulars of the preceding U.S.-U.S.S.R. attempts at communicating over the West-East divide showed the usefulness of a top-down governmental initiative in the age of distrust for bottom-up action in a scientific community. However, American and Russian historians hold a skeptical view of the U.S.-U.S.S.R. cultural exchange program, seeing it as a Cold War ploy, mostly on the part of the Soviet authorities and the Communist Party, to convert the adversary nation to their ideology, expose the flaws of their society, and pilfer it for innovation and technology.[23]

Both points of view of historians are well argued and supported with historical data. To paint a more nuanced picture of the cultural exchange program, this chapter argues that while the larger set of programs under the Lacy-Zaroubin agreement undeniably

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[22] For a contemporary overview of the program from the congressional perspective, see Helen B. Shaffer, "Cultural Exchanges with Soviet Russia," in *Editorial Research Reports 1959*, vol. II (Washington, D.C.: CQ Press, 1959), 493-511. On agricultural exchanges before WWII, see Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), 157-187; and under the Lacy-Zaroubin agreement, "Exchange of Agricultural Observers," *Science* 127, no. 3313 (Jun. 27, 1958): 1489-1490.

[23] As examples of this viewpoint of historians, see Nigel Gould-Davies, "The Logic of Soviet Cultural Diplomacy", *Diplomatic History* 27, no. 2 (2003): 207-208; Christopher D. Hollings, *Scientific Communication across the Iron Curtain* (Cham: Springer 2016), 42; Maria Rogacheva, *The Private Life of Soviet Scientists from Stalin to Gorbachev* (New York: Cambridge University Press, 2017), 154; O.S. Nagornaya, ed., *Sovetskaya Kulturnaya Diplomatiya v Usloviyah Holodnoy Voiny, 1945-1989* [Soviet cultural diplomacy in the Cold War] (Moscow: Rosspen, 2018), 97. The authors of the latter collective monograph unequivocally support Gould-Davis's view with the corrective that the ultimate goal of hunting and appropriating better technology was only true for Soviet-Western scientific contacts. Soviet programs with Eastern bloc and developing countries, they argue, went in the opposite direction with the U.S.S.R. as an investor and a donor of knowledge and technology. These statements can be traced back to one source, Yale Richmond, *Cultural Exchange and the Cold War: Raising the Iron Curtain* (Pennsylvania: Pennsylvania State University Press, 2003).

Unless otherwise noted, all translations from Russian are my own.

operated under the influence of complex political and ideological motivations of some actors (nations' leaders, officials, and bureaucrats) and institutions (State Department, the Supreme Soviet of the Communist Party of the Soviet Union), scientific exchanges within this program took a different direction. Through more administrative liberty, mutual interest, and their specific agencies, scientists established a long-running channel of communication between two communities under the Lacy-Zaroubin agreement.[24] The scientific program did not follow the pattern of dependence on events on the political scene evident in other sectors of cultural exchanges.[25] To borrow David Bobrow's terms, accommodative behavior in the scientific exchange group overrode uncooperative behavior (an example of which is given below), leading to productivity and further development of exchanges.[26]

Women physicians, proper protocols, and skepticism

It would be historically inaccurate to portray the Lacy-Zaroubin agreement as the first instance in cultural dialogue between the U.S. and the U.S.S.R. after the onset of the Cold War. It was preceded by earlier small-scale attempts. Occasional cultural events and

[24] Gerson S. Sher, *From Pugwash to Putin: A Critical History of US-Soviet Scientific Cooperation* (Bloomington, Indiana: Indiana University Press, 2019), 16. "The interacademy program was the longest lasting scientific exchange program with the Soviet Union and later Russia, lasting thirty years. Funded by the National Science Foundation, the interacademy program began losing support in the 1980s—as relations between the United States under President Ronald Reagan and the "evil empire" had reached an all-time low. Later in the 1980s other priorities and concerns shifted resources away from investment, and the programs were finally phased out in 2009. During this period, however, the interacademy exchanges continued to play an extremely important, if reduced, role as the sole national, structured bilateral instrument available to scientists in both countries to pursue their scientific interests on an individual basis."
[25] N.A. Tregubov, "Transformatsiya Sovetskih kulturnyh svyazey s SShA v usloviyah Holodnoy Voiny" [Transformation of Soviet cultural contacts with the U.S. in the Cold War], *Evraziysky Zhurnal Regionalnyh i Politicheskih Issledovaniy* 1, no. 17 (2017): 54-65.
[26] David Bobrow, "Uncoordinated Giants," in *Foreign Policy USA/USSR*, ed. Charles W. Kegley and Pat McGowan (Beverly Hills: Sage, 1982), 23-49.

academic dialogue had been in effect in the preceding decade, 1947-1957.[27] The difference was that they were sporadic, hard to organize given the numerous bans on travel and communication, went against "the party line" on both ends, and were not sanctioned by intergovernmental bilateral agreements, which increased their vulnerability to propaganda attacks, travel restrictions, and cultural miscommunication, leaving participants with no protection against these challenges.[28]

Prior to the Lacy-Zaroubin agreement, individual attempts were made to initiate a dialogue between medical professionals from the U.S. and the U.S.S.R.[29] A one-time exchange that sustained significant ideological and cultural pressure was organized by the NAS, the Rockefeller Foundation, and the State Department the year before the Lacy-Zaroubin agreement became operational. In 1957 six physicians from Soviet research institutions and hospitals came to visit the US as part of an exchange of groups of women doctors. Later historical assessments claimed that through these cooperative actions the US had been trying to "draw the USSR back to the work of the World Health

[27] A good example of an American cultural visit is the 1955 tour of *Porgy and Bess* that gave a performance in the U.S.S.R. (two tickets to that performance are part of my family's collection of relics from the past), as discussed in Eleonory Gilburd, *To See Paris and Die: The Soviet Lives of Western Culture* (Cambridge, Massachusetts: Bellknap Press, 2018), 27.

[28] A discussion of access limits to cultural events prior to the Lacy-Zaroubin agreement can be found in Hixson, *Parting the Curtain*, 154-157. Academic communication in the first post-war decade was restricted and mainly went through international scientific organizations, in which both countries were members, such as the International Council of Scientific Unions and the Pugwash Committee. In the earth sciences, the most important line of communication of the decade was, of course, negotiations in preparation for the International Geophysical Year (IGY). They were publicized on a regular basis in the *Nauka I Zhizn* ("science and life") magazine, roughly the Soviet analogue of *Science*. For example, the first announcement of the forthcoming launch of the IGY: Yu. D. Boulange, "Pered Mezhdunarodnym Geofizicheskim Godom [Before the International Geophysical Year]," *Nauka I Zhizn*, January 1957, 11-14.

[29] For a brief history of the earliest post-WWII medical exchanges, see David D. Finley, "Soviet-U.S. Cooperation in Space and Medicine," in *Sectors of Mutual Benefit in U.S.-Soviet Relations,* ed. Nish Jamgotch Jr. (Durham: Duke University Press, 1985), 139-140.

Organization, from which it had withdrawn in 1950."[30] This American effort, however, came out of its own reluctance to ratify the WHO constitution and the strongly adverse reaction to national, or "social", medicine that the WHO promoted. After denying China, North Korea, and North Vietnam admission to the organization, the US saw other Soviet bloc nations leave the WHO.[31] Steps were taken to appease the situation. The case study of the "informal" exchange of women physicians in 1957 showcases the three larger challenges early exchanges were facing: the overpowering influence of diplomatic protocols that inhibited mutual understanding and discouraged further communication, high levels of skepticism in organizers toward the program, and bureaucratic resistance (in this case, of the State Department). All these challenges would soon materialize in the inter-academy exchange and, with varying degrees of success, would be overcome.[32]In 1957, in the aftermath of the visit of six Soviet physicians to the U.S., an official of the National Research Council R. Keith Cannan spotted one of the most vexing problems with organizing these bilateral exchanges: division of responsibility. Three entities were involved, the State Department, the Rockefeller Foundation, and the National Academy of Sciences (and, by extension, the National Research Council). Although the Division of Medical Sciences was tasked with facilitating the visit, the logistics also involved staff in

[30] Finley, "Soviet-U.S. Cooperation in Space and Medicine," 140.
[31] Greg Whitesides, *Science and American Foreign Relations since World War II* (Cambridge: Cambridge University Press, 2019), 41-42.
[32] The historian Audra Wolfe discovered this incident independently. In a recent book, she offers a brief description of it that illustrates "a fairly typical example of how these early, somewhat informal exchanges played out" (p. 104). With a bit more detail than the broad scope of Wolfe's discussion of American science policies toward (and against) internationalism would allow, the exchange of women physicians looks more troubled and unsuccessful and less typical and informal. As shown in this dissertation, until institutional backing and personal involvement broke some of the diplomatic protocols and filled the exchanges with cultural and intellectual content, the productivity of early exchanges remained quite low and stress levels high for both sides. Wolfe, *Freedom's Laboratory*, 104-105.

each of the institutions that the Soviet women were to visit. Each institution had its own policies for dealing with such unexpected visits or had none and created them on the go. The resulting confusion only elevated stress levels and produced more tension, contrary to the original goal of the exchange.[33]

Another issue that did not help matters any more than convoluted interinstitutional collaboration was communication with the visiting physicians. Given they came from a different culture, both socially and professionally, they were probably nervous and overwhelmed so that miscommunications were bound to happen. At Johns Hopkins University they apparently committed a faux pas, and their behavior was perceived as unbecoming.[34] As one of the hosts for the delegation sarcastically noted, "We simply put this down to the fact that they were Russians and women to boot." As a result, some organizers expressed an opinion that Russians were impossible to understand or handle, and there was a degree of futility in these attempts at expression of good will.[35] The schedule for the thirteen days that Russian women were to spend in the Washington-Baltimore-New York area was overflowing with formal receptions, at times back to back (the Women's Bureau of the Department of Labor, the Soviet Embassy, the National Academy of Sciences, the National Institutes of Health, a press conference, a TV

[33] R. Keith Cannan to Thomas B. Turner, folder "IR. US-USSR exchange of scientists. Women physicians: Russians to US, 1957," National Academy of Sciences Archives (hereafter cited as NAS). The records of the NAS are catalogued by folder only. Folders are categorized by division or activity. These headings in frequently used folder titles will be abbreviated in the dissertation: "International Relations" to IR, "East-West" to E-W.

[34] The nature of this faux pas is not revealed in archival documents pertaining to the visit, we only learn that Cannan "deplored the apparent rudeness and lack of consideration shown by the delegation" and that "we have much to learn before we can ever say we understand the Russians." R. Keith Cannan to Thomas B. Turner, 7 March 1958, folder "IR. US-USSR exchange of scientists. Women physicians: Russians to US, 1957," NAS.

[35] Turner to Cannan, 11 March 1958, folder "IR. US-USSR exchange of scientists. Women physicians: Russians to US, 1957," NAS.

broadcast), cocktails (where the protocols would be unfamiliar to a Soviet doctor in 1957), and, as a final step, tea at Eleanor Roosevelt's house. Stiff protocols overtook the schedule. With ideological and professional goals interspersed in planning of this unusual visit, few provisions were made for informal communication with colleagues or visiting hospitals or research institutions in the field that members of the delegation specialized in, such as cancer research, virology, or endocrinology.[36] The visitors could have been welcomed into a friendlier and more accommodating environment. This one-time exchange of women physicians was not set up to encourage compatibility and genuine exchange, so it proved awkward and hard on both sides as these working women were appointed representatives of a nation, a gender, and a profession.

The State Department made its contribution to complicating these exchanges when a delegation of American physicians was bound for the Soviet Union in May 1958, demanding that Dr. Thelma Dunn of the National Institutes of Health withdraw from the delegation as its only member affiliated with a U.S. governmental institution.[37] Her position implied that, as a government employee, she would be accepting hospitality from the Soviet side. The State Department found it utterly inappropriate and engaged in a chain of missives, meetings, and phone calls at the higher levels, opposing a U.S. government employee receiving favors from the Soviets. Or, as the above-mentioned R.

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[36] Itinerary of group of Russian women physicians, folder "IR. US-USSR exchange of scientists. Women physicians: Russians to US, 1957," NAS; Dr. Catharine Macfarlane to Dr. Margaret Sloan, 23 October 1957, folder "IR. US-USSR exchange of scientists. Women physicians: Russians to US, 1957," NAS. In this letter, regarding invitations to a gathering of women physicians: "It occurred to me that a nice colored woman doctor might be good propaganda for these ladies. <…> It might be more comfortable for her to drive down with me rather than to come alone."

[37] "Dr. Dunn, NCI, to Tour USSR with Delegation", *NIH Record*, March 24, 1958, https://nihrecord.nih.gov/sites/recordNIH/files/pdf/1958/NIH-Record-1958-03-24.pdf.

Keith Cannan described it, "continued to bedevil what should be a simple operation."[38] The involvement of the State Department with its own set of restrictions and an understanding of how to handle communication with the Soviet Union added a layer of complications. Also, interestingly, it marked a controversy between the State Department and the NAS over facilitating (or complicating) scientific exchanges with the U.S.S.R. that would continue, as will be discussed in the following chapters, for decades to come.

In 1958 a month-long return visit was paid to the Soviet Union by a small group of American women physicians. Perhaps having learned from negative experience, the Soviet hosts made provisions to accommodate each member's interests and show them around hospitals and medical research institutions in multiple cities.[39] This was their first trip to the Soviet Union. The vividness and depth of their impressions, professional and general as they encountered a very different society, are reflected in a short candid report by Dr. Helen Taussig, the head of the American group.[40] In a report-memoir she admitted to her initial personal biases toward the Soviet Union, suggesting they came from lack of information. The experience, however, changed her mind and led her to absorb as much in fact and impression as she could to counter them for herself and others. She shared this text with NAS officials and requested authorization to publish it for a wider audience to learn more about Soviet life.[41] Writing travelogue-reports about trips to the Soviet Union

[38] Memorandum by R. Keith Cannan, folder "IR. US-USSR exchange of scientists. Women physicians: Americans to USSR, 1958," NAS.
[39] Undated aide-memoir, folder "IR. US-USSR exchange of scientists. Women physicians: Americans to USSR, 1958," NAS.
[40] Helen Taussig, Impressions Gained from Four Weeks Inside the U.S.S.R., folder "IR. US-USSR exchange of scientists. Women physicians: Americans to USSR, 1958," NAS.
[41] Cannan to Taussig, 8 August 1958, folder "IR. US-USSR exchange of scientists. Women physicians: Americans to USSR, 1958," NAS. This letter informed Dr. Taussig that her request for publishing the Soviet memoir was approved by the NAS and the CIA. This is one of the few instances in which the involvement of the CIA in U.S.-U.S.S.R. scientific dialogue is revealed.

would soon become a recurrent theme with American scientists, their way of sharing personal and often positive impressions in an attempt to encourage further exchanges. Their reports have also proven to be a valuable historical source of insight into Americans' personal views of Soviet science and society.

Carte blanche for science

The new bilateral exchange program introduced unprecedented protocols and included unconventional provisions for fulfillment:

> "…The agreement undertakes to provide for exchanges in such media as radio and television broadcasts and showing of films, as well as to arrange over the next two years for wide exchange in the cultural, technical, and educational fields. In the academic area, exchanges of graduate students, instructors and professors of the universities of both countries will take place for the first time. Exchanges of scientists for purposes of lecturing and research are to be worked out by the respective Academies of Science."[42]

This quotation from the joint communique prefacing the Lacy-Zaroubin agreement echoes the text of the signed document itself. Exchange of scientists is the only section that explicitly delegates full responsibility to specific institutions, namely the "respective Academies of Science." It bears a striking contrast to the rhetoric of other sections of the agreement that meticulously specify categories of visitors to be included (i.e., in cultural, civic, youth and student exchanges: university newspaper editors, women professionals), areas of expertise or interest (in exchange in industry, agriculture and medicine: cotton growing, endocrinology) or even concrete persons by name (i.e., in exchange of theatrical groups: V. Ashkenazi, pianist).[43] Scientific exchanges, however, were a complete *carte blanche*. For one thing, a separate inter-academy accord was being negotiated at the time

[42] The full text of the Lacy-Zaroubin agreement can be found in the "United States and U.S.S.R. Sign Agreement of East-West Exchanges," *Department of State Bulletin,* 38, no. 973 (February 17, 1958): 243-248.
[43] *Department of State Bulletin,* 244-245.

the Lacy-Zaroubin agreement was signed. Another explanation for not micromanaging scientific exchanges might have been the convenience of well-respected organizations like the academies that were willing to take charge of oversight. It perhaps also related to a reluctance to interfere in scientific affairs, which carried an air of expertise accessible to a limited group of professionals.

Regardless, the lack of specificity in the text of the umbrella agreement provided the first in a series of advantages that the top-down support of bilateral accords granted the U.S.-U.S.S.R. scientific communication. The State Department and the Soviet government provided scientists with a chance to shape their exchanges in accord with their interests, and that chance was not wasted on the Academy organizers. Combined with financial independence (the program received sufficient federal funding channeled through the academies' budgets, which gave them more freedom of action), and enthusiasm and diligence of participants, this license to act freely alleviated Cold War pressures on scientific exchanges. Compared to other sections of the Lacy-Zaroubin agreement and some similar bilateral exchanges between the U.S. and Eastern bloc nations or the U.S.S.R. and countries outside the Western bloc, American-Soviet

scientific exchanges were less heavily charged with underlying Cold War ideological agendas.[44]

The transfer of management power over scientific exchanges from political structures to academic institutions was reinforced by the first of many bilateral inter-academy accords in July 1959, known as the Bronk-Nesmeyanov agreement (after the signatories, the President of the National Academy of Sciences of the United States Detlev Bronk and the President of the Academy of Sciences of the U.S.S.R. Alexander Nesmeyanov).[45]

A good portion of success of this first non-mediated inter-academy agreement should be attributed to the two presidents. Both were talented academic administrators and scientists, Detlev Bronk in biophysics, Alexander Nesmeyanov in organic chemistry, and both recognized the importance of dialogue.[46] Negotiations of the agreement coincided

[44] On the exchange under section VIII of the Lacy-Zaroubin agreement, "Exchange of Theatrical, Choral, and Choreographic Groups, Symphony Orchestras and Artistic Performers," see Peterson McDaniel, *American-Soviet Cultural Diplomacy*. She draws on rich primary sources at Russian archives and American press to reveal the political gameplay behind the Bolshoi Theater tour of the United States in 1958. Perhaps giving too much credit to the plotting powers of Soviet authorities and too little to the genuine desire of artists to share their stagecraft and make their country proud, Peterson McDaniel argues that Soviet ideological ambitions consumed the artistic exchange, arguing that the entire enterprise (choice of repertoire, interpretations of music and dance, directing, and large number of cities to tour) was "a Cold War weapon" and a failed attempt to convert the American nation to Communism. On page 212 she notes: "This conclusion suggests that the Soviet leadership was not truly interested in improving relations with the Americans but sought to utilize all resources to score a Cold War victory."

[45] Full text of the Agreement on the Exchange of Scientists between the National Academy of Sciences of the USA and the Academy of Sciences of the USSR (1959) can be found in Glenn E. Schweitzer, *Scientists, Engineers, and Track-Two Diplomacy: A Half-Century of U.S.-Russian Interacademy Cooperation* (Washington, D.C.: National Academies Press, 2004), Appendix B, 104-113.

[46] On Bronk initiating and supporting exchanges between the National Academy of Sciences of the U.S. and the Eastern Bloc countries, see Rexmond C. Cochrane, *The National Academy of Sciences: The First Hundred Years, 1863-1963* (Washington, D.C.: National Academy of Sciences, 1978), 544-546.

with the time of greater involvement of American scientific entities in global politics.[47] As importantly, going against the official state policies, Nesmeyanov was committed to gaining access to international expertise for Soviet scientists and protecting the independence of the Academy of Sciences.[48] It would become true for the entire program that individual commitments, and contributions of academics played a key part in continuing and nurturing it. In the case of Nesmeyanov, for example, the Communist Party approval of visits of American scientists already prearranged for 1960 was suspended after the incident with the American U-2 piloted by F. Gary Powers shot down over Russia.[49] All contacts with capitalist countries were to be sanctioned by officials from the Communist Party Supreme Soviet's department of science, led at the time by the physicist Vladimir Kirillin. When Nesmeyanov approached him for advice about upcoming visits of Americans, Kirillin recommended going on as planned and

[47] Cochrane, *National Academy of Sciences*, 519-520.
[48] Istvan Hargittai, *Buried Glory: Portraits of Soviet Scientists* (New York: Oxford University Press, 2013), 273-274. In this reflection-memoir based on history of science scholarship and reminiscences, the Hungarian chemist and explorer of twentieth century science offers biographical sketches on twelve Soviet scientists. He was, apparently, unaware of the Bronk-Nesmeyanov agreement, as it is not mentioned in his argument for Nesmeyanov's attempts to establish communication with the West, thus portraying Nesmeyanov's efforts as a failure when they were indeed an achievement: "The development of science in the 1950s was unfavorable with respect to international interactions when compared with the 1920s. In the 1950s, young researchers had meagre opportunities to gain international experience. This was not for want of trying on Nesmeyanov's part. He tried and achieved some success, but the meagerness of his success tells us how hopeless the situation was." On the contrary, Nesmeyanov's clout and perseverance ensured the success of something as unprecedented as the first inter-academy agreement.
[49] John Lewis Gaddis, *The Cold War: A New History* (New York: Penguin Press, 2005), 73.

welcoming the American group, while the department would "turn a blind eye and deal with it later".[50]

Between reciprocity and retaliation

The Bronk-Nesmeyanov agreement, as subsequent U.S.-U.S.S.R. inter-academy agreements, operated on the basis (and expectation) of reciprocity of action and funding. Equal numbers of scholars from agreed upon academic fields were expected to visit the partner country in a given year, with the hosting group covering the expenses of the guests, and the choice of candidates for visits was to be confined to a list of previously agreed upon scientific fields of interest for each side. The Americans were constantly vexed by these "artificial" imposed restrictions.[51] Visas for entering the U.S. were a recurrent obstacle for the Soviets, but the Americans argued that they also experienced delays in visa approvals, so the tit-for-tat principle, ironically, was preserved. In 1965 the NAS Foreign Secretary Harrison Brown wrote a passionate statement commenting on national order restrictions in the world and condemning the policy of the State Department as convoluted, excessively harsh, and short-sighted.[52]

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[50] The source of this quotation is to be taken with caution. It appears in a monograph in memory of Nesmeyanov written by experts from the analytical department of the Moscow State University, in which the authors created what they call a "virtual interview" with Nesmeyanov, supplying cut-and-paste answers to their questions his published memoir, his personal papers at the Russian Academy of Sciences archive, and earlier biographies of Nesmeyanov published by the Academy. The problematic aspect of their approach is not so much the "virtual interview" itself but the absence of citations for Nesmeyanov's specific responses, which does not allow other researchers to trace them back to original sources. However, there is no cause for doubting the authors' academic integrity. E. V. Ilchenko and V.I. Ilchenko, *Akademik A.N. Nesmeyanov – Rektor Moskovskogo Universiteta i Prezident Akademii Nauk SSSR* [Academician Nesmeyanov – president of the Moscow University and the Academy of Sciences] (Moscow: Izdatelstvo Moskovskogo Universiteta, 2013), 354.

[51] Exchange Agreement with the Soviet Academy, 1, "IR EW Exchange Program: General, 1961," NAS; Sher, *From Pugwash to Putin,* 17.

[52] Harrison Brown, The Scientist and National Boundaries: Statement by NAS Foreign Secretary, folder "IR. Exchange Programs: Problems between governments re exchange of scientists," NAS.

Were these exchanges equal? The international affairs expert Nigel Gould-Davies argues it was a ploy of backwater Soviets in order to pilfer the Western scientific community for cutting-edge tech: "The Soviets also used educational exchanges primarily to gain technical knowledge: in the 1950s and 1960s about 90 percent of Soviet academic visitors to the United States were scientists or engineers, while about 90 percent of the reverse flow consisted of scholars in the humanities."[53] That ratio would have been extremely difficult to achieve, even the cunning Soviets would have had a bit of trouble following the conditions of the Bronk-Nesmeyanov agreement to send to America experts in such fields from the pre-agreed list of disciplines as "Electron microscopy," "Powder metallurgy," or " Flu epidemiology" and have them be scholars in the humanities. A closer look at the Soviet Academy reports shows a more interesting reality. Out of nineteen Soviet experts who visited the U.S. in 1961, the second year of agreement activities, when its reciprocity principle was followed to the letter, all nineteen were natural scientists fulfilling the American requests.[54] Any other given year reveals the same ratio, as the agreement stipulated that experts came from the pre-approved fields of natural sciences.

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[53] Gould-Davies, "The Logic of Soviet Cultural Diplomacy", 207-208.

[54] Prilozheniye 1, Spisok uchhenyh AN SSSR, vyezzhavshih v SShA po soglasheniyu s Natsionalnoy Akademiey Nauk 1959 goda [Appendix 1, List of scientists from AS USSR who traveled under the agreement with the National Academy of Sciences of the U.S. of 1959, "Reports on fulfillment of agreements between USSR and USA on scientific cooperation under AS USSR, 1961-1963"], 53-54, folder "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomu sotrudnichestvu po linii AN SSSR, 1961-1963," 579-13-180, Archive of the Russian Academy of Sciences. *Arkhiv Rossiiskoy Akademii Nauk* (the Russian Academy of Sciences Archive, cited hereafter as ARAN) in Moscow utilizes the traditional Russian cataloguing system. Materials in manuscript collections are filed, from largest to smallest record unit, under *fond* (collection), *opis* (series), and *delo* (file) numbers. Within each *delo*, documents are filed in a *papka* (folder), which are not numbered but have descriptive titles instead. All cited materials from ARAN collections cited in the dissertation will have three identifying numbers after the folder title, *fond-opis-delo*.

In fact, the Committee on Scientific Exchanges at the NAS was determined to provide a good solution for organizing exchanges in the humanities.[55] After the unsuccessful American efforts in the aftermath of WWII to initiate contacts with the U.S.S.R. in the humanities and cultural spheres, the American Council of Learned Societies was tasked with making another attempt to organize a self-sustaining and productive line of exchanges with the Soviets in 1961.[56] As representatives and mediators for American humanities and social sciences, the ACLS signed a separate agreement with the AS U.S.S.R. operating within the same framework as the NAS. Not without its own bureaucratic stumbling stones, this initiative proved largely successful and satisfying to both parties.[57]

The strict division between natural sciences and humanities and social disciplines was observed meticulously. Thus, the University of Minnesota expert in agricultural economics Philip Raup was invited under the AS USSR – ACLS agreement.[58] The ACLS program also functioned on the reciprocity principle but ran a smaller operation (ten to twelve people from each side to make exchange visits every year) and financed, on the American end, by grants from the Ford Foundation, the Carnegie Corporation, and the

[55] Folder "IR. E-W Exchange Program. Committee on scientific exchanges: Adv, 1961," NAS.
[56] J.D. Parks, *Culture, Conflict and Coexistence: American-Soviet Cultural Relations, 1917-1958* (Jefferson: McFarland, 1983), 106-115.
[57] See, for example, among many other documents in support of this program Report by Professor James M. Burns on Visit to U.S.S.R. under the ACLS – Academy of Sciences Exchange Agreement, box I-610, folder "US-USSR Exchanges. Correspondence (April 1961 – 1963)," records of the American Council of Learned Societies, Manuscript Division, Library of Congress (cited hereafter as ACLS records, LOC).
[58] Exchange Program between Academy of Sciences of the U.S.S.R. and American Council of Learned Societies, 2, "Slavic/East European misc. projects, JCSS subcommittee on US-USSR exchange grants, 1964-65/1967-68," box I-607, ACLS records, LOC.

State Department.[59] Parallel to the bilateral natural sciences program, the humanities and social sciences exchange expanded and became more engaged in joint professional discussions and deeper research contacts after Nixon's Moscow Summit in 1972. Regular joint conferences (among other topics: literary criticism, semiotics, textual analysis of literary sources), scholarship exchanges, access to libraries and archives, and correspondence became normalized.[60] Carefully avoiding previous assumptions and predictions, the tone of negotiations between Americans and Soviets switched to a more relaxed and enthusiastic one. The discontent over breaks in communication, the worry about propaganda issues, and the resentment toward the ways in which things were done in the Soviet Union subsided, giving way to a work-friendship relationship between the two groups.[61]

From a diplomatic point of view, as American and Russian skeptical historians argue, cultural exchanges between the Soviet Union and the West in general were little more than a weapon of the Cold War, a propaganda tool, or a covert means of mining the Western scientific community for latest technologies. The scientific exchange program largely escaped this underwhelming fate due to a combination of a state approved top-

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[59] Report on Program of Exchanges of Scholars in the Humanities and Social Sciences between the American Council of Learned Societies and the Academy of Sciences of the USSR, 1, box I-607, folder "Slavic/East European Misc. Projects, JCSS Subcommittee on US-USSR Exchange Grants, 1964-65/1967-68," ACLS records, LOC.

[60] Folders "Binational Commission. Humanities Editorial Meth. Bloomington, Ind. April 1976", "Correspondence with Academy of Sciences of the USSR, 1970-1974", "Moscow – October 1975," box II-437, ACLS records, LOC.

[61] "I'm afraid the dry and abstract nature of my report doesn't suggest the enthusiasm of the participants in the discussions or the warm good-will of the professional friendships established," wrote David J. Nordloh, an Indiana University professor of English and the general editor of "A Selected Edition of W. D. Howells" by Indiana University Press in his report on the Soviet-American conference on textual editing held in April 1976 at Indiana University. "Binational Commission. Humanities Editorial Meth. Bloomington, Ind. April 1976," box II-437, ACLS records, LOC.

down framework of the Lacy-Zaroubin agreement, more open-ended opportunities for inter-academy dialogue, mutual understanding and interest between the NAS and AS U.S.S.R., and determination of individual scientists to contribute to these exchanges. Shifting the focus of analysis from politicians and bureaucrats to historical actors from within the scientific community reveals a specific set of motivations and choices for this group. The relative academic freedom of action discussed in this chapter had limitations. As will be shown, there were security concerns, bureaucratic challenges, cultural differences, ideological controversies, and restrictions throughout the program that depended on the political climate within and between the two nations. These issues, however, did not define the program or paralyze the people who participated in it.

Section 2. The Americans

The political barometer of U.S.-U.S.S.R. relationships in the late 1950s was stuck at "nasty with a good chance of storms." With Nikita Khrushchev's bluntness and Dwight Eisenhower's determination, the bilateral confrontation at the top level persevered, but the post-war internationalism as a trend in politics and some fresh ways of cognition and communication (diplomatic, trading, cultural, and scientific) were on the rise as a countermeasure to the adversarial stance.[62] Against wars, hunger, or epidemics, and in support of women, sports, or other special collaborations, international organizations had already begun appearing on the scene at the turn of the century. These gained more and

[62] A detailed account of Eisenhower's science policies can be found in Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick: Rutgers University Press, 2008), 42-70.

more momentum after the Second World War, notably with the establishment of the United Nations, the World Health Organization, and other influential entities.[63]

As the diplomatic historian Akira Iriye observes, "In the meantime, irrespective of intergovernmental conferences and agreements, international nongovernmental organizations were pursuing their own agendas, enriching the world arena with networks of interdependence."[64] In the sciences, the International Council of Scientific Unions now consisted of fourteen international scientific organizations, and the U.S. and the U.S.S.R. were represented in all of them. Through the bilateral exchange program, American and Soviet scientists were to embark on creating another network of interdependence meant to bridge more than the gap in professional knowledge—a gap in regular communication that had intensified in the post-WWII scientific world as both sides continued to militarize.

Many American scientists from universities across the country invited by the National Academy of Sciences were willing and even eager to travel to the Soviet Union. What motivated them to go on these trips and, in their opinions, in what ways were they useful to their scientific communities at home? Some researchers had previously made unsuccessful attempts to connect with Soviet colleagues and many were looking forward to learning more about recent research in their field done by Soviet scientists.[65]

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[63] Akira Iriye, *Global Community: The Role of International Organizations in the Making of the Contemporary World* (Berkeley: University of California Press, 2002), 9-36.
[64] Iriye, *Global Community*, 25.
[65] Learning as much as possible about the current state of Soviet science was the official NAS goal for the inter-academy program in general. An early overall NAS progress report from 1961 stated that the scientific take from the exchanges was not impressive yet, but "as the result of visits and other contacts, American scientists now know more about Soviet science than their European colleagues do." Summary Report. Second Meeting. Advisory Committee on Scientific Exchanges with the Soviet Union. 21 October 1961, folder "IR. E-W Exchange Program. Comittee on Scientific Exchanges: Adv, 1961," NAS archive.

Importantly, professional interest was not the only motivation for Americans. Many were curious. The exoticism of entering a "forbidden land" behind the Iron Curtain on a fully funded journey was no less appealing than the primary goals of exchanges. Some of the early-years participants were well-traveled by the beginning of the program, and most Americans on these trips felt that they were on a mission to document, assess, and share the maximum of their professional and social Soviet experiences. And it was not simply about the travel.

The impetus of scientific internationality combined with aspirations for prestige and new data brought these exchanges to a surprisingly stable and mutually beneficial level.[66] Scientists and scholars from mid-level professors to university presidents, internationally renowned experts, and Nobel laureates were genuinely invested in the success and longevity of the scientific contacts with the Soviets. What new ideas and approaches to this communication had to be adopted, adjusted, or abandoned? How did the participants' perceptions of the Soviets, scientific contacts, and even themselves changed? Why did the exchange program evolve on the American side during the first fifteen years of its existence, what drove it, and how did it survive one of the most trying periods of the Cold War in the late 1950s and into the 1960s? Based on reports, correspondence, and memoirs of participants, and institutional records of the National Academy of Sciences, this section discusses the American perspective on the history of the U.S.-U.S.S.R. scientific program. Not everything turned out as the Americans had expected, and even the notion of mutual benefit embedded in the formal agreements for exchanges acquired fresh and more contextual meaning.

[66]A discussion of the prestige motivation for the NAS and its potential benefits can be found in Wolfe, *Freedom's Laboratory*, 106.

Speak of "bedevil"

What drove American scientists to participate in the exchanges with the Soviet Union during the launch years of the program when they were not just put to the test of dealing with a different mentality and organizational style but also faced resentment from their own ranks? In 1961, the University of Illinois physicist James H. Bartlett returned from a month-long trip to the U.S.S.R., quite satisfied with his communication with Soviet colleagues and enthusiastic about the future of the program.[67] Bartlett happened to have studied Russian for three and a half years before joining the exchange program and braved giving his two lectures, in Moscow and Leningrad, in Russian. Having more cultural familiarity and access to direct dialogue with the Soviets than most of his colleagues on their first visits and with a realistic approach to mutual understanding, he was candid in an interim first impressions note to the NAS exchange program director Lawrence Mitchell. After five days in the Soviet Union, Bartlett identified two barriers between Americans and Soviets in the exchange, namely the language difference and an unfortunate attitude in which "Americans tend to act condescendingly to the Russians, who have had hard sledding and would like to feel important."[68] He submitted his elated final report to the NAS president Detlev Bronk describing the trip as a "complete success, in that there has been a maximum exchange of information" and noting in the conclusion that "tensions can be reduced and should be."[69] The terse commentary on the report by

[67] As is, alas, the case with so many other participants of U.S.-Soviet exchanges, the nearly singular published sources of biographical information are their eulogies in professional journals. Gene G. Byrd, "Obituary: James H. Bartlett, 1904-2000," *Bulletin of the American Astronomical Society* 33, no. 4 (2001): 1565.
[68] James H. Bartlett to Lawrence Mitchell, "IR. E-W Exchange Program: Individuals 1961A", NAS.
[69] James H. Bartlett to Detlev Bronk (report), "IR. E-W Exchange Program: Individuals 1961A", NAS.

Samuel Douglas Cornell, an executive officer and chief of staff at the NAS and the National Research Council at the time and a proponent of Moral Re-Armament, was unequivocal: "Dr. Bronk – I should say this man shows no understanding whatever of the real situation vis-à-vis Communism. He has been very effectively brainwashed."[70] As an NAS administrator, Cornell had advising power, but his opinion in this case did not seem to produce much of an effect on the NAS president.

One of the practices in scientific networks in the U.S. (and, in fact, in so many other professional circles across the globe) was trusting the opinions of those who came from the same group, fostering friendships within the community, and relying on each other's expertise. Interestingly, Bartlett was on a first-name basis with Bronk while Cornell was not, judging from correspondence. A government agency, however, could have more influence on the Academy's decisions than a zealous individual regarding the politics of the exchange program. One such agency made regular attempts to guide the exchanges based on their own policies and persistently created opposition toward the Academy.

The NAS always acknowledged that in organizing exchanges with the Soviets they were answering the call and fulfilling an obligation to the federal government via the State Department.[71] Nonetheless, its academic leadership found these State Department interventions off-putting as they interfered with developing and administering international programs. Even the earliest communications before the official launch of the program earned the State Department a caustic comment from an NRC official, who

[70] Samuel Douglas Cornell to Detlev Bronk, folder "IR. E-W Exchange Program: Individuals 1961A", NAS. On Moral Re-Armament and Samuel Douglas Cornell, see Ralph B. Gehring, "Moral Re-Armament and Filipino Catholics," *Philippine Studies* 5, no. 4 (1957): 402.
[71] Frederick Seitz to all NAS members, 21 May 1964, folder "IR Exchange Program: USSR: General, 1964," NAS.

described the government's involvement as continuing "to bedevil what should be a simple operation". Such remarks, however passionate and revealing, were usually held within the group but reflected tension between the academic administration and the State Department following two different policies on one and the same program.

In 1961 eight Soviet scientists, who were planning to participate in national conferences on semiconducting materials, carbon, and cryogenic technology in fulfillment of the inter-academy agreement, were denied access (and visas) to the United States. This action was justified by the State Department as a retaliation measure in response of the U.S.S.R closing off restricted areas to American visitors. In the same year another group of Soviet experts were denied access to an international professional meeting on precision electromagnetic measurements in Boulder, Colorado, despite the fact that it was held by the International Union of Radio Science, whose vice-president in that year was the Soviet radio physicist and future (1964) Nobel laureate Alexander Prokhorov.[72] Not just conference travel but individual visits were also hindered by similar visa rejections and they were becoming a threat to the success of the program.

While the NAS and involved universities were striving to facilitate the exchange, the State Department was, by contrast, primarily concerned about containment, diplomatic matters, and such matters as reciprocity, retaliation, and limited access to sensitive information. This approach was often questioned by academics, who found it ineffective and, on occasion, intrusive and obstructive for the program they were entrusted to conduct. In 1964 the atomic physicist Ronald Geballe, having encountered a problem

[72] Folder "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomy sotrudnichstvu po linii AN SSSR, 1961-1963" [Reports on fulfilling agreements between the USSR and the USA on scientific cooperation with the Academy of Sciences of the USSR], 579-13-180, 15, ARAN.

with organizing an internship for a Soviet graduate student at the University of Washington in fulfillment of the inter-academy agreement, reached out to the NAS president Frederick Seitz.[73] Acting under guidance from the State Department, the Atomic Energy Commission refused approval to an exchange student in nuclear energy on account of an earlier Soviet refusal to accept American exchange students in the same field. Inquiring if any NAS action might be taken to resolve this diplomatic standoff, Geballe noted: "…I am disturbed over a policy of attempting to hide this game behind the "nuclear energy" curtain. <…> Is there any prospect of altering the State Department's stand? I am communicating also with Dr. Donald F. Hornig, science advisor to the President, about this episode."[74]

Geballe's concern was one of many. Other scientists were quite vocal within the community and in public in raising the issue of obstacles to international exchanges. Harrison Brown, the NAS foreign secretary, was a persistent and passionate opponent of State Department restrictions in his internal reports and public addresses.[75] Eugene Rabinowitch, a Russian-born American nuclear physicist and co-founder of the *Bulletin of the Atomic Scientists*, also published an editorial highlighting the importance of releasing scientific exchanges from the grips of state control and criticizing the

[73] Kenneth Clark, Ernest Henley, and Gordon Dunn, "Obituaries: Ronald Geballe," *Physics Today* 52, no. 5 (1999): 87, https://doi.org/10.1063/1.2802789.
[74] Ronald Geballe to Frederick Seitz, 23 June 1964, folder "IR. Exchange Program: USSR: General, 1964," NAS.
[75] For example, see Harrison Brown, Scientist and National Borders, folder "IR. Exchange Programs: Problems between Governments re Exchange of Scientists Statement by NAS Foreign Secretary, 1965," NAS.

unnecessary interventions of the State Department for what he viewed as unproductive diplomatic games that got in the way of exchange.[76]

The administration and communication troubles that befell the inter-academy program in its early years would not be solved overnight. Some issues would eventually subside toward the détente years when "the formal exchanges had become routine."[77] For example, the Academy eventually provided institutional status that helped reduce tensions around visas, shield the program from brute-force political interventions, and even facilitate "grass-roots" symposia organized by interested scientists.[78] Other issues were more imagined than real. In a recently published history of U.S.-Soviet scientific exchanges viewed through the lens of the author's professional experience as a program officer, Gerson Sher documents the frustrations of American scientists. They encountered an unpleasant contrast, Sher argues, to their "previous experience of free, unfettered movement throughout the world," as they "were used to making their own arrangements as a traditional right and matter of convenience." He finds that in this instance, the exchange agreement itself served "in short, to satisfy the Soviets' obsession with control."[79]

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[76] Eugene Rabinowitch, "Gresham's Law in Soviet-American Exchange," *Bulletin of the Atomic Scientists* 20, no. 6 (1964): 2-3.
[77] On Relaxing US-USSR Scientific Exchanges, 17 August 1965, folder "IR Exchange Programs: USSR General, 1965," NAS.
[78] A comprehensive analytical report on the first fifteen years of U.S.-U.S.S.R. scientific exchanges gives a detailed description of its successes and caveats from the American perspective: Loren R. Graham, A Feasibility Study of a Review of US-USSR Scientific Exchanges and Relations, "IR. Reviews of US-USSR Scientific Exchanges and Relations, 1975," NAS. On the symposium on theoretical physics (electron theory of solids), see D. Pines and C. Herring, U.S.-U.S.S.R. Symposium, Rockefeller University, January 1970, folder "IR. Exchange Programs: USSR General, 1970," NAS.
[79] Sher, *From Pugwash to Putin*, 17-18.

Sher's observations paint a picture of American scientists as free agents of the Western republic of letters who never knew restrictions or constraints in communicating their science or conducting research. Applied to the U.S.-U.S.S.R. relations and compared to the limits for Soviet scientists at the time, this image may be accurate. However, outside of this comparison, Americans had previously experienced and continued to encounter obstacles in traveling abroad and working with foreign colleagues, especially after the passage of the McCarran Act in 1950. This anti-communist vigilante legislature gave the State Department extraordinary power of flagging and restricting travel of communist affiliated or suspicious individuals, including scientists. The most widely known was the incident with Linus Pauling who was denied permission to leave the United States for a professional meeting or be issued a passport.[80] In this case, public policy and individual interpretations of it allowed administrators to exercise considerable power to restrict, refuse, and forbid travel. It was exercised vigorously at the State Department courtesy of its zealous and influential Chief of the Passport Division, Ruth Shipley. She single-handedly determined the fate of applicants and, as Jeffrey Kahn argues, set a model for control in decision-making and processing travel applications under the anti-communism scare that is being followed to this day under anti-terrorism guidelines.[81] Thus, permission to travel abroad could be an issue for American scientists as well as for their Soviet counterparts.

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[80] For a detailed discussion of the McCarran Act, the Pauling incident, and other cases of travel challenges for American scientists, see Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (Chapel Hill: University of North Carolina Press, 1999), 274-283.

[81] Jeffrey Kahn, "The Extraordinary Mrs. Shipley: How the United States Controlled International Travel before the Age of Terrorism," *Connecticut Law Review* 43, no. 3 (2011): 819-888.

Sher found that the Academy as an institution could do what individuals could not. It was in a position to develop protocols for previously unprecedented processes such as facilitating regular scientific traffic between the U.S. and the U.S.S.R.[82] Similarly, the influence and political capital of other academic institutions became an effective tool of advancing the inter-academy program. Understated in analytical literature, however, are the contributions of individual scientists. In both cultural and scientific terms, the program penetrated as deeply as it did largely due to interest, involvement, and dedication of individual academics who believed in the usefulness and significance of these exchanges and pursued them as they challenged their own cultural preconceptions and prejudices.

"Transparent attempts, accurate accounts": American scientists report[83]

American involvement in the exchanges was such that most university archives in the United States hold in their collections at least one trip report of a faculty member to the Soviet Union within the scientific exchange program.[84] Participants from all

[82] Sher, *From Pugwash to Putin*, 187-188.
[83] Philip M. Raup, A Russian Notebook, box 35, folder "1958 USSR Trip," collection 1028, Philip Raup papers, UMN.
[84] If somewhat of an overstatement, this assumption is not unsubstantiated and is supported by evidence from three kinds of sources. The first is the author's archival research for this dissertation. Except the National Academy of Sciences records, I never searched specifically for Soviet trip accounts in the U.S. archives, yet they kept emerging accidentally alongside other documents, as, for example, did Robert Dietz's report on the International Oceanographic Congress in Moscow, 1966 at the University of California San Diego (UCSD), Robert S. Dietz, The Second International Oceanographic Congress, 23 June 1966, box 10, folder 10, Robert Dietz papers, Special Collections, University of California, San Diego. The second source was the generosity of archivists and fellow historians. For example, Erik Moore at the University of Minnesota archives happened upon three collections of personal papers of faculty members that contained Soviet trip reports and kindly reached out to share references. The third source was cold online searches in randomly picked institutional archives, e.g., a search in the MIT records immediately yielded Jule G. Charney's Soviet trip report from 1961 (Jule G. Charney, Trip to Soviet Union, 1961-1962, box 1, folder 44, Jule G. Charney papers, Distinctive Collections, MIT Libraries).

institutions, including non-academic, were requested to submit reports of their trips to the NAS.[85] Whether a group tour, a conference visit, or an individual trip in fulfillment of the exchange treaty stipulations, these accounts shared features that make them thought-provoking as reading material and significant as a tool for understand the overall development of the exchange program. They were rarely formal, dry, or succinct but typically thorough, insightful, and candid. Taking seriously their role as ambassadors of American science, U.S. experts applied to their Soviet travelogues the same degree of precision and meticulousness that they would practice in record-keeping for their laboratory experiments or field notebooks. Some of them used field notebooks for jotting down information and impressions, which shows that best practices of keeping data records were so engrained in their mentality that scientists extended them to Soviet trip reports. This resulted in a variety of accounts that offered fellow experts, administrators, and other readers vivid impressions of locales, institutions, personalities, and everyday life in the Soviet Union. There were two types of these trip accounts: the required reports participants submitted to the NAS (to the ACLS for humanities scholars) and notes some of them kept during trips or wrote up after returning home. Accounts of both types and from both institutions circulated within the NAS-ACLS-AS U.S.S.R. program to better prepare prospective visitors for future trips.[86] Not all of them were positive or enthusiastic. An occasional unequivocally harsh assessment of Soviet scientific traditions or communication techniques would prove just as informative, stimulating, or intriguing

[85] An example of a report from a participant outside academic institutions would be an eighty-one-page report by Carl E. Hartbower of the research division of the Manufacturing Laboratories Inc. Carl E. Hartbower, Technical and Sociological Observations on my Trip to the Soviet Union, November 28, 1961, folder "IR. E-W Exchange Program. Tech & Sociological Observations in USSR. Report: Hartbower C. E., 1961," NAS.
[86] The author found NAS reports and guidelines for visitors in ACLS records and vice versa.

for colleagues.[87] All, however, claimed to strive to be objective, as impartial as they would be in a lab report, and often included disclaimers for their own biases. This was an important way of recognizing possible flaws of judgement and giving others an example of not simply surviving but making use of and enjoying exposure to their Soviet experience.

Many American academics meticulously recorded their impressions on these trips, with a dedication to objectivity. Professor Philip M. Raup of the Department of Agricultural Economics in 1958 submitted a trip report to the University of Minnesota. He supplied it with an explanation of his commitment to accuracy through verifying statistics he received in the U.S.S.R. Raup prefaced his intention to "preserve the flavor of the question-and-answer form that characterized most of the interviews" with a disclaimer:

> This is no guarantee against misleading statements or inaccurate statistics. The reader should be alert to the fact that the notes are reported as taken. Errors of translation and transcription are undoubtedly present, in addition to any other bias, although in most instances the notes have been reviewed by at least one other party to the interview."[88]

During his first month-long visit to the U.S.S.R. in 1958 with a group of eleven University of Minnesota professors, Raup's self-designated mission was to document the material aspects of Soviet life: construction of a housing complex in Kiev, dynamics of milk yields and vegetable production on collective farms in rural Ukraine and southern Russia operating under a planned economy, and simply content of a conversation with

[87] A moderately critical report was submitted to the NAS in 1961 by G.W. Swenson, a radio astronomer from the University of Illinois at Urbana, about his two-week trip to survey astronomical research facilities in the U.S.S.R. In it, Swenson argued that Americans offered more hospitality and effective tours than the Soviets had provided to him. G.W. Swenson, 15 February 1961, folder "IR. E-W Exchange Program: Individuals, 1961A," NAS.
[88] Philip M. Raup, A Russian Notebook, box 35, folder "1958 USSR Trip," collection 1028, Philip M. Raup papers, UMN.

two teenagers on a street.[89] This Minnesota group was featured in color every weekday in the afternoon edition of the largest Minnesota newspaper, *The Minneapolis Star*, during the month of December 1958.[90] On the trip Raup meticulously documented their interviews with Soviet citizens and used them later as data sources and points of comparison for his own research in agricultural economy.[91]

The story of Raup's involvement in the exchanges is a sample of early complications in the program and ways of resolving them. In the early years of collaboration, the following glitch was identified in exchange protocols that suggested black-boxed unilateral decisions of the Soviets. Considerable bureaucratic weight lay with requiring mutual approval of proposed candidates. For example, the American side would submit a list of candidates for exchange visits under each topic (e.g., cosmic ray studies), each article of the agreement (e.g., Article 1, one-month lecture visits), and supply characteristics of the candidates and a description of their interests, research topics, and proposals for a visit. The Soviets would return the list with a few rejections with or without an explanation, and new candidates would have to be proposed to fill the quota for each category. With differences in reasons for and wording of rejections or adjustments, the Americans would similarly process lists of Soviet candidates. This protocol generated frustrations, tensions, and delays in exchange visits, while these academic "juries" deliberated on who they could (or wanted to) accommodate each year.

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[89] Raup, "A Russian Notebook."
[90] *The Minneapolis Star*, 2-22 December 1958.
[91] Philip M. Raup, "Economies and Diseconomies of Large-Scale Agriculture," *American Journal of Agricultural Economics* 51, no. 5 (Dec. 1969): 1274-1283, https://www.jstor.org/stable/1238003.

After the scouting trip with ten colleagues from Minnesota, Raup was selected to join the ACLS exchange as an expert in a social discipline, agricultural land management. He applied for a trip in 1962-63, but the Soviet Academy approval group took too long to assess his application. By the time Raup's participation was approved for a shorter period than he had requested, he chose to decline the invitation.[92] He applied again for the 1964-1965 exchange year and was rejected as a candidate on account of the Soviet Academy not being able to "satisfy the program" (i.e., organize visits to the institutions and facilities Raup requested in the application).[93]

Raup would finally pay another visit to the Soviet Union under the exchange program in 1968 and would continue to stay in the know about the U.S.-U.S.S.R. scientific dialogue afterwards. His trips clearly made an impression professionally and personally. The environmental concerns of the 1970s in connection with the Soviet Union became of particular interest to him as he followed the negotiations and developments of the Nixon-Podgorny bilateral agreement for cooperation in the field of environmental protection, everyday life, and industry and science in general.[94]

These approval decisions on candidates on the American side were as unilateral as Soviet ones. While the exchange program between the NAS and ACLS and the AS U.S.S.R. still bore a "deep Cold War" diplomatic charge in the first decade of its

[92] Exchange program between Academy of Sciences and American Council of Learned Societies 1964-1965, box I-607, folder "Slavic/East European Misc. Projects. JCSS Subcommittee on US-USSR exchange, Grants, 1964-65, 1967-68", ACLS records, LOC.
[93] Exchange program between Academy of Sciences and American Council of Learned Societies 1964-1965, ACLS records, LOC.
[94] Folder "USSR. Pollution. Environmental Problems, 1970-1975, 1980," box 38, collection 1028, Philip Raup papers, UMN; folder "USSR. Leisure, 1967, 1971, 1977," collection 1028, Philip Raup papers, box 41, UMN.

existence, these approvals were a tool of ideological manipulation in the program.[95] One side of the agreement could grant or deny respected academics access to this well-funded professional program, but there were other reasons for rejecting a candidate. A proposed research topic could be too sensitive in terms of ideology or defense, there could be few primary sources or technology for a successful project, or proposed travel could involve restricted areas.[96] For example, while scientists and scholars of numerous specializations were welcome in the program, professor of political science Alfred G. Meyer from the University of Michigan, sadly, was not one of them for the Soviet Academy.[97] In a polite, friendly but firm response to ACLS president Frederick Burkhardt's inquiry, the Soviet Academy official stated that the decision to reject Meyer as a candidate for a visit to the Institute of Philosophy in Moscow was immutable:

> "In the case of a foreign scholar who has chosen as his field of specialization anti-Communism, casting of aspersions on Marxist-Leninist theory, unsubstantiated attacks upon the Soviet state—such a "scholar" cannot be a desired guest of the Institutes of the Academy of Sciences, USSR. It is possible to dispute with one who is mistaken, with one who adheres to a different point of view, a different conception, but to dispute with one who deliberately distorts reality is scarcely advisable."[98]

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[95] "Deep Cold War" is a term Gerson Sher introduced in *From Pugwash to Putin*. As an allusion, it encapsulates the image of the morose 1940s and 1950s in American-Soviet relations.

[96] These "restricted areas" were a tool of political power of their own. The Soviet Union closed off some strategic sites for visitations early in the program, and the U.S. retaliated with restricting access to national research facilities and other spaces to Soviet delegates. Both scientific communities kept circling back to this issue in negotiating individual trips and reporting on the progress of the program in general, pointing it out as a hindrance. These restrictions were never entirely lifted, but an easing of the rules was achieved over the years. List of closed areas in the U.S. and the U.S.S.R. as of the beginning of NAS-ACLS-AS U.S.S.R. exchanges and a brief history from the American perspective can be found in Department of State. Areas in the United States and the U.S.S.R. Mutually Closed to Travel by Citizens of the Other Country, folder "US-USSR Exchanges: Maps, Bulletins, etc.," box I-610, ACLS records, LOC.

[97] On Meyer, an obituary: Ronald M. Peters, Arlene W. Saxonhouse, William Zimmerman, John E. Jackson, and Lucian W. Pye, "In Memoriam. Alfred G. Meyer," *PS: Political Science and Politics* 32, no. 3 (1999): 617-619, www.jstor.org/stable/420657.

[98] V.A. Vinogradov to Frederick Burkhardt, October 31, 1963, box II-790, folder "Correspondence with Academy of Sciences of the USSR. 1963," ACLS records, LOC.

There was a logic in this letter that showed respect and continuation of good intentions but reaffirmed a strong ideological position and a desire to avoid unproductive confrontation. Nonetheless, rejections constituted roughly five to ten percent of reviewed applications, and the majority of candidates were approved, including historians, philosophers, and political scientists.

1960-1970: going steady

Every year of the program American exchange scientists would submit reports to the NAS about their short national and international conference trips, one-month lecture visits, or longer, up to six months, research stays in the Soviet Union. Once workable protocols for organizing and negotiating exchanges were established between the academies, the tensions and awkwardness of encounters gradually eased. Apart from regular spats with the State Department over visa issues and semi-regular irritation with the Soviet bureaucratic ways and slowness in responding to mail, the NAS exchanges went smoothly. The communication, if not permanent, became regular, consistent, and even normalized for the American scientific community. Over time, too, fewer unpleasant surprises were awaiting new and returning visitors upon arrival in the U.S.S.R. This mitigation of problems signaled that participants had gained a better sense of expectations and could more accurately gauge the capabilities of their Soviet counterparts. Even more importantly, the productivity of exchanges increased, and meaningful professional conversations happened on a regular basis between experts, with scholarship (and even data) circulating more freely.

The meticulous note taking, record keeping, and experience sharing also proved to be helpful in advancing international cooperation. Having understood enough about the

Soviet ways of organizing and administrating exchanges from colleagues, later academics learned to work with the system to achieve their research goals and thus make travel more productive and enjoyable. Depending on their personality, status, and interests, U.S. scientists learned strategies to communicate their interest in specific institutions, insist on their prioritized activities if there was resistance, make friends, get information, travel to locations outside the pre-arranged program, and be creative while abroad. The secret recipe for success was tacit cultural knowledge, reasonable expectations, individual initiative, positive attitude, and a pinch of can-do spirit.

On his nine-month exchange trip to the Soviet Union, the aerospace engineer John E. Anderson applied multiple strategies to make his visit as productive as possible. His home base for the trip was the Institute of Heat and Mass Transfer in Minsk, the capital of Belarus (then Belorussian Soviet Socialist Republic). Upon his initial arrival to Moscow—all international flights to the Soviet Union had to go through that city—he met with his Academy facilitator to discuss the schedule of the visit. After six months of research and teaching in Minsk, Anderson was to tour institutions in Moscow, Kiev, Leningrad, and Novosibirsk. Anderson had done his homework. He had researched Soviet experts in his field and institutions at which they worked. Not seeing the Moscow Aviation Institute on the list, he asked to add it and provided the name of a specific expert there with whom he wanted to connect. This request was declined.[99]

Without a moment's reaction, Anderson traveled to Minsk to start his appointment. There he met V. Popov, a Soviet colleague who had returned earlier from an exchange visit to the University of Minnesota, Anderson's home institution. He also struck a good

[99] J.E. Anderson, Report on technical activities on an exchange visit to the Soviet Union, 10 September 1968, folder "IR. Exchange Programs USSR Individuals 1968," NAS.

professional relationship with Popov's supervisor and the director of the Institute Alexey Lykov, whose "general desire for good relations with foreign scientists and his own warmth and humanity of character," Anderson found, "was a great asset to me during my stay in Minsk."[100] Upon arrival, Anderson was asked to teach a lecture course at Belorussian State University, which was not on his proposal or prearranged schedule. He agreed. Teaching, he decided, was an excellent opportunity to get a book written. Better still, he was asked to write the lectures in English and submit them for translation in advance and he offered them "in a form more suitable as a written text; thus I came to realize that I could achieve my ambition of writing a book while in Minsk." He also found the teaching experience informative and rewarding. He learned some of the peculiarities of the Soviet higher education as well as its overlap with the American system. Somewhat tongue in cheek, he reported his impressions of the final exam for his course: "Some did well, others miserably, just like at home. It made me feel that I personally benefitted from my lectures far more than anyone in the class."

Months later, the rejected request to visit the Moscow Aviation Institute paid off in an unexpected way. When Anderson went back to Moscow to start touring relevant academic institutions, it turned out that an institute on the preapproved list could not

[100] Lykov's name in Anderson's report is spelled as "Luikov". There is no doubt, however, that Anderson is talking about the director of the institute Alexey Vasilievich Lykov, Soviet physicist and active proponent of international exchanges and knowledge circulation in his field. Under his leadership the institute started to host heat and mass transfer conferences, one of which Anderson attended. When Lykov died in 1974, the institute was given his name and identifies to this day as "A.V. Luikov Institute of Heat and Mass Transfer of the National Academy of Sciences of Belarus" (for background information, see the institute's website http://www.itmo.by/en/institute/about/).
More on Alexey Lykov, his life trajectory, scientific contributions, and administration (in Russian): V. Predtechensky, *Alexey Vasilievich Lykov: Kommentarii k Avtobiografii* [Alexey Vasilievich Lykov: commentaries to an autobiography] (Moscow: Grifon, 2010).

accommodate him, but given his previous interest in the Aviation Institute, it had been made available for a visit. Not only was this a fortuitous coincidence, but this day also became "the most cordial and most fruitful visit" of Anderson's scientific tour. He teamed up with Erick E. Soehngen, a colleague from the Airspace Research Laboratories of the U.S. Air Force, who had similar professional interests and research institutions to visit. Declining requests of two Americans would have been harder than those of one. Turned down for one request (to meet with a colleague working on similar research problems, to see the magnetohydrodynamic power generator, or visit the Moscow University), Anderson just switched to another. Because he had researched the people, facilities, and technologies in advance and knew what to request that was of interest to him, his six ways from Sunday approach brought good results. Upon request to see the power generator, "they continued to hem and haw" until "there was clearly no point in pursuing the matter further." However, when Anderson wanted to visit the Physico-Technical Institute in Leningrad, an institution for cutting edge solid-state, plasma and semiconductors research, he got in "only after pressing very hard." "As a result," Anderson wrote, "I spent a very fruitful pair of days at this institute, saw many experiments, chatted with many scientists, and gave a seminar."[101]

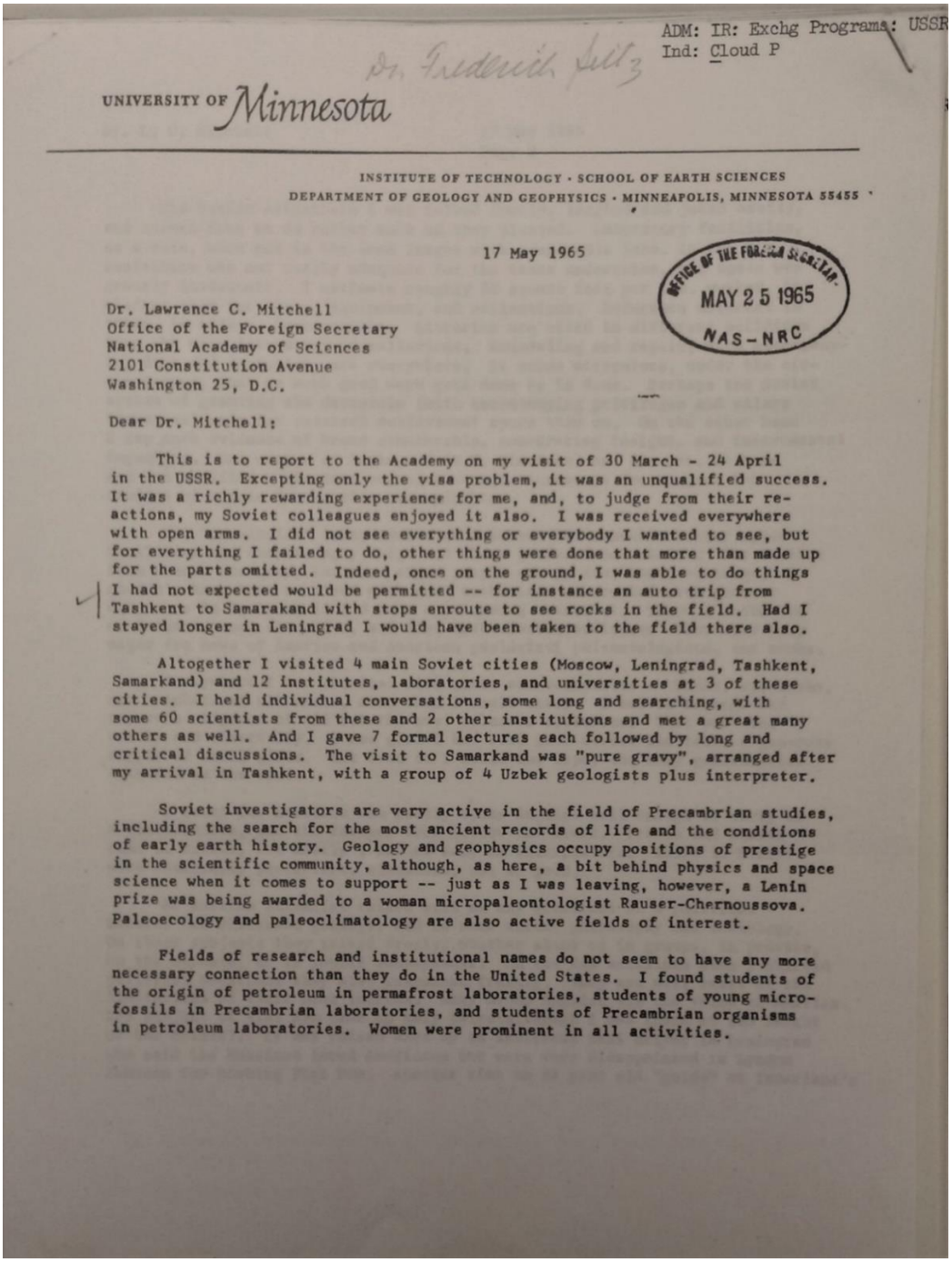
Anderson's strategies and experiences were individual but not rare or unique. They were shared by many American exchange scientists, and many of them had positive experiences on their Soviet trips (see example in Fig. 1). Personal communication, professional friendships, accessing available if scarce Soviet scientific publications, pre-travel research in newly available reference books on Soviet scientists or even, time

[101] J.E. Anderson, "Report," NAS.

permitting, taking a Russian class, or exploring Russian culture in advance —all means came in handy to establish productive and amicable relationships.[102]

[102] A "who is who" type of reference book on Soviet scientists became available in 1963. It covered only members of the Soviet Academy of sciences, leaving mid-level scientists outside of the scope, but it nonetheless provided a good starting point for Americans writing proposals for visits. John Turkevich, *Soviet Men of Science: Academicians and Corresponding Members of the Academy of Sciences of the USSR* (Princeton: D. Van Nostrand Company, Inc., 1963).
On access to scientific papers from the U.S.S.R.: the situation in the 1950s and 1960s can be pieced together from the chapters focusing on Russian as a language of science, the U.S. Cold War impetus for translating Russian academic texts, and the project to develop machine translation in Michael D. Gordin, *Scientific Babel: The Language of Science from the Fall of Latin to the Rise of English* (London: Profile Books Ltd, 2017), 213-266.

Figure 1. Report by geologist Preston E. Cloud on his productive 1965 trip to the Soviet Union with a comment "…it was an unqualified success". Building on this experience, Cloud would go back to the U.S.S.R. twice for his own research in the 1970s.[103]



ADM: IR: Exchg Programs: USSR
Ind: Cloud P

Dr. Frederick Seitz

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17 May 1965

OFFICE OF THE FOREIGN SECRETARY
MAY 25 1965
NAS-NRC

Dr. Lawrence C. Mitchell
Office of the Foreign Secretary
National Academy of Sciences
2101 Constitution Avenue
Washington 25, D.C.

Dear Dr. Mitchell:

This is to report to the Academy on my visit of 30 March - 24 April in the USSR. Excepting only the visa problem, it was an unqualified success. It was a richly rewarding experience for me, and, to judge from their reactions, my Soviet colleagues enjoyed it also. I was received everywhere with open arms. I did not see everything or everybody I wanted to see, but for everything I failed to do, other things were done that more than made up for the parts omitted. Indeed, once on the ground, I was able to do things I had not expected would be permitted -- for instance an auto trip from Tashkent to Samarakand with stops enroute to see rocks in the field. Had I stayed longer in Leningrad I would have been taken to the field there also.

Altogether I visited 4 main Soviet cities (Moscow, Leningrad, Tashkent, Samarkand) and 12 institutes, laboratories, and universities at 3 of these cities. I held individual conversations, some long and searching, with some 60 scientists from these and 2 other institutions and met a great many others as well. And I gave 7 formal lectures each followed by long and critical discussions. The visit to Samarkand was "pure gravy", arranged after my arrival in Tashkent, with a group of 4 Uzbek geologists plus interpreter.

Soviet investigators are very active in the field of Precambrian studies, including the search for the most ancient records of life and the conditions of early earth history. Geology and geophysics occupy positions of prestige in the scientific community, although, as here, a bit behind physics and space science when it comes to support -- just as I was leaving, however, a Lenin prize was being awarded to a woman micropaleontologist Rauser-Chernoussova. Paleoecology and paleoclimatology are also active fields of interest.

Fields of research and institutional names do not seem to have any more necessary connection than they do in the United States. I found students of the origin of petroleum in permafrost laboratories, students of young microfossils in Precambrian laboratories, and students of Precambrian organisms in petroleum laboratories. Women were prominent in all activities.

[103] Preston E. Cloud, May 17, 1965, folder "IR. Exchange Programs: USSR. Individuals, 1965," NAS.

In the course of early exchanges, gradually, amicability became an important goal in itself. The initial setup of the program relied heavily on gaining a measure of information in return for the same amount from the other side. With time, establishing personal contacts and acquiring a better understanding of how things worked on the other end of the exchange helped to overcome more than the emotional resistance toward new experiences and people. A shift from "what do I/we stand to gain from this trip" to "what is my contribution" was important in having visitors shift from outsider to insider mentality. The growing personal engagement of participants aided in overcoming red tape and miscommunications. It also created mutual trust and stability that protected the relationship between the U.S. and Soviet academic communities from disintegrating under the pressure of controversies and even scandals.

Contact, conflict, and scandal

No relationship is without an occasional disagreement. The American scientific group was putting a considerable effort into managing the program from within, but outside factors and issues beyond Soviet red tape and minor inconveniences including quality of food presented a different kind of challenge.[104] The scientific exchange program within the bilateral framework of cultural dialogue between the U.S. and the U.S.S.R. could be seen in very different ways by outsiders and insiders.

An incensed exposé on the cultural exchanges with the Soviet Union was published in April of 1966 in the New York based biweekly magazine *The Reporter*.[105] Penned by

[104] From many comments on this matter, an example: "The food and the service in Russia are bad. I believe this to be an objective fact and it is not a major calamity. It can be lived with, but it must be allowed for." Paul R. Halmos, June 14, 1965, folder "IR. Exchange Programs: USSR. Individuals, 1965," NAS.

[105] George Bailey, "Cultural Exchange as the Soviets Use It," *The Reporter*, April 7, 1966, 20-25, https://www.unz.com/print/Reporter-1966apr07-00020/.

the staunch opponent of the Soviet regime and the future director of Radio Liberty, George Bailey, the article debunked all the "myths" of the program. The author argued that since the Soviets had stopped fighting the American effort to coexist peacefully and discovered the benefit of access to cutting-edge U.S. science and technology, they relentlessly undermined and abused the program. The Soviets, in Bailey's view, had no intention to cooperate but instead created unbearable conditions for the program participants. They sent natural scientists to the U.S. to investigate and collect new knowledge, while America mostly sent humanities scholars (ninety per cent of them, according to Bailey) to the Soviet Union as a simple gesture of good will. Even that benevolence was stymied by the Soviets who denied access to archives to American scholars.

According to Bailey, no Soviets had been caught in espionage through the exchange program with the U.S. for seven years, but that was only a matter of time. There had been a case of a young Soviet economist charged with it in the U.S.S.R.-Netherlands program.[106] Bailey made another quite serious allegation:

> "The majority of Americans in every Exchange Program have been subjected to at least one recruitment attempt by the KGB. Sexual provocations are usually the first stage of such operations. This is the main reason why the Soviets have always balked at American insistence that wives accompany program participants to the Soviet Union (officially the Soviets plead inability to provide family quarters because of the very real housing shortage)." [107]

[106] Bailey, "Cultural Exchange as the Soviets Use It," 21. In the preceding section of this chapter, "Seal of approval", there was a discussion of contemporary diplomatic historians who were skeptical about the scientific exchange program. Their language sounded strikingly similar to Bailey's article; except they argued the opposite. Nigel Gould-Davies stated in 2003 that the majority of Americans had been science people bringing technology to the U.S.S.R. and 90% of the Soviets were humanities people, who brought nothing to the deal.
[107] Bailey, "Cultural Exchange as the Soviets Use It," 23.

All in all, the author stated, the American attempts at continuing the cultural exchange were being met with deliberate obstruction, turned into a waste of administrative and intellectual resources, and put Americans in harm's way for nothing except Soviets' gain.

At least three facts problematize this opinion. First, *The Reporter* and George Bailey himself had a reputation of being actively involved in constructing an image of the U.S. overseas to support American Cold War hegemony and doing so with CIA funding.[108] Given the origin of this information, such reports were biased against the Soviet Union and lacked credibility. Bailey did not reveal his sources, but the article alluded to communication with administrators and exchange participants themselves. Some of these accusations might have been true for other exchange programs under the Lacy-Zaroubin agreement. However, records of scientific exchanges reveal nothing in support of this opinion. There was not a single report submitted to the NAS or the ACLS from an exchange scientist that would support the accusations of Soviet intelligence recruitment attempts. Intelligence agencies of both countries played a part in the exchanges but

[108] On *The Reporter* as partisan media and a propaganda platform, see Elke Van Cassel, "In Search of a Clear and Overarching American Policy: *The Reporter* Magazine (1949–68) and the Cold War," 116-140, in *The US Government, Citizen Groups and the Cold War: The State-Private Network*, ed. Helen Laville and Hugh Wilford (London: Routledge, 2006).
On Bailey, in media: Phil Gailey and Warren Weaver Jr., "New Man at Radio Liberty," *New York Times*, August 31, 1982. Russian literature treats Bailey more judgmentally labeling him a counterintelligence agent in various genres; for example, in an autobiographical novel by a former Radio Liberty employee (Dmitry Dobrodeev, *Bolshaya Svoboda Ivana D.* [The Great Liberty of Ivan D.] (Moscow: Ad Marginem, 2010), 112-113. and a popular history of Soviet intelligence operations (Vitaly Chernyavsky, *Operatsii Sovetskoy Razvedki: Vymysly i Realnost* [Soviet Intelligence Operations: Fantasies and Reality] (Moscow: Alistorus, 2016), 181-183). Neither text is annotated and should be treated with extreme caution as a historical source. They can, however, be seen as cultural evidence of Bailey's presence on the intelligence scene during the Cold War. Bailey's own perspective on the politics of intelligence of his time can be found in David E. Murphy, Sergei A. Kondrashev and George Bailey, *Battleground Berlin: CIA vs KGB in the Cold War* (New Haven and London: Yale University Press, 1997).

mostly at the level of allowing or prohibiting participation (especially around traveling abroad, clearance issues, and fraternizing with foreigners).

Second, in April of 1966, the same month Bailey's article came out, a report was submitted to the NAS by Robert A. Zimmerman, a researcher in molecular biology at MIT who had just come back from a fourteen-month inter-academy exchange trip to Moscow and Leningrad.[109] Zimmermann's twenty-four-page account was a survival manual for other American scholars who were planning a visit to the Soviet Union. This guide suggesting that in the Soviet Union, "as nowhere else, every person's experience is different" was co-written with Zimmerman's wife."[110] She accompanied him on the fourteen-month long trip, which, together with numerous earlier instances of family joining American researchers in the U.S.S.R., counters Bailey's point about the Soviets denying academics' spouses admission on trips.[111] In fact, some American scientists and scholars brought their entire families on one- to two-months guest visits or on research visits which could last anywhere from six to fourteen months. At first, the Soviets resisted this practice based on limited funding for the program as well as for the lack of housing and household amenities comparable to an American family's standard of living.[112] Once it was established in internal negotiations that accommodation for family

[109] Report no. 17, 1 July 1966, folder "IR. Exchange Programs: USSR Status Reports, 1966," NAS.
[110] Robert A. Zimmermann, Report on Some Aspects of Life in the Soviet Union as a Participant in the Interacademy Exchange: February 1965 – April 1966, box II-789, ACLS records, LOC.
[111] The option for American scholars to bring family members on Soviet trips was written into NAS-ACLS-AS U.S.S.R. exchange agreements in 1961 and widely utilized. Warren W. Eason, 4 April 1963, Memorandum to Scholars Planning to Visit the Soviet Union with Their Families, under the Exchange between the Academy of Sciences of the U.S.S.R. and either the National Academy of Sciences or the American Council of Learned Societies, box I-610, folder "US-USSR Exchanges: Correspondence, 1961-1963," ACLS records, LOC.
[112] This gap in material, economic, and cultural approaches to household comforts and appliances became painfully obvious in the so-called kitchen debate between Nikita Khrushchev and Richard Nixon during the American exhibition in Moscow in 1959. Hixson, *Parting the Curtain*, 178-180.

members would not be paid from the inter-academy program funds and the Americans accepted it, the issue was resolved.[113] American participants regained the freedom of choice in whether to take their families on research trips and cover their expenses or to leave them behind. Third, archival records show that opportunities to participate in scientific exchanges were extended to some of the most prominent and acclaimed experts and leaders in their fields.[114]

Going back to Bailey's most intriguing and egregious allegation, that of most American participants undergoing recruitment attempts by the KGB through "sexual provocations," no trip reports submitted to the NAS or the ACLS support it. However, there was a later instance that came as close to a Mata Hari story in the U.S.-U.S.S.R. scientific exchange as a spook afficionado could hope. While on an exchange trip in the fall of 1969, a twenty-six-year-old mathematician Anthony J. Tromba met an attractive

[113] The list of American scientists and scholars who visited the U.S.S.R. in 1970, for example, reveals that 40 out of 106 visitors brought their families along (wives and, in thirteen cases, children). Spravka o priyeme Akademiey nauk SSSR uchenyh iz SShA v 1970 g. [Record of reception by the Academy of Sciences of the U.S.S.R. of scientists from the U.S. in 1970], folder "Spravki o vypolnenii soglasheniy s NAN SShA, 1964-1972" [Records of fulfillment of agreements with the NAS], 579-13-184, ARAN.

[114] Among those who made one or more exchange visits to the Soviet Union, to name a few, were Walter Munk, Bruce Heezen, and Jule Charney (earth sciences); David Pines (physics); George Kistiakovsky and Paul Doty (chemistry), Richard Courant and Einar Hille (mathematics); Selman Waksman and Keith R. Porter (microbiology); Thomas Francis (epidemiology); Ronald N. Bracewell (radio astronomy). The list of their Soviet counterparts included Leonid Brekhovskykh, Yuri Riznichenko, and Gleb Udintsev (earth sciences); Gersh Budker (nuclear physics); Lev Pontryagin and Leonid Sedov (mathematics); Georgy Skryabin (microbiology); Eduard Khachikyan and Nobel laureate Vitaly Ginzburg (astrophysics); Gury Marchuk (computer science); Boris Vainshtein (crystallography), Evgeny Velikhov (hydrodynamics), Arkady Kuzmin (radio astronomy). This list was compiled from multiple NAS and AS U.S.S.R. program reports (for example, folders "IR. E-W Exchange Program General, 1961," "IR. Exchange Programs: USSR Status Reports on Exchanges, 1964, 1966, 1967, 1968," and "IR. Exchange Programs: USSR Individuals, 1965," NAS; folders "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomy sotrudnichstvu po linii AN SSSR, 1961-1963," 579-13-180, "Otchety o nauchnyh svyaziah Akademii Nauk SSSR s nauchnymi uchrezhdeniyami i organizatsiyami SShA za 1968-1977 gg.," 579-13-192, ARAN. The selection of names is in no way comprehensive. However, it does give a sampling of equilibrium of expert scientists' involvement in the exchanges.

young woman on a city bus. They talked wandering the streets of Moscow and stopped at Tromba's hotel room for drinks. The relationship continued in the next couple of weeks, until the young woman offered Tromba "blueprints of secret Soviet aircraft," to which her father allegedly had access. Discombobulated, Tromba sought advice at the American embassy and was told to terminate the relationship immediately, which he did. The story ended there, and Tromba did not report it to the NAS.[115]

There was no known reaction to Bailey's piece from the Soviets. However, later that year the newspaper *Izvestiya*, the mouthpiece of the Soviet government, responded to an offensive article in the *Washington Post* that alluded to an embassy employee making suspicious telephone calls. The result was a slap fight in the media over who was more blatant in spying, the U.S. or the U.S.S.R. About the same time, Marshall D. Shulman, a scholar of the Soviet Union and a Harvard professor, was accused in Soviet media of censoring the mail of two exchange scholars, attempting to convince one of them to defect to the U.S., and sneaking into the U.S.S.R. as a tourist after being refused an official Academy visit. His presumed intention was to collect evidence for his anti-Communist publications.[116]

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[115] Anthony J. Tromba, interview by Anna Amramina, September 2020.
On that visit in 1969, Tromba and two colleagues were involved in a maladroit attempt by the Soviet intelligence to cut communication between Americans and Soviet "disaffected elements including Zionists" and were asked to leave the country. In this typical instance of the information war, an article in *Literaturnaya Gazeta* accused employees of the American embassy of espionage and implicated American scientists for more credibility: Scientists were said to have communicated with pro-Western Soviet colleagues at the request of embassy staff and solicit "slanderous information" from them. The NAS considered this incident and chose not to give it any publicity but discuss it directly with Soviet counterparts. Folder "IR. Exchange Programs: USSR. Difficulties of American Scientists in USSR, 1971," NAS.

[116] V. Mazhorov, "Srabotano FBR," *Izvestiya,* October 29, 1966, 5 [Manufactured by the FBI]; Mitchell to Brown, December 8, 1966, folder "IR. Academies & Councils Abroad. Acad. of Sc. of USSR: Protest Shulman," NAS.

The chairman of the Inter-University Committee on Travel Grants Robert Byrnes sent a letter of protest to an official at the Soviet ministry of education.[117] The NAS president Frederick Seitz exchanged correspondence with Mstislav Keldysh, the president of the Soviet Academy. Seitz expressed concern over Shulman's treatment in Soviet press, vouched for his reputation as a scholar with legitimate research interests, and acknowledged the fact that Soviet press and Soviet academic community were not necessarily expressing the same views.[118] Keldysh's response was slightly nonchalant, pointing out that Shulman came to the U.S.S.R. as a tourist outside of the inter-academy exchange and the incident could be dismissed as unrelated. In internal conferencing about the Shulman case, NAS officials also leaned toward dismissing it but for a different reason, because "it would not be realistic to expect the Soviets—whether Government or Academy—to retract the infamous implications and charges."[119]

By that point, the exchange program had gained enough momentum and its participants enough tolerance and understanding toward each other to carry on by focusing more on their primary goal of continuing the relationship, while ignoring, where

[117] Byrnes to Kulikov, 21 November 1966, folder "IR. Academies & Councils Abroad. AS USSR: Protest Shulman," NAS.
[118] Keldysh to Seitz, 31 January 1967, folder "IR. Academies & Councils Abroad. AS USSR: Protest Shulman," NAS.
[119] Lawrence C. Mitchell to Harrison Brown, 8 December 1966, folder "IR. Academies & Councils Abroad. AS USSR: Protest Shulman, 1966," NAS.

acceptable, the interference of third parties such as politics, press, and propaganda.[120] Similar incidents and larger challenges would appear in the 1970s and throughout the program but with no significant impact on the efficiency of exchanges.

Section 3. The view from the Soviet Academy

The exchanges were officially an American initiative. It was the Americans who reached out to the Soviets, it was they who offered the Lacy-Zaroubin deal and who worked hard to make the exchange acceptable for their counterparts.[121] The seed fell on fertile ground. In the 1950s, there was a pronounced desire within the Soviet scientific community for dialogue with the West. Top Academy officials were making attempts to expose their young researchers to Western science, to initiate exchanges at various levels, and to generate and maintain professional and personal contacts with prominent scholars from the capitalist world. The Soviets had a determination to become part of the global

[120] An earlier scandalous episode contributes to demonstrating the scope of these incidents and the dynamics of building trust within the program. In 1964 Prof. Frederick Barghoorn, a scholar of the Soviet Union like Shulman, was arrested and detained in the USSR on suspicions of collaborating with American intelligence. The NAS sent out a letter of protest to the Soviet Academy, President Kennedy petitioned with the Soviet authorities for Barghoorn's release, negotiations for the next two-year exchange agreement were halted…, and then everything in the exchanges resumed as usual. The publicity of this episode was so wide and impactful that when Barghoorn died in 1991, his obituary in the *New York Times* came out with "detained in the Soviet Union in 1963" in the title. Bruce Lambert, "Frederick Barghoorn, Scholar Detained in the Soviet Union in 1963," *New York Times*, November 26, 1991. Accessed online on June 8, 2020 at https://www.nytimes.com/1991/11/26/obituaries/frederick-barghoorn-80-scholar-detained-in-soviet-union-in-1963.html. Consider also a brief description of this episode in Loren R. Graham, *Moscow Stories* (Bloomington and Indianapolis: Indiana University Press, 2006), 93. The author reveals that Barghoorn indeed had had contacts with American intelligence before the incident.

[121] Saul, "The Program that Shattered the Iron Curtain," 229-233.

scientific community through international organizations.[122] They were primed to match the American initiative with an enthusiastic response.

Enough impetus was created, one might conclude, to power a successful exchange program with the Americans. Yet at the early initiatives of the program seemed to bring considerable discontent over failures. The Soviets often came across to the Americans as uncooperative, secretive, and unwilling to fulfill their end of the mutual and self-defined bargain. They were constantly criticized by American participants for their reluctance, evasiveness, and red tape.[123] Restrictiveness, black-boxing information, blatant refusals to include in the program experts who would be of interest to Americans—these were only a few stumbling blocks for communication, from the American's point of view. Besides Cold War politics and propaganda clashes, it remains important to understand what stood in the way of a seemingly straightforward plan to send a few dozen scholars each year for survey visits, lectures, and internships.

To understand why the exchanges were seen by American participants as a largely worthwhile yet onerous task, it is worth taking a closer look at the Soviet Academy as a

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[122] The USSR increased its presence in international scientific organizations from 18 in 1955 to 82 in 1959.
Konstantin V. Ivanov, "Nauka posle Stalina: Reforma Akademii 1954-1961" [Science after Stalin: the reform of the academy], *Naukovedeniye* 1 (2000), 184-211.

[123] In September of 1960, barely a year into the inter-academy agreement, Detlev Bronk had to address multiple requests and complaints that illustrate the Soviet attitude. In response to petitioning for assistance to science writer Walter Sullivan in meeting with Soviet scientists in August of 1960, the NAS received a terse telegram: "Academy of sciences USSR unfortunately unable render to Sullivan any assistance in August because nearly all scientists are on summer vacations." Evgeny Fedorov to Detlev Bronk, August 4, 1960, folder "IR. US-USSR Exchange of Scientists. Interacademy Agreement: General, 1959," NAS. Benjamin J. Lazan, a University of Minnesota professor, asked to put in a good word for him with President Nesmeyanov to facilitate contacts with scientists during his individual tourist visit to the U.S.S.R. Bronk responded: "…many American scientists have enjoyed professionally profitable visits in the USSR as tourists. The tourist status seems to remove them from the bureaucratic complexities that surround formal exchanges." Bronk to Lazan, September 16, 1960, folder "IR. US-USSR Exchange of Scientists. Interacademy Agreement: General, 1959," NAS.

social structure, an administrative body, and a cultural phenomenon. A better understanding of the Soviet system and making accommodations for its peculiarities became key for many Americans to continue and develop the program. Others, as we saw in the previous section, upon encountering exchanges had little taste for more. This better understanding of scientific administration, ethos, and culture in the U.S.S.R., which proved to be important for successful communication during the Cold War, offers new insight for a historian as well. Setting aside the cynicism of less patient American academics and following the examples of more good-humored ones, we will now focus on the Soviet Academy.

Credibility of Soviet science

The level of scientific advancement in the U.S.S.R. was a source of skepticism in the American community.[124] English-language historiography of Soviet science has been dominated for decades by the tragic fate of Soviet genetics and Trofim Lysenko's academic hegemony under Stalin. This example of a national scientific community being complicit in obliterating a discipline and prosecuting its adepts is often used as a cautionary tale of science in a totalitarian regime crumpling under the pressure of the state to enormous disappointment, resentment, and disapproval of the Western scientific community. The controversy was widely discussed by contemporaries in the West while it was happening and was condemned as "less a branch of science comprising a basis of facts, than a branch of ideology, a doctrine which its proponents seek to impose upon

[124] At that time, even the early successes of the Soviet space program, which were deeply rooted in Soviet scientific research, were doubted and observers believed that "the Soviets owed the success of Sputnik to German scientists and technology (p. 122)." Asif A. Siddiqi, "Germans in Russia: Cold War, Technology Transfer, and National Identity," *Osiris* 24, no. 1 (2009): 120-143.

facts."[125] As historians argue, it undermined trust in Soviet science with the global community and compromised its reputation. However, there is more to the story of Lysenko's ascent and ousting from Soviet science. This case study is so nuanced and full of twists that speak to the dynamics of power between science and the state, scientific internationalism, pseudoscience, different school of knowledge, and credibility that it attracts prominent historians of science who comment on it continuously to this day.[126]

While the "Lysenko affair" still looms large over the history of Soviet science and its acceptance in the West, its place in the history of U.S.-U.S.S.R. exchanges was minimal.[127] Two factors came into play here. First, the American participants found the Lysenko case irrelevant for the purpose of the program and were determined to make it more constructive through exchanges in ecology "instead of stirring up old controversies."[128] Proposing genetics as a topic did not prove very successful in the beginning of the exchanges in 1959—the Soviets refused to include it in the list. Quite possibly, Bronk surmised, "they felt it would save embarrassment in connection with the

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[125] Julian Huxley, *Heredity, East and West; Lysenko and World Science* (New York: H. Schuman, 1949), viii. In the first chapter of this monograph Huxley gives a colorful description of the entire spectrum of responses from the Western society to Lysenko's claims, which shows how widely it was discussed in the scientific community and outside of it: Eric Ashby, *Scientist in Russia* (London: Penguin Books, 1947); Theodosius Dobzhansky, "The Suppression of a Science," *Bulletin of the Atomic Scientists* 5, no. 5 (1949): 144-146; P.S. Hudson and R.H. Richens, *The New Genetics in the Soviet Union* (Cambridge: Imperial Bureau of Plant Breeding and Genetics, 1946); John Langdon-Davies, *Russia Puts the Clock Back* (London: Gollancz, 1949); H.J. Muller, "It Still Isn't a Science: A Reply to George Bernard Shaw," *Saturday Review of Literature*, April 16, 1949, 11.

[126] A concise history and an extensive analytical discussion of the historiography of Lysenkoism, its perception, ramifications, and historians' views are given in William DeJong-Lambert and Nikolai Krementsov, "On Labels and Issues: The Lysenko Controversy and the Cold War," *Journal of the History of Biology* 45 (2012), 373-388.

[127] The term "Lysenko affair" comes from the title of a classic in historians' discussions of Lysenkoism: David Joravsky, *The Lysenko Affair* (Cambridge: Harvard University Press, 1970).

[128] F.W. Went to Detlev Bronk, July 29, 1959, folder "IR. US-USSR Exchange of Scientists. Interacademy agreement: General, 1959," NAS.

Lysenko dispute in their internal affairs."[129] In the 1970s, a decade after the revival of genetics in the Soviet Union at the institutional level, both genetics and ecology would thrive in the U.S.-U.S.S.R. exchanges, which will be discussed in the next chapter.[130] Second, a deeper concern of the Americans that the Lysenko affair brought about was whether Soviet scientific methods and conclusions could be trusted as adequate and proper. Thus, one of the implicit goals of the exchange was to determine the level of credibility of Soviet science that had sprung to success so suddenly and unexpectedly for the Western scientists after WWII. How do you ask a foreign colleague you just met on a two-week visit if their research is legitimate? Would you get an honest and exhaustive answer if you did? Gaining access to the system, seeing it work from the inside, making personal contacts with colleagues and contributing to creating a safe and comfortable atmosphere for discussing specific questions and finding answers for oneself—this was the modus operandi essential for the reliable exchanges.

A state within a state: AS U.S.S.R. as an institution

Americans quickly sensed that Soviet Academy business was not like most other Western scientific communities. This distinction, in their opinion, impeded communication.[131] Some of these differences were openly recognized and addressed in the exchange program with varying degrees of success. Others, aggregated with time and

[129] Detlev Bronk to F.W. Went, September 22, 1959, "IR. US-USSR Exchange of Scientists. Interacademy agreement: General, 1959," NAS.
[130] The Institute of General Genetics of the AS USSR was established in 1965 to take the place of Lysenko's abolished Institute of Genetics, thus reinstating the discipline at the Academy level. Alexander Vucinich, *Empire of Knowledge: The Academy of Sciences of the USSR* (1917-1970) (Berkeley: University of California Press, 1984), 262-263.
[131] Detlev Bronk to William S.B. Lacy, February 19, 1960, folder "IR. E-W Exchange Program General 1960," NAS: "How pleasant it would be if they were truly friendly and reasonable so that our exchange relations would be normal as they are between this country and Britain."

exposure, became tacit knowledge on which many interactions in the program were based. What were these differences specifically? How did they affect the functionality of the Soviet academic system and why were they seen as problematic by the Americans?

The NAS served as an advisory body for the government, a networking hub, a source of funding through the NRC, and an honorary society for elected members. It was involved in policy making and, especially at the time of "postwar consensus," organized and supervised a large volume of interinstitutional and international connections, keeping in touch with individual research structures through members and their colleagues at universities, national laboratories, and private facilities where research was conducted.[132]

Operating quite differently, the Soviet Academy was "the only one of the eighteenth-century academies of science of Europe that continued to dominate intellectually the scientific research of its nation in the twentieth century."[133] It orchestrated and ran a significant portion of the nation's scientific research and had an odd autonomy in doing so.[134] Its institutes and research sites occupied large spaces in major cities and in the provinces. It owned research vessels, organized expeditions locally and globally, built

[132] "Postwar consensus" is a term Bruce L.R. Smith uses to describe American science policy in 1945-1965. His terminology is helpful for understanding connections between trends in national politics and strategies in science policy. Bruce L.R. Smith, *American Science Policy since World War II* (Washington, D.C.: The Brooking Institution, 1990).
[133] Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge: Cambridge University Press, 1994), 178.
[134] Graham, *Science in Russia and the Soviet Union*, 180-181. The Soviet Academy operated on its own budget, quite extensive especially in the two afterwar decades, and had less interference or directives from governing bodies on research than one would expect from the Soviet system. For example, the system exerted enormous pressure on physicists to expedite atomic energy, space, and weapons research and employed both negative (repercussions and threats to personal freedom) and positive motivation which included liberties unavailable to non-academics (status, material benefits, and independence). The range of motivations varied depending on the strategic and ideological value of a discipline. The SAS followed an autocratic model of leadership, and those at the top of the academic hierarchy often belonged to the same elite as the members of the party nomenclature.

housing for its employees, and sponsored schools for talented children. With a long 250-year history, hundreds of research facilities around the country, the Academy was a colossal centralized body.[135] In addition, around the launch of the exchanges, AS U.S.S.R. was going through a major reform aimed at decentralization and growth. It was a state-funded self-governed scientific pyramid and was in the process of rapid expansion of its branches in the Urals.[136] This vast research machine had a complex structure and less transparency in its operation than an outsider from the West might anticipate.

In the American academic system, there was a strong division between sciences and other intellectual pursuits: arts, humanities, and social studies. Historically, several organizations supported both groups, as did the American Academy of Arts and Sciences, but the NAS represented exclusively the natural sciences and mathematics. However, the Soviet academic system, based on the German *Wissenschaft* model, embraced both natural sciences and humanities and had a monopoly on advancing and supporting research in all areas.[137]

This inclusion of the humanities in the Soviet Academy introduced a twist in negotiating exchanges. Reciprocity was the cornerstone of inter-academy agreements. Thus, social sciences and humanities were part of the Soviet academic system, so they would have to be represented somehow. The Soviets were adamant that all exchanges go

[135] Vucinich, *Empire of Knowledge*, ix-x.
[136] Vucinich, *Empire of Knowledge*, 285-292.
[137] Humanities entered the scope of interests of the Russian Academy at the time of its inception in the 1720s. The Soviet Academy reorganized and reintroduced various aspects of its structure but preserved what became the humanities and social sciences as its integral parts. Ye. G. Pivovarov and A.Yu. Skrydlov, "Stanovleniye gumanitarnyh issledovaniy v akademii nauk v nachalny period ee deyatelnosti," in N.A. Ashcheulova, ed., *Nauki Proizvodit I Sovershit: Iz Istorii Rossiyskoy Akademii Nauk* (Saint-Petersburg: Amirit, 2019) ["The establishment of humanities research at the Academy of Sciences in the initial stage of its activity" in *To improve and develop sciences: from the history of the Russian Academy of sciences*].

through one channel (preferably the NAS) as opposed to striking deals with individual American universities.[138] If the NAS could only account for natural sciences, which American entity would administer exchanges in the humanities? The State Department delegated facilitating them to the ACLS, and the problem was solved with creating a second "humanities" channel, to which the Soviets had no objections.[139]

The Americans found persistent demands from the Soviets to send all interaction through one channel befuddling at the beginning. Why limit options for diversity of contacts and put the entire organizational load on the Academy, what difference would it make? The Soviet perspective was orthogonal. One counterpart in the US with equal or similar status of an academy would make things straightforward: a clear chain of accountability, stable or renewable contacts, fewer communication challenges, which also reduced potential embarrassment and hassle over doing in it English.[140] In fact, there were multiple cases of direct contacts between individual scientific institutions despite the "one channel rule." One of the earliest, between the Institute of Oceanology in Moscow and the Scripps Institution of Oceanography in California, initiated a long-

[138] Inter-office memorandum, November 27, 1959, folder "IR. US-USSR Exchange of Scientists. Interacademy agreement: General, 1959," NAS.
[139] Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomy sotrudnichstvu po linii AN SSSR, 1961-1963 [Performance reports for the USSR-US agreement on scientific cooperation through AS USSR, 1961-1963], 579-13-180, 2-3, ARAN; Exchange Agreement with the Soviet Academy, folder "IR. E–W Exchange Program, General, 1961," 1, NAS.
[140] By the end of WWII, English had taken the place of lingua franca in scientific communication globally and it was only reasonable to make it the official language of exchanges. However, the NAS continuously encouraged its longer-term delegates to the Soviet Union to learn at least some Russian. The NAS also enlisted the help of any scientists with prior knowledge of Russian language who were willing to be involved.

standing fruitful collaboration between these institutions.[141] The one-channel strategy simply had to be articulated, even if proforma in some cases, because it created a familiar hierarchy. And hierarchy was of high value in the scientific pyramid that was the AS U.S.S.R.

"Come to Russia, I'll show you everything": hierarchy and networks in the Soviet Academy[142]

Hierarchies. From its inception in the early eighteenth century the Russian Academy was an intensely hierarchical institution with a vertical ascension through ranks. Its Soviet successor inherited many traits of this model.[143] The scientific community in the Soviet Union was a privileged social group with better prospects for access to financial resources, political clout, and personal welfare than members of other white-collar professions.

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[141] Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomy sotrudnichstvu po linii AN SSSR, 579-13-180, 18, ARAN.
Perhaps not surprisingly, geophysics was among the disciplines that pioneered closer US-USSR contacts in research. This was a consequence of a preceding global research initiative, the International Geophysical Year (IGY, July 1957-December 1958). Combining the rise of geophysics as a discipline, an emerging need for global geophysical data sharing, national interests in geopolitics, and Cold War military agendas, the IGY catalyzed many bilateral projects around the globe. Unlike other scientific initiatives, the IGY was well publicized, and its visibility opened many doors to scientific collaboration and joint research in geosciences. There has been a continuous discussion among historians on the aspects, influence, and place of the IGY in the 20th century history. For scholarly accounts, consider: Christy Collis and Klaus Dodds, "Assault on the Unknown: The Historical and Political Geographies of the International Geophysical Year (1957–8)," *Journal of Historical Geography* 34 (2008): 555-573; Fae L. Korsmo, "The Birth of the International Geophysical Year," *Leading Edge* 26, no. 10 (2007): 1312–1316; Rip Bulkeley, "Aspects of the Soviet IGY," *Russian Journal of Earth Sciences* 10, no. 1 (2008): 1-17, http://doi,org/10.2205/2007ES000249; Adrian Howkins, "Reluctant Collaborators: Argentina and Chile in Antarctica during the International Geophysical Year, 1957-58," *Journal of Historical Geography* 34 (2008): 596-617.
[142] Earl Ubell to Bronk, September 26, 1960, "IR. US-USSR Exchange of Scientists. Interacademy agreement: General, 1959," NAS.
[143] Graham, *Science in Russia and the Soviet Union*, 179.

After the wage reform of 1964, Soviet secondary school teachers began to receive a raised monthly salary of 65-115 rubles.[144] At the same time, a junior researcher at a scientific institution with a candidate's degree would receive an average of 200 rubles, with career prospects of producing a doctor's dissertation and/or obtaining the status of professor, which also secured a promotion to a senior researcher with a salary of 400 rubles per month.[145] The gap in incomes was visible but that was not all this elitism entailed. Beyond monetary compensation of labor, the higher up the career ladder, the more access one could get to status, services, information, and material goods, including traveling abroad. [146]

Apropos of traveling abroad, the contemporary state of this concept in the Soviet Union is an important part of understanding the motivations, risks, and reservations that accompanied the exchanges for Soviet scientists. In the 1940s traveling abroad had very different and largely negative connotations in the broader Soviet culture. Stalin's prewar

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[144] N.A. Belova, "Zarabotnaya Plata Sovetskih Uchiteley v 1920-1960-e gg." [Salaries of Soviet teachers in the 1920s-1960s], *Yaroslavsky Pedagogichesky Vestnik* 1, no. 1 (2011): 38.

[145] Maria R. Zezina, "Materialnoye Stimulirovaniye Nauchnogo Truda v SSSR, 1945-1985" [Material incentives for scientific labor in the USSR, 1945-1985], *Vestnik Akademii Nauk* 67, no. 1 (1997): 21-22, 26.
The structure of academic certification in the Soviet Union was more akin to the German system than that of the U.S. A five- or six-year university course roughly equivalent to a master's degree was followed by three to four years of graduate school and a defense of a dissertation for a Candidate of Science degree. A researcher could choose to pursue larger projects and produce a Doctor of Science dissertation that would grant the author the highest academic qualification available. In teaching at university level, the status of a docent was the first stage of certification available to specialists with a candidate's degree based on the number of publications, years of teaching, and their university position during teaching. The next level with similar requirements for specialists with a doctor's degree was full professorship. The research track offered more benefits and professional opportunities than the teaching track, and membership in the Academy was open to both tracks, granted the highest level of recognition, and held the most benefit potential.

[146] Zezina, "Materialnoye Stimulirovaniye Nauchnogo Truda v SSSR, 1945-1985," 24. The author provides statistics from archival and published sources on additional benefits available to Academy employees in the 1940s and 1960s, such as monthly food supplies (those were scarce at times after WWII) and "deficit" consumer goods (clothes, furniture, automobiles, etc.).

espionage witch-hunts, forceful migrations during and after WW II, postwar poverty, and the sealing of national borders cast such stigmas and restrictions on travel and tourism that visiting other countries was simply unthinkable to most Soviet citizens.

All these barriers, however, did not prevent people from dreaming about going abroad or wanting to learn more about life in distant lands.[147] As a rule, access to capitalist countries was occasional, with personal trips off-limits and professional barely possible until the early 1950s. Change came during Khrushchev's Thaw when Soviet foreign policies pivoted from hostile opposition to the West to rapprochement and tourism and contacts with socialist countries became available to limited groups.[148] Travel abroad was still politicized and in many ways elitist, more easily available to top members of the Soviet nomenclature and a few exceptions from intelligentsia. At that time, visiting other countries was opening for average citizens as well. However, like state allocated housing did in the prewar decade, it was becoming a commodity, a bartering item, and an incentive for bribery.[149]

These new opportunities for travel abroad came to the Soviet scientific community as well, although similarly unpredictable. Within this scientific elite, whose praise was collectively sung in popular culture as the intellectual force behind building a communist world, was yet another elite. An average researcher at an Academy institute certainly belonged to a minority whose education allowed him or her to use their knowledge and

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[147] Gilburd, *To See Paris and Die*, 169.
[148] Rogacheva, *The Private Life of Soviet Scientists*, 153-154.
[149] I.B. Orlov and A.D. Popov, *"Skvoz Zhelezny Zanaves." Russo Turisto: Sovetsky Vyezdnoy Turizm*. 1955-1991 ["Through the Iron Curtain." Russo Turisto: Soviet Tourism Abroad. 1955-1991] (Moscow: Vysshaya Shkola Ekonomiki, 2016), 40-42, 99-101. This thoroughly researched monograph written by two Russian historians gives a detailed and rich analysis of the dynamics of Soviet tourism abroad including Soviet scientists.

intellectual power to pursue a white-collar career. However, a director of an institute, a full member of the Academy, or a major contributor to the advancement of Soviet science (all the above roles could be performed by one and the same person) would be of a different caste, and the social differences would at times reach absurd proportions.[150] With a lavish monthly income, a direct line of communication with decision makers of federal magnitude, extensive access to administrative resources, and travel abroad covered from the Academy budget, the Academy president could move readily across some borders while enjoying comforts unavailable to other Academy employees at lower levels and unthinkable to the majority of Soviet citizens.[151] The financial well-being of top tier scientific administrators and researchers allowed them to feel more comfortable and relaxed in the company of foreign colleagues of high societal standing. This sense of belonging to an elite and having access to resources, which spared Soviet scientists feeling like poor cousins with their colleagues abroad, was certainly helpful in exchanges.

Due to this hierarchy, not only opportunities to go to the US but also smaller benefits such as traveling with more comfort were distributed based on a hidden internal logic that was far from fair. An academician returning from a lecturing tour of US universities in 1960 complained in a report that "the choice of second class travel instead of first was

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[150] Evgeny G. Vodichev, "Vsegda li Ponedelnik Nachinaetsya v Subbotu", ili Mify i Realii Sibirskoy "Novoy Atlantidy". Statyia Vtoraya: Realii," [Does Monday always begin on Saturday, or myths and realities of the Siberian "New Atlantis", Part 2: Realities], *Idei i idealy* 2, no. 1 (2018): 34-35. The same point about material privileges of the academic elite is argued with an extensive example base for the Novosibirsk scientific city in Ksenia Tatarchenko, "A House with the Window to the West": The Akademgorodok Computer Center (1958-1993)" (PhD diss., Princeton University, 2013), 59-63.

[151] A.N. Nesmeyanov, *Na Kachelyah XX Veka* (Moscow: Nauka, 1999), 166-171 [On the swing of the twentieth century]; Zezina, "Materialnoye Stimulirovaniye Nauchnogo Truda v SSSR, 1945-1985," 24. The president of the Academy received a staggering 8000 rubles (at post-monetary reform rates) monthly salary in 1950s and 1960s, which was roughly two annual incomes of an average Soviet family of two working adults.

unfortunate; already at leaving Moscow the luggage exceeded the twenty-kilogram allowance, which circumstance had fatal consequences the entire stay in the US." He added in a footnote that other members of the Academy, whom he mentioned by name, were granted first class or an extra luggage allowance and a longer trip.[152]

Soviet participants had other frustrations in the early years of the program, often with organizational issues, during their American trips. Member of the Soviet delegation to the 12th International Astronautical Congress in Washington, D.C. in 1961 were invited by American attendees to stay on, visit research institutions and give lectures on their work. The Americans petitioned the State Department to grant visa extensions to the Soviet group led by the prominent mathematician Leonid Sedov only to receive a negative response. After a round of negotiations, the foreign affairs officer Joseph J. Sisco from the State Department offered a three-day extension on the condition that Soviet scientists remain in Washington. This originated in a nonsensical concern that they might attempt to infiltrate the American Rocket Society's meeting that was being held on the same dates in New York, while two Soviet representatives were officially invited to the meeting.[153]

In the humanities and social sciences exchange, which was generally harder to mediate than the natural sciences due to more frequent occurrences of ideological clashes, researchers routinely had limited access to archives: Arnold Shlepakov, a historian of global social migration and eventually a member of the Ukrainian Academy of Sciences, visited archives, libraries, and universities to collect materials relevant to his potentially sensitive research topic "The role of immigration to the US in the 20th

[152] Otchet akademika I.V. Tananayeva o poezdke v SShA v period 4-25 maya 1960 g. [Report by academician I.V. Tananayev on a trip to the USA on 4-25 May 1960], 579-2-172, ARAN.
[153] Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomy sotrudnichstvu po linii AN SSSR, 579-13-180, 15-17, ARAN.

century" on a four-month trip in 1964-1965. He reported that he was refused a meeting with leaders of the American Federation of Labor and Congress of Industrial Organizations. He was also denied access to records of American labor unions as had been all his colleagues before him who had requested it.[154]

Not all complaints were taken at face value or counted as cases of unfair treatment of Soviet scholars. The Americanist Irina Belyavskaya expressed a concern that American hosts were deliberately "too eager to please," offering so many short visits to different cities and institutions that it took away a significant portion of research time. The Academy modified that assumption with a comment that "evidence is not enough to conclude that the American side is substituting research visits with tourist ones."[155]

Some scientists noticed differences in logic, morals, or practices with genuine bewilderment and curiosity. On his tour of research facilities in the U.S., the Soviet geologist and a corresponding member of the Soviet Academy Yuri Kosygin visited private companies that conducted or commissioned geological research. At Phillips Petroleum he learned about how these businesses operated and noted with some surprise that "spreading falsified data (bluffing) to mislead a client is very common and when several competing firms conspire against one player, this bluff is particularly successful.

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[154] Arnold N. Shlepakov, Otchet o nauchnoy komandirovke v SShA [Report on a research trip to the US], 579-2-279, ARAN. More on Shlepakov and his entanglement with the KGB in scholarly exchanges can be found in Sergei Zhuk, "The "KGB People," Soviet Americanists, and Soviet-American Academic Exchanges, 1958-1985," *The Soviet and Post-Soviet Review* 44 (2017): 152-165.

[155] Otchet o nauchnyh svyazyah mezhdu Akademiey nauk i nauchnymi uchrezhdeniyami SShA v 1963 godu [Report on scientific liaisons between AS U.S.S.R. and scientific institutions in the U.S.A. for 1963], folder "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomu sotrudnichestvu po linii AN SSSR, 1961-1963," 579-13-180, ARAN.

Corbett was talking about it without any reprehension but as a certain virtuoso business skill." [156]

Networks. There was a kind of soft power that Soviet scientists possessed that was gradually revealed to their American counterparts. As if in response to the rigid hierarchy—and in a way, as an unintended product of it—a robust network of informal contacts permeated the Soviet Academy.

Specific to the Soviet system with its planned economy and non-monetary methods of labor motivation, informal networks were a key mechanism of getting things done in the Academy system, from national science policy to private country cabins.[157] These networks stood on personal connections, friendships, family relationships, and other social bonds that are so elusive to a historian, that, as Mark Adams argued, "they leave historical traces, to be sure—but such traces are likely to be scattered in personal photographs, reminiscences, diaries, and private letters."[158]

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[156] Otchet chlen-korrespondenta AN SSSR Yu.A. Kosygina o nauchnoy komandirovke v SShA v mae-iyune 1960 g., 579-2-172, ARAN [Report by corresponding member of AS USSR Yu.A. Kosygin on scientific trip to the USA in May-June 1960]: "Очень часты случаи распространения ложных данных (блеф) для дезориентации конкурента, а когда несколько конкурентов объединяются против одного, то такой блеф бывает особенно удачен. Корбетт говорил об этих комбинациях без всякого порицания, а как об известной деловой виртуозности."

[157] Mark B. Adams, "Networks in action," in *Science, History and Social Activism*, ed. Garland E. Allen and Roy M. MacLeod (Dordrecht: Kluwer Academic Publishers, 2001), 255-276, 265-267.

[158] Adams, "Networks in action," 261. For Adams's definition and description of informal networks at the Soviet Academy see 260-264. He does not provide citations to grey sources on informal networks. When the edited volume with Adams's chapter was published in 2001, scarce materials were available to support his insight into this important phenomenon. More memoirs and scientists' analyses of their Soviet past have emerged since. One of them, an emotional historical encyclopedia based on eclectic sources and personal reminiscences of a Russian biologist, talks about exactly the kind of informal connections, gatherings, groups, and shared memories that Adams invokes for his argument: S.E. Shnol, *Geroi, Zlodei, Konformisty Otechestvennoy Nauki* [Heroes, villains, and conformists in national science], Moscow: Librokom, 2012.

What was the agency of these networks relevant for understanding the U.S.-U.S.S.R. scientific exchanges? Among other things, these networks and informal arrangements in the top echelons of academic administration provided Soviet scientists outside of them access to Western science and contacts with colleagues in the capitalist world.[159] Moreover, this "underground" system of friendships, exchanges of favors, and shared views equipped Soviet academics with organizational power that allowed them to go around rigid rules.[160] "Come to Russia, I'll show you everything" was not simply a turn of phrase. Two people, the president of the Soviet Academy of Medicine Nikolay Blokhin and the head of the Soviet Atomic Energy Commission Vasily Emelyanov, said that in face-to-face conversations to the science editor of the New York *Herald Tribune*, Earl Ubell, in 1960 when he raised the question of NAS-sponsored visits to the U.S.S.R. After these conversations Ubell wrote to Bronk: "Now suppose I got formal

[159] Vladimir Gubarev, *Mstislav Vsevolodovich Keldysh* (Moscow: Komsomolskaya Pravda, 2016), 151-152. This is a popular biography of the Academy president produced by a Soviet/Russian journalist and science writer who interviewed Keldysh several times during his presidency and followed his career. In an interview for Gubarev's book, geologist Nikolay Shilo commented: "…академик Келдыш старался, чтобы наука в дальних краях расширялась. Я был избран членом-корреспондентом АН СССР, меня направляли на разные международные конгрессы и конференции. Все это давало возможность не только устанавливать контакты с зарубежными коллегами, но и знакомить их с достижениями нашей геологической науки." ["Academician Keldysh worked hard to help science in remote regions to develop. I was elected a corresponding member of the Academy of Sciences of the USSR, was sent to various international congresses and conferences. All this provided an opportunity not only to establish contacts with foreign colleagues but also to introduce them to achievements of our geology."]

[160] Lev Altshuler, "K Istorii Sovetskogo Atomnogo Proekta," in *Ekstremalnye Sostoyaniya Lva Altshulera,* ed. B.L. Altshuler (Moscow: Fizmatlit, 2011), 60-70 ["On the history of the Soviet atomic project" in *Extreme states of Lev Alrtshuler*]. The memoirs of the physicist Lev Altshuler, an active participant of the Soviet atomic project, are replete with examples of this mentality. A phone call from a colleague who had friends in high places or political capital could save a career or a life as it did his once (p. 69). Altshuler described this mentality as it was shared with him by the Soviet economist Boris Milner who had traveled to the US extensively: "Я стремлюсь внести разумное начало, не входя в открытое противоречие с системой." [I strive to bring about the rational sense without creating a direct conflict with the system] (p. 63).

commitments from Blokhin and Emelyanov, couldn't we then write to Nesmeyanov and say: "See, Blokhin and Emelyanov say o.k., why not you?"[161] The essence of the issue eluded Ubell at the time: Formal commitments would never say anything like this or would not work if they did. What was expressed in a private conversation had to stay off record to be accomplished. In a society with a dual mentality, one would say things that went with the Party line in public spaces. Privately, the same person would have entirely different opinions and would act on them.[162] This was the Soviet way of conforming with the rules of society while pursuing one's own objectives, one may argue—a hypocritical and corrupt way. Was it all that was, however? Favoritism was criticized in AS U.S.S.R. when abuse of this power was detected.[163] Otherwise, it was a survival mechanism, a reality of Soviet life that Americans were to discover.

The notorious issue of everyday life

A different reality can be hard to comprehend. Whether the term "culture shock" was an operative concept for Albert G. Guy in 1959 or not, he was fully experiencing it on

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[161] Ubell to Bronk, NAS.

[162] Elena Zubkova, *Poslevoyennoe Sovetskoe Obshchestvo: Politika i Povsedndevnost* (Moscow: ROSSPEN, 1999), 220-223 [Postwar Soviet society: politics and everyday life]. On page 221: "В условиях существования системы жесткого социального контроля способом выживания становилась аполитичность или показная (ритуальная) политическая активность." On page 222: "Между властью и народом как будто существовал негласный договор, который, впрочем, время от времени нарушался. <…> Общественное мнение в Советском Союзе было двуликим и сложным, как и сама жизнь в стране, где карались не только действия, но и слова и даже мысли. Поэтому люди часто говорили на собрании одно, а в доверительных разговорах — совсем другое."
["In a system of strict social control apolitical behavior or pretend (ritual) political activity became means of survival. It was as if an unspoken agreement existed between the authorities and the people that was, however, broken every now and again. Public opinion in the Soviet Union was two-faced and complex as was life itself in a country where not only acts but words and thoughts could be penalized. This explains why people often said one thing at a meeting and something completely different in private conversations."]

[163] Zezina, "Materialnoye Stimulirovaniye Nauchnogo Truda v SSSR, 1945-1985," 25.

his six-month exchange trip to the Soviet Union.[164] Guy was the first American academic to travel under the section of the agreement that made provisions for longer term (up to 12 months) exchanges of scientists for conducting scientific work and internships under the first two-year Bronk-Nesmeyanov agreement.[165] At the end of his stay in Moscow, Guy, who was assigned to the Baikov Institute of Metallurgy of the AS U.S.S.R. for the duration of his visit, wrote a letter directly to President Nesmeyanov.[166] Guy's intention was to alert the president to two issues the American metallurgy expert was planning to include in his final report to president Bronk before they found their way into official records. The first issue was the unacceptable, in Guy's opinion, living conditions he was offered in Moscow: "…a six-months period of scientific study cannot meet the requirement of being a "normal scientific exchange" if it is assumed that the scientist

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[164] A brief biographical entry on Albert Guy, *American Men of Science: A Biographical Directory*, s.v. "Albert Glasgow Guy" (New York and London: R.R. Bowker Company, 1967). The term "culture shock" was used in the NAS-ACLS-AS U.S.S.R. exchange program to describe first experiences of American scholars three years after Guy's trip and to prepare Americans for their visits to the Soviet Union. Warren W. Eason, April 4, 1963, Memorandum to Scholars Planning to Visit the Soviet Union with Their Families, under the Exchange between the Academy of Sciences of the U.S.S.R. and either the National Academy of Sciences or the American Council of Learned Societies, box I-610, folder "US-USSR Exchanges: Correspondence, 1961-1963," ACLS records, LOC.

[165] 579-13-80, ARAN. The Soviet interpretation of the terms of the Bronk-Nesmeyanov agreement used to determine the Academy's actions in the US-USSR exchanges for 1959-1960 can be found in the records of the AS USSR. The division responsible for supervising, managing, and keeping records of these exchanges within the Academy was the Department of External Affairs. Reports and protocols of US-USSR exchanges were filed under the category of "contacts with scientific organizations from capitalist countries," which typically generated more responsibility, anxiety, and suspicion about the interaction than contacts with socialist states. These elevated concerns were not ungrounded, given that only ten to twenty years before contacts with organizations and individuals from capitalist states could be arbitrarily construed as espionage with ensuing indictments.

[166] According to Audra Wolfe, "As of April 1960, not a single American had traveled to Moscow under the academy exchange program" (Wolfe, *Freedom's Laboratory*, 2018, 106). According to documents at the Russian Academy archive, two Soviet researchers had an internship at MIT, and Guy, who started his research trip in February 1959, was the single American who came to the Soviet Union that year. One explanation for the discrepancy in data may be that his exchange might have officially gone through the Lacy-Zaroubin, not the Bronk-Nesmeyanov agreement, even though it was organized by the academies.

must be separated from his family for this period. Now, aside from the unreasonable expense and general inconvenience of living in a hotel, there is the fundamental fact that life in a hotel does not represent normal life in any community, Soviet or American."[167]

Guy's strong feelings toward his accommodation might have been completely justified from an American point of view. However, a hotel suite would be the best available option to offer an important guest from the perspective of his hosts at the Academy. Guy might have had no notion of local circumstances, having never been exposed to the history and traditions of everyday life in Russia. To his credit, he familiarized himself with general issues of contemporary housing challenges in Soviet society, which was still recovering from the damage of the Second World War, and he thus was aware of housing shortages in the Soviet Union.[168] What he might not have known was that housing, temporary or permanent, carried social value and had become a commodity under the Soviet planned economy well before 1959.[169] The notion of a vacant cottage set aside specifically for visiting academics was non-existent, and Guy's expectations for being housed with his family according to the comfort standards of the American middle class were utterly unrealistic. Hotel accommodation was also not readily available to anyone who required it. Some higher rate suites permanently reserved

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[167] Guy to Nesmeyanov, 14 March 1959, folder "Perepiska s uchrezhdeniyami AN SSSR po priezdu v SSSR amerikanskih uchenyh dlya chteniya lektsiy, oznakomleniya s rabotoy uchrezhdeniy i t.d.," 579-1-159, ARAN.
As the practice of U.S.-U.S.S.R. scientific exchanges would reveal throughout the 1960-1970s, the Americans' desire to bring family to trips to the Soviet Union was accommodated but not reciprocated. Rare Soviet participants (almost exclusively top-ranking science administrators) brought their spouses along on exchange visits to the United States, but no Soviet scientists ever shared a trip with their children.
[168] Guy to Nesmeyanov, 579-1-159, ARAN.
[169] Natalia Lebina, *Sovetskaya Povsednevnost: Normy i Anomalii ot Voennogo Kommunizma k Bolshomu Stilyu* (Moscow: Novoye Literaturnoye Obozreniye, 2016), 113-118 [*Soviet everyday life: norms and anomalies from military communism to the grand style*].

for Communist Party functionaries and star entertainers and, given the shortage of accommodation for travelers in general, what other rooms were left were often booked and unavailable. Outside of the best kept hotels in Moscow and a few other large cities, an average hotel room left much to be desired in all respects, from interiors to service.[170] From the Russian perspective, a prolonged stay in a hotel suite was historically attributed to important people and granted as a privilege. An earlier example of this tradition would be the case from 1936, when the Austrian physiologist Julius Tandler was invited to Moscow on a two-year contract with the municipal authorities, welcomed as a VIP, and offered a suite at the Nationale for the entire duration of his stay.[171]

Until the opening for visitors in the 1960s of *akademgorodki* (scientific towns), which were built with accommodation for visiting scientists, President Nesmeyanov would have nothing to offer in response to Guy's disgruntled missive.[172] This discontent over the disparity of various kinds of accommodations is but one instance of many challenges that continuously tested the durability of the U.S.-U.S.S.R. scientific exchanges for a while, from food shortages and problems with other supply chains to absurd bureaucratic demands and humiliating border security checks. The Soviets were under more pressure than the Americans. Seen as representatives of their country, its

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[170] On the state of hotel accommodation in post-WWII Soviet Union, its challenges and attempts at reforms and renovations to satisfy the growing demand of international tourism and the influx of foreign visitors to the Soviet Union, see: I. A. Kolupanova, "Osnovnyie Napravleniya Razvitiya Inostrannogo Turizma v Rossii i za Rubezhom v 1950-1960-e gody," *Izvestiya Tomskogo Politekhnicheskogo Universiteta* 321, no. 6 (2012): 211 [Main developments in foreign tourism in Russia and abroad in the 1950s and 1960s].

[171] M. Yu. Borisenok, "Red Vienna and Red Moscow," *The New Past* 3 (2017): 50.

[172] The first *akademgorodok* in the USSR was officially founded in 1957 but became fully operational 2-3 years later in Novosibirsk. In the 1960s, it became a Siberian hub of the US-USSR exchanges, especially in physics. Nesmeyanov was a proponent and architect of the idea of scientific cities in the USSR. See Paul R. Josephson, *New Atlantis Revisited: Akademgorodok, the Siberian City of Science* (Princeton, N.J.: Princeton University Press, 1997); Rogacheva, *The Private World of Soviet Scientists from Stalin to Gorbachev*.

ideology, science, and social values, Soviet academics recurrently found themselves under crossfire from their American counterparts and their domestic authorities for issues they rarely had ways of fixing.[173] Expected to put their best foot forward in the dialogue with the West, Soviets were jammed between two mutually contradicting sets of factors. Traditional rules of hospitality came into conflict with being discouraged from fraternizing with Americans and inviting them to private homes.[174] Putting them up for longer stays in the U.S.S.R. exposed the general modesty of everyday Soviet realities when an ideological objective of exchanges was to promote the Soviet lifestyle.

[173] A 1962 comprehensive Soviet Academy report on activities under NAS and ACLS exchange agreements states in the conclusion: "A peculiarity has been detected in the course of fulfilling the agreement, i.e. many American scientists bring their families along to the U.S.S.R., which requires solving a whole range of additional issues relating to the stay of family members in the U.S.S.R. [*Russian*: «Следует также отметить еще одну особенность, выявленную при осуществлении Соглашения, а именно: многие американские ученые приезжают в СССР с семьями и это требует решения целого ряда дополнительных вопросов, связанных с организацией пребывания членов семей в СССР»] Otchet o nauchnyh svyazyah mezhdu SSSR i SShA po linii Akademii nauk SSSR za 1962 god, "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomu sotrudnichestvu po linii AN SSSR, 1961-1963," 579-13-180, ARAN [Report on scientific liaisons between the U.S.S.R. and the U.S.A. under the Academy of Sciences of the U.S.S.R. for 1962].

[174] This tacit rule (no official law existed that forbade contacts with foreigners) went both ways. Depending on the status of people involved, the severity of consequences differed. For example, employees of the American embassy would not set foot in a Muscovite's apartment, discouraged from fraternizing with the Russians by the rules of their trade. Loren R. Graham, *Moscow Stories*, 66.

There is no better book to read leisurely about the atmosphere of the 1960s, communication with foreigners, and everyday life in Moscow as experienced by an American scholar than *Moscow Stories*. A participant of the sister program at the time (student exchanges under the Lacy-Zaroubin agreement) and an authority on the history of Russian science, Loren Graham shares personal memories with warmth and deep understanding of many things unspoken, including ignoring rules (p. 25), visiting homes of Soviets (pp. 66-67), and his own experiences with living conditions and housing (pp. 26-27, 80).

These challenges that the Soviets faced could explain the ubiquitous "cultural programs" offered to foreign guests in the U.S.S.R.[175] An evening at the ballet or a concert of classical music, a trip to a historical location or a museum, a guided tour of city sights—frequently all the above—would often be offered, if not imposed, on any foreign visitor including American scientists. The neutral ground of a public venue and beauty of the setting compensated for the stress and could prompt casual conversations. The advice of more experienced Americans who had been treated to these casual chats about life and art was: "Study up!" As a mathematician from the University of Michigan noted in his trip report to the NAS, "it is good for a visitor to come prepared to talk about current American art and literature. I was embarrassed several times by learning that my Russian colleagues knew more about Saul Bellow than I did."[176]

It is a well-established fact that informal, unsanctioned communication with foreigners was not simply regulated by Soviet authorities, it was monitored and, in some cases, persecuted by the KGB. Prior to sanctioned interaction abroad, Soviet citizens including scholars were to be briefed on security and on proper responses to foreigners' questions about the U.S.S.R.[177] Soviet participants of the ACLS-SAS exchange in the

[175] The abundance of these cultural programs was a concern for the NAS in the beginning as they could take time away from research. Role of NAS in American Scientific Community and in Scientific Exchanges with USSR, "IR EW Exchange Program: General, 1961, NAS. These excursions were also mentioned in reports by American scientists, who reported that they were, in fact, a good way of learning more about culture in the USSR. Agricultural economist Philip Raup, for example, collected mementos such as theater programs. See box 37, collection 1028, Raup papers, UMN.
[176] Paul R. Halmos, June 14, 1965, folder "International Relations: Exchange Programs: USSR. Individuals, 1965," NAS.
[177] Alex Hazanov, "Porous Empire: Foreign Visitors and the Post-Stalin Soviet State." (PhD diss.: University of Pennsylvania, 2016), 252-254.

humanities certainly received these instructions from what people habitually called "directive organs."[178]

The U.S.-U.S.S.R. scientific exchange seemed to have escaped such pressures. Security issues occurred on occasion. Some Soviet scientists did not receive approval for international travel, others were not approved by the Americans, but there was nothing on par with restrictions for non-academic tourists or "spy scandals" of the humanities program. There is very little evidence of engagement of Soviet scientific exchange participants in ideological activities. Their colleagues in the humanities would pepper their reports with politically correct phrases to show compliance with the rules. Some scholars would even be zealous enough to grade their American colleagues based on attitudes to the Soviet Union, "friendly," "neutral," "anti-Soviet," or "anti-Communist".[179] Contrary to some scholarly assessments, Soviet scientists had the freedom to focus on the knowledge they gained, new contacts they made, and general comments about their experiences on trips. At a time when at least ritual mentions of proper rhetoric and showing loyalty was expected of any Soviet citizen who went abroad,

[178] Shlepakov, Otchet o nauchnoy komandirovke v SShA, 579-2-279, ARAN. He mentioned casually: "…в беседах во всех названных центрах часто принимали участие и другие специалисты-историки. С их стороны неоднократно задавались вопросы общего характера о современных общественно-политических и экономических процессах в СССР, о постановке исследования в области истории, об основных направлениях работы представляемого мною Института. Ответы давались мной в соответствии с принятыми у нас в печати оценками и разъяснениями, полученными в директивных органах." ["…other fellow historians took part in discussions in all above-mentioned research centers. They often asked general questions about current socio-political and economic processes in the USSR, research methodologies in history, and prioritized research topics at the institute that I represent. My responses were in compliance with assessments published in our press and recommendations given to me by the directive organs."].

[179]For example, a report by Alexander M. Sharkov, a scholar of Japanese economic policies, 579-2-279, ARAN.

this negligence seems extraordinary.[180] An active participant of the scientific exchange and a lifelong collaborator with American colleagues since the 1960s geophysicist Gleb Udintsev gave his explanation:

> The desire of the CP leadership was of course to ideologize and politicize science as much as possible. That's very easy in the humanities and much harder in the natural sciences. The weak link in all this turned out to be biology, in terms of resistance to it, because a person was found who managed to get the trust of the Communist leadership, Lysenko. <…> Attempts to instill such a policy into the other sciences aside from biology did take place, but they were totally fruitless. They achieved nothing. It's very hard to inculcate ideology into geology, geophysics... Therefore, there was no such influence in those sciences.[181]

This intellectual space of "science speak", minimally infused with ideologies and largely populated by apolitical terminologies, concepts, and data provided scientists with opportunities to connect professionally and personally. However, this absence of ideological engagement should not be mistaken for a sterile apolitical environment of "pure science".[182] While prioritizing professional activities, both communities were involved in ethical and political debates of their time. There were occasional problems within the program itself created by bureaucrats, the secret services, and Soviet press intrusions. When those arose, scientists opted for "frank discussions" and choosing not to issue protests for fear of such public actions "being treated as a propaganda gambit,"

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[180] For details on preparing, monitoring, and disciplining Soviet tourists abroad, see Orlov and Popov, *Russo Turisto…,* chapter 8 (129-161) and on the ideological specifics and risks of traveling to the US, see chapter 11 (184-199).

[181] Gleb B. Udintsev, interview by Lynn Visson, July 30, 1997, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD, USA, www.aip.org/history-programs/niels-bohr-library/oral-histories/6946-1.

[182] On Soviet intelligentsia's opposition to official policies and involvement of scientists in resisting, protesting, and evading state control of thought and infringement of human rights, consider Vladimir Shlapentokh, *Soviet Intellectuals and Political Power: The Post-Stalin Era* (Princeton, New Jersey: Princeton University Press, 1990).

showing strong resistance to politicizing the program.[183] They also made attempts to support and protect colleagues from the other side of the exchange.[184]

The ties between academics, intellectual communities, and institutions were growing with the help of the exchange program. By the early 1970s, annual agendas expanded to include something unprecedented, regular bilateral American-Soviet symposia in narrow fields.[185] Despite cultural differences, political disagreements, bureaucratic roadblocks, and propaganda inferences, many American and Soviet scientists and scholars involved in the exchanges shared a premise—work came first. Nonetheless, informal personal ties, shared (or stimulatingly different) ways of thinking, friendships, and mutual admiration ran a very close second.[186]

According to the records of the Russian Academy of Sciences, by 1970, after a decade of excruciating negotiations, tedious bureaucratic paper-pushing, intense travel, and intense dialogue, this vibrant bilateral exchange program… shrank. Statistics show

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[183] Memorandum by Lawrence C. Mitchell, 3 June 1971, folder "IR. Exchange programs: USSR. Difficulties of American Scientists in USSR, 1971," NAS. In 1971, the NAS accumulated six incidents when American scientists were mistreated in the Soviet Union with consequences ranging from being subjected to a thorough search at the airport to expulsion from the country. After discussions, the NAS officials decided against taking diplomatic countermeasures and resort to dealing with controversies internally (between the Academies).

[184] Harrison Brown, "When Soviet and American Scientists Meet" (draft), 1965, folder "IR. Problems between Governments re Exchange of Scientists, 1965," NAS; Anthony J. Tromba to Mitchell, 18 May 1971, folder "IR. Exchange programs: USSR. Difficulties of American Scientists in USSR, 1970," NAS.

[185] For a detailed report on over a decade of US-USSR scientific exchanges and their developments by 1972, consider Philip Handler, "Scientific Relationships between the United States and the Soviet Union," folder "Congress. Committees. Science & Astronautics. Subcommittee on International Cooperation in Science & Space. Hearings: US-USSR Agreements. Testimony: Handler P: Text, 1972," NAS.

[186] A strong argument for the importance of personal connections in the U.S.-U.S.S.R. academic exchanges in the humanities can be found in Sergei I. Zhuk, "Academic Détente": Soviet Americanists as Exchange Scholars during Brezhnev Era," in *New Perspectives on Russian-American Relations*, ed. William Benton Whisenhunt and Norman E. Saul (New York: Routledge, 2016), 240-260.

that the 1968-1969 two-year agreement between AS U.S.S.R. and NAS and ACLS yielded a grand total of 28 people.

Table 1. Exchanges under the 1968-1969 agreement between AS U.S.S.R. and NAS and ACLS.

type of visit	Soviets to the U.S.	Americans to the U.S.S.R.	
AS USSR – NAS (sciences)			
lecturing	2	4	
survey visits	4	5	
research	5	3	
AS USSR – ACLS (humanities)			
research	3	2	
total	**14**	**14**	**28**

This statistic is illusory. In fact, the reality was that the program had outgrown the bounds of the initial two-year agreements by then. Communication was established well enough to allow for direct contacts, considerably less centralized control (reporting to—yes, sanctioning and approving all decisions), numerous bilateral projects had sprung in the humanities and in the sciences and were taken out of immediate control of the inter-academy agreements. In earlier years, all activities were required to be written into the agreements and arranged by the academies (see Table 2).

Table 2. Exchanges between AS U.S.S.R. and NAS and ACLS, 1961.

type of visit	Soviets to the U.S.	Americans to the U.S.S.R.	
AS U.S.S.R. – NAS (sciences)			
lecturing	11	8	
survey visits	13	8	
research	4	2	
total	**28**	**18**	**46**
nat. conferences	31	15	
international congresses	49	767	
individual visits	4	19	
scientific tourism	26	13	
total	**110**	**814**	**924**
AS U.S.S.R. – ACLS (humanities)			

research	0	0	
total	**138**	**832**	**970**

Table 3. Exchanges between AS U.S.S.R. and NAS and ACLS, 1963.[187]

type of visit	Soviets to the U.S.	Americans to the U.S.S.R.	
AS U.S.S.R. – NAS (sciences)			
lecturing	9	8	
survey visits	10	7	
research	3	8	
total	**22**	**23**	**45**
nat. conferences	11	46	
international congresses	33	43	
individual visits & scientific tourism	12	13	
total	**65**	**102**	**167**
AS U.S.S.R. – ACLS (humanities)			
research	7	10	
total	**94**	**135**	**229**

The program was functioning smoothly and was becoming much more about the scholars, not the authorities or Cold War agendas. Political disturbances such as the Vietnam War and the Soviet crisis in Czechoslovakia in 1968 still interfered with the flow of the program but never halted it.[188] Most exchanges and collaborations were now happening outside of inter-academy agreements (see Table 4), and the academies' supervision, still a function of the program, gradually reduced to collecting reports and keeping records.

[187] Data in Table 3 were taken from folder "Otchety o vypolnenii soglasheniy mezhdu SSSR i SShA po nauchnomu sotrudnichestvu po linii AN SSSR, 1961-1963," 579-13-180, ARAN [Reports on fulfilment of agreements between USSR and USA on scientific cooperation via the Academy of Sciences, 1961-1963] and verified against NAS status reports.
[188] Folder "IR. Exchange Programs: USSR status reports, 1968," NAS.

Table 4. Scholarly exchanges outside the scope of inter-academy agreements, 1968-1969.[189]

type of visit	Soviets to the U.S.	Americans to the U.S.S.R.	
sciences & humanities			
international congresses	133	723	
national conferences			
lecturing & research	137	217	
individual guests of AS	6	42	
scientific tourism	93	120	
invited to serve on editorial boards	(American journals) 14	no data	
elected to academies/societies	7	no data	
total	**390**	**1102**	**1492**

The initial scaffolding of the relationship that had been based on strict reciprocity between two state-affiliated units providing all organizational support and scientific guidance was no longer crucial for the survival of the program. Nor was it a requirement. Even with smaller numbers of visitors on the Soviet side of exchanges, numerous academics from the US.S.R. acquired access to American research and shared their own facilities in an ongoing process. President Keldysh noted casually at a meeting of the Presidium of the AS U.S.S.R. in 1972 that, although his own trip to the U.S. that year was

[189] Table 3 reflects the same period as table 1, 1968-1968. Data in tables 1 and 3 were taken from folders "Otchety o nauchnyh svyaziah Akademii Nauk SSSR s nauchnymi uchrezhdeniyami i organizatsiyami SShA za 1968-1977 gg." [Reports on scientific contacts of the Academy of Sciences of the USSR with institutions and organizations in the USA from 1968-1977], 579-13-192, ARAN, and verified against NAS data, "Summary Report. Second Meeting. Advisory Committee on Scientific Exchanges with the Soviet Union. October 21, 1961," folder "IR. E-W Exchange Program. Committee on Scientific Exchanges: Adv, 1961," NAS.

his first exposure to the American academic system, many members of the Presidium had already been to the U.S. and knew it quite well.[190]

The early U.S.-U.S.S.R. scientific exchange program became a pilot project and training grounds not only for the mechanics of inter-academy communication. It also exposed American and Soviet scientists to a better, deeper understanding of each other's worlds. This practical and cultural knowledge combined with mutual interest in research in new areas of scientific expertise opened doors to closer dialogue and more projects. A pivot from formal exchanges to collaboration in the U.S.-U.S.S.R. scientific communication came with another development in bilateral politics, the Moscow summit of 1972. The winds of the Cold War were changing, so were the global map and the scientific understanding of the planet.

During Richard Nixon's official trip to Moscow, the first American presidential visit to the Soviet capital in history, several significant bilateral agreements were signed. Among larger Cold War agendas at the summit, such as Strategic Arms Limitation Talks, was a modest agreement on cooperation in the field of environmental protection. Apart from the fact that the title openly stated an interest of the two signatory nations in environmental protection, a nascent concept and new global concern, this agreement was a gateway for scientists. Rather than exchanges of earlier accords, it stipulated joint in situ research and recurring narrow-field bilateral symposia in life and earth sciences to detect and scientifically address human induced environmental hazards. This new episode

[190] Stenogramma zasedaniya prezidiuma Akademii Nauk SSSR [Shorthand notes of a meeting of the Presidium of the Academy of Sciences of the USSR], December 14, 1972, folder "Materialy peregovorov mezhdu AN SSSR i NAN SShA (protokoly, spravki, programmy)," 579-13-199, ARAN.

in the history of U.S.-U.S.S.R. scientific relationships carried an entirely new level of collaboration.

CHAPTER 2
The agreement: "a new ball game with the Soviets…?"

Recap

From the late 1950s to the early 1970s the U.S.-U.S.S.R. inter-academy exchange described in the previous chapter helped to establish a stable channel of communication between the two scientific communities. The strategic goal of the exchanges was to "let one another in" the previously unattainable world of national science. The two academies, other institutions, and individual scientists put considerable efforts into establishing protocols for consistent exchanges of people and information, familiarizing themselves with the state of affairs in scientific disciplines in the other nation, and sharing their own expertise. As a result, some openness was achieved where none had been before. American physicists, chemists, microbiologists, and other experts now had the option of visiting Soviet colleagues at their place of work, attending a national conference, or joining an international congress held in the U.S.S.R. A small number of early-career American scientists could take up to a year-long research trip to work at a relevant academic institution on the other side of the Iron Curtain. The same possibility became available to Soviet scientists. Moreover, this was not merely an option to consider—a quota of visits was to be fulfilled annually in both directions.

Scientific communication between the United States and the Soviet Union continued for the entire duration of the Cold War. In the early 1970s, several contemporaneous events and processes came together to foster further expansion of American-Soviet scientific dialogue. This chapter explores ways in which directly engaged participants contributed to the creation of more substantial opportunities for joint research projects

between American and Soviet scientists, activities that had been largely unavailable in the exchanges of the 1950s and 1960s.[191]

Joint work allowed for more than exposure to current developments and research methodologies in the other scientific community. The focus of this new dialogue shifted from learning about one another to creating collaborative scientific expertise. This stage of rapprochement, however, still demonstrated mixed motives, undercurrents, and other complexities that accompanied intercultural communication in Cold War science.[192] The U.S.-U.S.S.R. vector of the Cold War took its course in politics from hostile opposition between 1945 and the mid-1950s to the détente of the 1960s and 1970s to the stalemate of the "evil empire" that followed the 1979 Soviet invasion of Afghanistan.[193] However, the scientific conversation between American and Soviet communities did not always follow that course. Instead, when challenged by new political controversies and bureaucratic roadblocks, more scientists continued to make their own professional and personal choices that sustained collaboration.

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[191] Loren R. Graham, "Aspects of Sharing Science and Technology," *Annals of the American Academy of Political and Social Science* 414 (1974): 84-95.

[192] The argument for contradictory scientific practices in the global Cold War is important for understanding the late twentieth-century science and its entanglement with military and geopolitical national interests. These historians of science established and discussed the many aspects of this argument in chapters of edited volumes (Michael Aaron Dennis, "A Polar Perspective," in *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*, ed. Roger D. Launius, James Rodger Fleming, and David H. DeVorkin (New York: Palgrave Macmillan, 2010), 13-22; Ronald E. Doel, "Scientists, Secrecy, and Scientific Intelligence: The Challenges of International Science in Cold War America," in *Cold War Science and the Transatlantic Circulation of Knowledge*, ed. Jeroen Van Dongen (Leiden and Boston: Brill, 2015): 9-35), articles (Katrina Dean, Simon Naylor, Simone Turchetti, and Martin Siegert, "Data in Antarctic Science and Politics," *Social Studies of Science* 38, no. 4 (2008): 571-604), and books (Naomi Oreskes and John Krige, *Science and Technology in the Global Cold War* (Cambridge: MIT Press, 2014).

[193] Melvyn P. Leffler, *For the Soul of Mankind: The United States, the Soviet Union, and the Cold War* (New York: Hill and Wang, 2007), 353.

Section 1. Bilateral politics: détente, continued

In June 1972, President of the National Academy of Sciences of the United States, Phillip Handler, was summoned to give a testimony in Congress on scientific ties with the Soviet scientific community. He prefaced his nineteen-page long report with the following emphatic statement:

> "Let me make it plain, at the outset, that I consider the totality of these agreements to be a truly major achievement and that I hope that they will be implemented with imagination and in the spirit of good will which, patently, underlies them. They offer hope that the history of mankind may have turned a corner—and in the right direction. That note of high optimism does not so much reflect the actual language of the signed protocols but rather the fact that it was possible for the President of the United States constructively to discuss arms control and cooperation in matters relating to science, space, the environment, public health and the uses of technology with the leaders of the Soviet Union. It was the very fact of the signature of these protocols, more than what was signed, that I hold to be of such great significance."[194]

The protocols that so enthused Handler were the eight bilateral agreements signed by President Richard Nixon and the leaders of the Soviet state, General Secretary of the Communist Party Leonid Brezhnev, Premier Alexey Kosygin, and Chairman of the Presidium of the Supreme Soviet Nikolai Podgorny in Moscow in late May of 1972. The Moscow summit was a milestone in Cold War politics. The first official visit of an American president to the Soviet Union since Franklin Delano Roosevelt attended the Yalta conference in 1945, Nixon's trip to Moscow was a diplomatic breakthrough in itself. In addition, the accords to be signed at the summit also held significant promise for relaxation in global politics and the relations between the U.S. and the U.S.S.R. [195]

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[194] *U.S.-U.S.S.R. Cooperative Agreements in Science and Technology: Hearings Before the Subcommittee on International Cooperation in Science and Space of the Comm. on Science and Astronautics*, 92nd Cong. 76 (1972) (statement of Dr. Philip Handler, President of the National Academy of Sciences of the United States).

[195] Gordon R. Weihmiller and Dusko Doder, *U.S.-Soviet Summits: An Account of East-West Diplomacy at the Top, 1955-1985* (Lanham: University Press of America; Institute for the Study of Diplomacy, Georgetown University, 1986), 54.

Most known in diplomatic history as the crowning moment of the three-year long Strategic Arms Limitation talks, the Moscow summit "represented a dramatic tilt in the balance of the Cold War,"[196] The Strategic Arms Limitation Treaty (SALT I) and the Anti-Ballistic Missile Treaty (ABM) were immensely important steps in nuclear non-proliferation. They froze production of intercontinental ballistic missiles and limited each signing party to two anti-ballistic missile launch sites, thus precluding the U.S. and the U.S.S.R. from stockpiling nuclear arms and expanding threat potential.[197] Another negotiation success also attributed to the Moscow summit was known as the "Basic Principles" of U.S.-U.S.S.R. political interactions, a somewhat weak diplomacy attempt to divert from open competition to working jointly to avoid confrontation.[198]

SALT I and ABM were two of eight bilateral agreements signed at the momentous Moscow summit. The other six had less impact on the global Cold War but promoted prevention or peaceful resolution of possible conflicts on other levels. These six complementary protocols represented American and Soviet intention to ensure safe and productive collaboration on bilateral issues in medicine, science, and technology, legal matters, economy, and environmental protection.[199] The one directly relevant to the history of earth sciences was the Agreement on Cooperation in the Field of Environmental Protection (for shorthand, CFEP in the text hereafter) signed by President Nixon and his Soviet equal in protocol rank, Chairman Podgorny.[200] Kissinger's plan for

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[196] David Reynolds, *Summits: The Six Meetings That Shaped the Twentieth Century* (New York: Basic Books, 2007), 247.
[197] Weihmiller and Doder, *U.S.-Soviet Summits*, 60.
[198] John Lewis Gaddis, *Strategies of Containment: A Critical Appraisal of Postwar American National Security Policy* (New York: Oxford University Press: 1982), 318.
[199] Reynolds, Summits, 271.
[200] Kissinger, *White House Years* (Boston: Little, Brown and Company, 1979), 1216.

these six subsidiary agreements presumed that "if we denied the Soviets all opportunities for expansion and kept the door open for genuine cooperation, we might inculcate habits of moderation and bring about a more constructive future." In fact, the protocols worked in ways he may not have anticipated for science and technology exchanges between the U.S. and the U.S.S.R.[201]

The collaborative effort of one of these subsidiary agreements has become not only common knowledge but a famed Cold War rapprochement feat publicized in press, popular books, documentaries, and museum culture.[202] The Nixon-Kosygin agreement concerning cooperation in the exploration and use of outer space for peaceful purposes gave birth to the dramatic 1975 Apollo-Soyuz mission, one of the most renowned successes of U.S.-U.S.S.R. collaboration in science and technology and peace-making.[203] While "the diplomatic event which symbolically terminated the Space Race" made it to first page news worldwide, no activity under the environmental agreement or any other subsidiary

[201] Kissinger, *White House Years*, 1203-1204.
[202] A popularized report was published by NASA, Edward Clinton Ezell and Linda Neuman Ezell, *The Partnership: A History of the Apollo-Soyuz Test Project* (National Aeronautics Space Administration Scientific Technical Information Office, 1978). A brief historical account can be found in Jennifer Ross-Nazzal, "Détente on Earth and in Space: The Apollo-Soyuz Test Project," *OAH Magazine of History* 24, no. 3 (2010): 29-34. Debbora Battaglia, "Arresting Hospitality: The Case of the "Handshake in Space," *The Journal of the Royal Anthropological Institute* (2012): S76-S89, and Thomas Ellis, "'Howdy Partner!' Space Brotherhood, Détente and the Symbolism of the 1975 Apollo-Soyuz Space Project," *Journal of American Studies* 53, no. 3 (2019): 744-769 offer contemporary scholarly analyses. To name one example from the museum culture, the National Air and Space Museum, Washington, D.C., has a reproduction of the culmination of the Apollo-Soyuz test project on permanent display, https://airandspace.si.edu/multimedia-gallery/2005-15152hjpg.
[203] Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age* (Baltimore and London: Johns Hopkins University Press, 1997), 430-431. NAS official Gerson Sher argues in the analytical memoir discussed in chapter 1 that the Apollo-Soyuz Test Project "was never actually an integral part of the space agreement" (Sher, *From Pugwash to Putin*, 26) and, being an engineering effort, should not have counted as a joint research project. This is somewhat misleading as article 3 of the space agreement clearly listed an Apollo-Soyuz docking as a major objective of the cooperation for "conducting joint scientific experiments in the future" among other goals ("Agreement Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes," *International Legal Materials* 11, no. 4 (1972): 768).

ones signed at the Moscow summit received such publicity.[204] Space exploration was a captivating topic, and the space race took the Cold War competition beyond the Earth's bounds. Other proposed collaborations were less newsworthy and had lower political stakes in the Cold War game.

Section 2. From environmental policy to environmental science

The agreement on cooperation in the field of environmental protection was one of these low-stakes arrangements. Conceived and drafted by the Americans, it is described as an initiative of the Council on Environmental Quality with the Executive Office of the President to promote the emerging environmental practices of the U.S. and "win positive publicity" during the summit.[205] The Soviet counterparts shared the intention to use the CFEP agreement to political ends. Nowadays historians argue that the Soviets signed CFEP largely in pursuit of "instrumental manipulation of environmental collaboration," with little to no interest in protecting the planet but to make up on the diplomatic front for the withdrawal from the United Nations Conference on the Human Environment in Stockholm.[206] On the national scale, historians point out that the Soviet authorities only pretended to introduce environmental

[204] Battaglia, "Arresting Hospitality," S76.
[205] Sher, *From Pugwash to Putin*, 20; Russell E. Train, *Politics, Pollution, and Pandas: An Environmental Memoir* (Washington, D.C.: Island Press, 2003), 126-127; J. Brooks Flippen, "Richard Nixon, Russell Train, and the Birth of Modern American Environmental Diplomacy," *Diplomatic History* 32, no. 4 (2008): 626.
[206] Giulia Rispoli and Doubravka Olšáková, "Science and Diplomacy around the Earth: From the Man and Biosphere Programme to the International Geosphere-Biosphere Programme," *Historical Studies in the Natural Sciences* 50, no. 4 (2020): 463-464.

policies but never followed them.[207] The country "was an environmental disaster" and the leadership of the U.S. hoped to encourage the Soviet Union to commit to addressing environmental issues through collaboration under this new agreement.[208] Besides, environmental policy was part of President Nixon's signature strategy, and this project fit well with it. Behind this bilateral accord was not only the intention to share the American success in overcoming an environmental crisis but also an attempt to "undermine multilateral cooperation" and bypass the Stockholm conference stalemate between the Eastern bloc and the West.[209]

The agreement was sent down the line of officials to be negotiated and prepared for implementation. The American (Russell E. Train, director of the Environmental Protection Agency) and the Soviet (academician Evgeny K. Fedorov, head of the Soviet Hydrometeorological Service, known colloquially as Gidromet) co-chairs of a joint committee were to supervise programs and projects. They signed a memorandum defining problem areas for investigation written by joint teams of experts. The American did not find the endeavor particularly auspicious.[210] He observed that the CFEP agreement appeared more like a publicity stunt than a truthful and mutually beneficial initiative. The vast range of problems for

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[207] J.R. McNeill, *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (New York: W.W. Norton & Company, 2001), 350. A classic in environmental history, McNeill's book has a single passage on this matter that drives a giant nail into the coffin of Soviet environmental policy efficiency: "…beginning around 1980, poorer countries established their own environmental protection agencies, often given the status of ministry. In many cases, such as Nigeria or Russia, environmental law and policy existed only on paper." For a similar opinion from the American perspective on developments of the environmental crisis in the Soviet Union, see Philips Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (New York: Hill and Wang, 1993), 195.

[208] Flippen, "Richard Nixon, Russell Train, and the Birth of Modern American Environmental Diplomacy," 626.

[209] Perrin Selcer, *The Postwar Origins of the Global Environment: How the United Nations Build Spaceship Earth* (New York: Columbia University Press, 2018), 212-213.

[210] Selcer, *Postwar Origins*, 213; Train, *Politics, Pollution, and Pandas*, 127.

investigation (from air pollution to legislature) and a disconnect in experience, access to technologies, conceptual approaches, and institutional structures between the collaborators could lead to low quality output. In addition, at least in official pronouncements, Soviet leaders were in ideological denial of environmental problems, claiming that a socialist state would never harm its environment.[211]

In a 2003 memoir, Train spoke enthusiastically about multiple trips with his family to Leningrad, the Lake Baikal area, the Soviet Far East (city of Khabarovsk), and Central Asia (Tajik republic) in order to survey CFEP activities in 1972-1976.[212] However, he judged the productivity of the agreement as undeniably underwhelming. Soviet environmental policies were self-serving, their pollution control efforts remained primitive, and their desire to adopt American industrial and digital technology overpowered any other motivation for joint work.[213] Moreover, Train mentioned that by the mid-1980s "the U.S.-U.S.S.R. agreement was still on the books but essentially moribund." During the Reagan era Train's attempts to rekindle environmental dialogue met no support, which forced him to abandon them. His earlier prognosis for the

[211] Train, *Politics, Pollution, and Pandas,* 132: "V.A. Kirillin, chairman of the State Committee for Science and Technology, started off by declaring that "of course, socialism by definition cannot pollute."
[212] Train, *Politics, Pollution, and Pandas,* 127.
[213] Train, *Politics, Pollution, and Pandas,* 132.

productivity of CFEP came true (or so he felt)—beyond one problem area out of eleven nothing useful or concrete came out of it for the American side of the agreement.[214]

Train's pessimism over helping the Soviets to raise their environmental awareness and the negative views of historians and other analysists on Soviet environmental policies may be accurate assessments for the political realm. However, they do not reveal the entire picture of interests and approaches to environmental issues and nature protection in the Soviet Union outside politics.[215] Neither do they do justice to the CFEP agreement because the unconventional trajectory of its development in the 1970s and 1980s is little known. Having fallen out of sight of politicians soon after the signing, the agreement took on a life of its own in a different arena, earth and environmental sciences. In fact, when the American leadership

[214] Train, *Politics, Pollution, and Pandas*, 133. Interestingly, the somewhat loaded term "problem areas" was soon changed to "working groups" in all official paperwork regarding the agreement as, perhaps, more accurately reflecting the collaborative nature of activities rather than emphasizing the negative connotation of "problems". They will be referred to in this dissertation as "working groups" (WG) by the Roman numbers they were assigned in the memorandum of implementation that defined them. "Memorandum of Implementation of Environmental Agreement," *International Legal Materials* 11, no. 6 (1972): 1408-1415.

[215] For three decades the complexities and controversies of Soviet ecology, conservationism, and environmentalism have been the subject of historians' research. Notable contributions have been made, for example, by Kendall E. Bailes, Douglas R. Weiner, Paul R. Josephson, Julia Lajus, David Moon, Stephen Brain, and Andy Bruno. Two recent edited volumes move from the grand narratives into deep analysis of specific case studies in Russian environmental history: Nicholas B. Breyfogle, ed., *Eurasian Environments: Nature and Ecology in Imperial Russian and Soviet History* (Pittsburgh: University of Pittsburgh Press, 2018) and David Moon, Nicholas B. Breyfogle, and Alexandra Bekasova, ed., *Place and Nature: Essays in Russian Environmental History* (Cambridgeshire: The White Horse Press, 2021). Following industrial pollution limits and standardizing environmental control and safety measures were routinely challenged in the Soviet Union, but the system of their development was in place since the end of WWII and was hardly rudimentary (for an overview of this history see Christopher Burton, "Destalinization as Detoxification? The Expert Debate on Industrial Toxins under Khrushchev," in *Soviet Medicine: Culture, Practice, and Science*, ed. Frances Lee Bernstein, Christopher Burton, and Dan Healey (DeKalb: Northern Illinois University Press, 2010), 237-258); for a critical review essay on understanding Russian/Soviet environmental policies and their depictions in Western scholarship, see David Moon, "The Curious Case of the Marginalisation or Distortion of Russian and Soviet Environmental History," *International Review of Environmental History* 3, no. 2 (2017): 31-50.

was just beginning to discuss the possibility of this environmental initiative to take the form of a bilateral agreement, the National Academy of Sciences set a similar plan in motion.

In January of 1971 two representatives of the NAS, the geophysicist Thomas F. Malone and the adviser on international environmental law Henry J. Kellerman traveled to Moscow for a meeting with Soviet colleagues.[216] Following the established inter-academy communication routines, the NAS president Philip Handler had negotiated this discussion with the Soviet Academy president Mstislav Keldysh in late 1970. The sole purpose of the meeting was to explore opportunities for bilateral collaboration in environmental research with the corresponding member of the AS U.S.S.R., hydrogeologist Vladimir N. Kunin and his associates. Kunin was considered a good match for this conversation. A prominent hydrologist, he served as a representative of the Soviet Union on the Economic Commission for Europe and the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions and could have clout. The conversation was very preliminary, and Kunin did not share the enthusiasm of his American colleagues for establishing a "worldwide institute for the environment" without a governmental directive or securing funds. However, he was optimistic about a global monitoring system for pollutants (if it was based on national systems and cleared for releasing data—rigid secrecy policies were still imposed by Soviet national security authorities on a lot of scientific data). Kunin was concerned about pollution rates in the U.S.S.R. and even confessed that it was his belief that his own chronic health issue might have been caused by bad air in Moscow. Nonetheless, Kunin was skeptical about an intergovernmental agreement on environmental protection and

[216] Thomas F. Malone's biographical memoir can be found on the NAS website: http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/malone-thomas.pdf.

reluctant to push for it without governmental approval. National scientific communities should continue to bring it up to their respective governments—that was as far as he was prepared to go.[217]

There had been attempts to launch joint research projects before the CFEP agreement, all stymied by red tape or national security issues. As an example, in 1970 the Soviet geophysicist Valeriya A. Troitskaya submitted to the Soviet Academy a proposal for a study of electromagnetic and infrasound phenomena at polar latitudes through a series of measurements conducted jointly by the Institute of Physics of the Earth, Moscow, and the Geophysical Institute at the University of Alaska, Fairbanks.[218] The project implied a one-time exchange of equipment, a consistent exchange of measurements between the two research teams, one-month-long exchange visits for team members, discussions of results, and publication of co-authored papers in peer-reviewed journals. The project was mutually beneficial. Magnetospheric studies were a new rising area of geophysics highly dependent on regional measurement data for a better understanding of the Earth's magnetosphere. The American side would obtain measurement from a Soviet polar locale where magnetospheric events are most pronounced, a research station near the village of Sogra, Arkhangelsk region, and at the Vostok station in Antarctica. The Soviets would receive a "unique cutting-edge" set of American measurement equipment units with more advanced technology and data from an

[217] Thomas F. Malone to Philip Handler, 22 February 1971, folder "IR: US-USSR Cooperation. General, 1971," NAS.

[218] M.A. Sadovsky to A.P. Vinogradov, E.A. Koridalin to Vinogradov, folder "Predlozheniya i perepiska s uchrezhdeniyami AN SSSR po rasshireniyu nauchnogo sotrudnichestva s nauchnymi uchrezhdeniyami, 1970-1972," 579-13-196, ARAN.
Valeriya A. Troitskaya served as the secretary of the Soviet committee for the International Geophysical Year, was an active participant in international research projects and the head of one of four research departments (Earth's electromagnetic field) at the Schmidt Institute of Physics of the Earth—which is to say she was well qualified for this kind of work, cleared for international travel including to capitalist countries, and experienced in dealing with foreign colleagues.

Alaskan array of magnetospheric stations in Thule. The Soviet Academy endorsed the project, so did the University of Alaska and the NAS. Despite the obvious benefit to the Soviet side of acquiring more advanced technology and French-Soviet works already underway at Sogra, the project did not seem to earn the approval of the Academy's Department of Foreign Liaisons (the KGB field office at the Academy).[219]

Another example of initiatives that emerged from direct communication between researchers and fell prey to red tape was a project for joint research in high energy physics. The project was negotiated by the physicist Jay Orear of the Nuclear Studies Laboratory, Cornell, directly with his institutional counterparts at the Lebedev Physical Institute in Moscow and was accepted. However, a disagreement between the U.S. Atomic Energy Commission (AEC) and the NAS brought the plan to a halt. AEC controlled all projects that involved research at American facilities that were affiliated with it. The proposed research was to be conducted at the National Accelerator Laboratory in Batavia, Illinois, that was under the wing of AEC. The Soviets were waiting for NAS approval, and the NAS appealed to AEC, AEC was reluctant to okay an NAS-supervised project at an AEC facility negotiated behind

[219] Robert M. Forcey, Memorandum on Soviet/American joint research project, 30 June 1972, folder "IR: US-USSR Cooperation. General, 1972," NAS. Ostensibly, the proposed locations of research triggered too many security red flags for sharing data. With Thule doubling as an American military base, most of Alaska was restricted for Soviet visitors, while Vostok was involved in Antarctic disputes and Sogra geographically close to the Novaya Zemlya nuclear test site. Information on the French-Soviet Sogra-Kerguelen project on geomagnetic activity comes from folder "Otchety, spravki, informasiya i perepiska o provedenii nauchnyh issledovaniy sovetskimi i frantsuzskimi uchenymi v oblasti geomagnitnyh issledovaniy v sopryazhennyh tochkah Sogra-Kerguelen, 1972-1974" [Reports, records, information, and correspondence on research by Soviet and French scientists in geomagnetic conjugate points Sogra-Kerguelen], 579-13-109, ARAN.

their back and fund it. The matter turned into a tedious game of power and bureaucracy and eventually potential collaborators lost.[220]

These two cases of unsuccessful research initiatives demonstrate two relevant issues. First, they highlight the networks of direct communication between American and Soviet scientist functioning by the early 1970s, in many ways thanks to the inter-academy exchange program of the 1950s and 1960s. Second, by contrast, they reveal the limited significance of an official framework such as an intergovernmental agreement that would provide jurisdiction, funding, and status to this yet unexplored kind of interaction between American and Soviet scientists. Challenges to collaborating were clearly of Cold War nature: direct, i.e., unsanctioned and uncensored communication between collaborators, research in restricted or disputed areas, security sensitive topics, and data sharing were continuously viewed as potential security threats and strategic information leaks by the authorities. Due to a constellation of factors, one of the most impactful being the agreements signed at the Moscow summit, these roadblocks to Soviet-American scientific collaboration would be reduced or removed in the next two decades. Even the fraught issues of nuclear weapons (geographic locations of test sites, data possibly revealing residue or impact, facilities affiliated with resource extraction or weapons production, and individuals involved in the nuclear weapons research) would be resolved to a degree.[221] This did not mean that all restrictions were lifted

[220] Handler to Mitchell, 18 January 1972, Mitchell to Handler, 12 January 1972, folder "IR: US-USSR Cooperation. General, 1972," NAS.
[221] Memorandum to participants in the Soviet program, 29 December 1972, box 1, folder "Memoranda and Letters," Records Relating to the US-USSR Joint Committee on Cooperation in the Field of Environmental Protection 1972-1980; EPA Office of Research and Development, RG 412; National Archives at College Park (hereafter EPA records, NARA). The earliest relaxation of rules was that visitors under the CFEP agreement were no longer restricted from formerly closed areas, including Alaska and the Great Lakes.

and forgotten. However, compared to failed attempts to organize a joint project just before the Moscow summit, the relaxation of limitations under the CFEP agreement was quite dramatic.

The negotiations on environmental collaboration continued in 1971. Another American group, this time of government officials including a representative from the EPA, was dispatched to Moscow for a higher-level and more detailed negotiation about areas of joint investigation. Air pollution measurements, mechanisms and technologies of control, and modeling, effects on human health were discussed. With these concrete suggestions, the project was underway. After that, the involvement of the EPA grew larger and became the running point agency on environmental protection by the time the Moscow summit program took shape.[222] Direct involvement of scientists in the inception of such a program of U.S.-Soviet collaboration played an invaluable role in its development. Once again, as with the Lacy-Zaroubin agreement discussed in the first chapter, a move in the political game opened a window of opportunity for research that had emerged in the scientific community but had met organizational difficulties. With the backing of an intergovernmental initiative, proposed research became sanctioned and funded. All that had to be done now was to jump on the bandwagon and officially write academic interests into the agreement.

Nonetheless, despite significant efforts by scientists, as late as 1972 NAS officials and American scholars commiserated over the Soviets' adamant rejection of any project involving polar regions regardless of the discipline, be it ornithology, volcanology, anthropology, or

[222] Henry J. Kellermann to Lawrence Mitchell, 12 October 1971, folder "IR: US-USSR Cooperation. General, 1971," NAS.

geomagnetism.[223] Data sharing and equipment exchanges were rarely possible.[224] Yet, later that year arctic research was officially put on the list of approved projects under the CFEP agreement.

The broader American scientific community greeted the environmental agreement, as well as other Moscow summit protocols on science and technology, with enthusiasm and high hopes for implementation.[225] Handler's extended review of current and proposed academic projects in the August issue of the NAS's *News Report* evoked a surge in research proposals for collaborative initiatives among the Soviets. Suddenly, the opportunities for joint research became seemingly endless.[226] The NAS was not officially on the books for the CFEP agreement. The EPA acted as the executive agency but extended an invitation to the Academy to be involved in any collaboration projects of their choosing (since the NAS and the EPA were "on parallel tracks in our negotiations with the Soviets nowadays"), and there was no shortage of choices.[227] The Soviet government made a similar offer to the Academy of Sciences of the U.S.S.R. (which had also been already involved). The Academy assumed one of the three leading roles on the Soviet side of the deal, the other two performed by the Hydrometeorological Service and relevant government ministries in the U.S.S.R. The EPA

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[223] Christy G. Turner II to Handler, 5 September 1972, Mitchell to Turner, 10 October 1972, folder "IR: US-USSR Cooperation. General, 1972," NAS.
[224] Anne Lif Lund Jacobsen, "Danish Seismic Research in Relation to American Nuclear Detection Efforts," in *Exploring Greenland: Cold War Science and Technology on Ice*, ed. Ronald E. Doel, Kristine C. Harper, and Matthias Heymann (New York: Palgrave MacMillan, 2016), 179-181.
[225] For example, Christy G. Turner to Handler, A.C. Zettlemoyer to Handler, folder "IR: US-USSR Cooperation. General, 1972," NAS.
[226] Philip Handler, "The Moscow Agreements and US-Soviet Scientific Relationships," *News Report* (National Research Council, National Academy of Sciences, National Academy of Engineering) 22, no. 7 (1972): 8-11 and 22.
[227] Russel E. Train to Handler, 20 October 1972, folder "IR: US-USSR Cooperation. General, 1972," NAS.

shared responsibility with the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Survey (USGS), and the U.S. Coast Guard.[228] Such multiplicity was important-the scope of proposed investigation under the agreement was so broad that no one agency would be able to cover it.

Section 3. Areas of problems, areas of interest

The eleven working groups included in the CFEP agreement could seem a random assemblage of topics, but in fact they reflected quite well some of the major public environmental concerns and scientific research interests of the time. The pollution cluster of working groups (WGs I, II, and III) involved more measurements, comparisons, and data exchanges than scientific research in order to identify current levels of pollution and to find ways of reducing or preventing it. It took the co-chairmen and their staff several rounds of negotiations and some detective work to identify responsible parties—institutions and research facilities—that had sufficient expertise and could perform this kind of work in the U.S. and in the Soviet Union.

[228] Memorandum of the Second Meeting of the U.S.-U.S.S.R. Joint Committee on Cooperation in the Field of Environmental Protection, Washington, D.C., 13-16 November 1973, folder "IR.US-USSR Cooperation: Environmental Protection, 1974," NAS.

Table 5. Structure of the CFEP agreement[229]

working group		projects								
WG I	air pollution	modeling, instrumentation, methodology	stationary source air pollution	particulate abatement technology	ferrous metallurgy abatement technology	transportation source air pollutions				
WG II	water pollution	river basin water quality planning & management	protection and management of lakes & estuaries	effects of pollutants on aquatic organisms and ecosystems		prevention or treatment of discharges				
WG III	pollution in agricultural production		integrated pest management	effects of chemicals on fauna	effects of pollutants on forests and plants	pesticides transportation mechanisms				
WG IV	enhancement of urban environments	urban environment	new communities	impact of construction and disposal of wastes on permafrost areas						
WG V	nature & preserves	conservation of endangered species, wildlife conservation	northern ecosystems	ichthyology & aquaculture	marine mammals	animal & plant ecology	biosphere reserves	arid ecosystems	reclamation and revegetation of disturbed land	
WG VI	marine pollution	prevention and clean-up of oil pollution in the marine environment					effects of pollutants on marine organisms			
WG VII	biological and genetic consequences		comprehensive analysis of the environment				biological and genetic effects of pollutants			
WG VIII	influence of environmental changes on climate	effects of changing levels of atmospheric constituents on climate	monitoring atmospheric constituents that might modify climate	climate modeling	polar research	effects of contamination of the upper atmosphere on climate				
WG IX	earthquake prediction	earthquake prediction	integration of U.S.-U.S.S.R. tsunami (earthquake-produced tidal waves) warning systems							
WG X	arctic and subarctic ecosystems	interspersed among other groups								
WG XI	legal and administrative issues	exchange of information and experience regarding legal & administrative measures for protecting environmental quality								

[229] This is a composite of discussions of projects in EPA memoranda from 1972-1973 cross-referenced against Donald R. Kelley, "American-Soviet Cooperation on Environmental Protection," in *Sectors of Mutual Benefit in U.S.-Soviet Relations*, ed. Nish Jamgotch Jr. (Durham: Duke University Press, 1985), 102-126, and Donald R. Kelley, "Environmental Protection and Conservation," in *U.S.-Soviet Cooperation: A New Future*, ed. Nish Jamgotch Jr. (New York: Praeger, 1989), 83-109.

Looking back at his career, Train spoke rather dismissively about the productivity of the CFEP agreement. Was it really that unsuccessful? The answer would be determined by how productivity was defined by participating historical actors, contemporary participants, and later commentators. For Train as an executive figure entrenched in Cold War politics, success meant gain for the American side—notable political (tame the Soviets) or technological (learn about a secret Soviet technology and use it) advances directly originating in or facilitated by the activities under the agreement.[230] For scientists who participated in the WGs, productivity translated into conducting research that would advance knowledge in their fields, obtaining and sharing new data, and co-publishing.[231] As for historians and other scholars, the CFEP agreement has not commanded much recent analysis, but other contemporary reports in the 1980s, from newspaper interviews to government publications, were more favorable than that of Train.[232] Below is an overview of these U.S.-Soviet programs based on archival records in the both countries, published reports and books, Congress hearings, and communication with participants. They reveal in some detail the activities and policies that determined and

[230] Train, *Politics, Pollution, and Pandas*, 132. In the memoir, Train critiqued his Soviet counterparts for using the CFEP agreement as a pretext for visiting American motor vehicle manufacturing facilities in the hope to pirate technology. This may have been true. At the same time, the majority of the forty-two CFEP projects in eleven working groups had little to nothing to do with consumer technologies. As primary sources of this dissertation suggest, Soviet participants had their own goals for the collaboration, often quite aligned with their American counterparts.

[231] James Rosen, in discussion with the author, August 2019; Thomas Elias, email message to author, April 2021; Vyacheslav U. Khattatov, interview by author, July 2019 (Dolgoprudny, Russia); Frank L. Vernon, interview by author, March 2019 (La Jolla, California).

[232] Nish Jamgotch Jr., ed., *Sectors of Mutual Benefit*; Nish Jamgotch Jr., ed., *U.S.-Soviet Cooperation*. These edited volumes will be cited in the chapter extensively for two reasons. They are the only scholarly publications by historians and Russianists that discuss the CFEP activities, and accounts given in these works were based on communication (interviews and correspondence) with American project supervisors, reliable first-hand sources of information, if only representing the American side of the bilateral work.

supported the success of collaborative projects as well as impediments and obstacles that undermined them.

WG I. Air pollution: a comprehensive approach to a wind tunnel

It is perhaps not surprising that air pollution came first on the list of eleven environmental programs. Transboundary air pollution had been the subject of discussion on the international agenda since mid-1960s.[233] The EPA (1970) was established to deal with water and air pollution and attended to research and prevention measures that were continuously updated and applied in industry and transportation.[234] In the U.S.S.R. the problem was not unknown; in fact, pollution had been studied and policies created by the legislature. Cooperation with American experts was of interest as the Russians noted, "works on atmospheric pollution in the U.S.S.R. and the U.S. have similar goals but are conducted in somewhat different veins and can be used for mutual benefit and refining."[235] The ambitious plan of the bilateral WG I team was to undertake five separate projects involving intellectual resources and technology from research institutions of the Soviet Academy of Sciences and the EPA, the American

[233] Robert G. Darst, *Smokestack Diplomacy: Cooperation and Conflict in East-West Environmental Politics* (Cambridge: MIT Press, 2001), 93-100.
[234] The shift in EPA's interests "away from conventional air pollution" was one of the official explanations for discontinuing this group by the mid-1980s. Donald R. Kelley, "American-Soviet Cooperation on Environmental Protection," in *Sectors of Mutual Benefit*, 110.
[235] Polny otchet o rezultatah komandirovaniya sovetskih uchenyh b spetsialistov za granitsu po linii sovetsko-amerikanskogo sotrudnichestva v oblasti ohrany okruzhayushchey sredy [Full report on results of trips of Soviet scientists and specialists abroad under the Soviet-American cooperation in the field of environmental protection], folder "Otchety o kimondirovkah sotrudnikov instituta za granitsu za 1979 g," 159-1-2020 (records of the Institute of Atmospheric Physics), 4-5, ARAN.

automobile industry, and emission control strategies in transportation to exchange knowledge on sources and control techniques of air pollution.[236]

Working Group I happens to be a showcase of two things that could go right or wrong in these exercises in détente environmentalism as they changed hands from politicians to science and technology experts.

Expectations. The dynamics and the pressures of these exchanges were predicated on the presumption that a "general balance of benefits" was a prerequisite for the entire CFEP program. Both sides assessed their input and output regularly as well as their intellectual and technological gain. The trouble with this utilitarian approach was that scientific results are not always predictable, readily quantifiable, or translatable into benefit. Keeping track of outcomes in the short term put an additional level of stress on projects leaders. The Americans entered WG I with an understanding that their air pollution control measures were superior to Soviet ones and there would be little for them to gain directly from the exchange. They planned to focus on narrow-field tasks: conducting in-situ experiments on air pollution modeling using wind tunnels. The Soviets, in their turn, claimed, if only among themselves, that they were equally informed and not behind the Americans. Perhaps lagging in technological solutions and state control of air pollution, they were nonetheless were working toward developing a comprehensive environmental monitoring system.[237] These differences

[236] Otchet o priyome delegatsii uchenyh SShA v Institute Fiziki Atmosfery, 16 May 1980 [Report on receiving a delegation of U.S. scientists at the Institute of Atmospheric Physics], folder "Otchety o priyome inostrannyh uchenyh v institute za 1980-1981 g.," 166-1-2020 (records of the Institute of Atmospheric Physics), ARAN. For the list of five projects of WG I, see table 5.
[237] Polny otchet o rezultatah komandirovaniya sovetskih uchenyh i spetsialistov za granitsu po linii sovetsko-amerikanskogo sotrudnichestva v oblasti ohrany okruzhayushchey sredy [Full report on results of trips of Soviet scientists and specialists abroad under the Soviet-American cooperation in the field of environmental protection], folder "Otchety o kimondirovkah sotrudnikov instituta za granitsu za 1979 g.," 159-1-2020 ARAN, 13.

could easily create an unnecessary sense of competition or even distrust. When the Americans were denied access to the Institute of Atmospheric Optics in the city of Tomsk, for example, they might have assumed that the Soviets were withholding a potentially beneficial advancement.[238]

Overlap. Transfer of pollutants in atmospheric aerosol was one of the most intriguing and impactful subjects of scientific investigation in transboundary air pollution. It was also on the list of research subjects of WG VIII. Generally, overlap of topics between WGs meant oversight in planning and failure in implementing projects. Overlap created confusion in jurisdiction, strain on human resources, and the thin spreading of funds. However, this group survived the overlap challenge through a joint laboratory experiment in lidar atmospheric sounding conducted successfully at the Abastumani observatory (Georgia). It generated multiple discussions and publications and was a helpful contribution to understanding the physics of the upper atmosphere.[239] The explanation for sustaining this work and a series of field experiments in aerosol transfer in WG VIII is that both projects were supervised jointly by Gidromet and the Soviet Academy, both of which had a robust research base, facilities, and experts, and that American and Soviet participants found common scientific ground. As time showed, other CFEP projects were not as successful in addressing topic overlap and would fold into other groups or dissolve.

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[238] Kelley, "American-Soviet Cooperation," 110. In 1984, Kelley did not offer a reason from the Soviets' reluctance to give the Americans access to the Institute but admitted that the incident almost became a breaking point for WG I as "American scientists regard the latter as essential to the pursuit of exchange goals focusing on pollution measurement and monitoring."

[239] V.D. Stepanenko, ed., *Kompleksny Sovetsko-Amerikansky Eksperiment po Issledovaniyu Fonovogo Aerozolya, Abastumani, SSSR, iyul 1979 g.* [Complex Soviet-American experiment in ambient aerosol] (Leningrad: Gidrometeoizdat, 1986); G.G. Mateishvili and Yu.D. Mateishvili, "Otkuda v Atmosfere Pyl" [Where atmospheric dust comes from], *Vestnik Rossiiskoy Akademii Nauk* 69, no. 1 (1999): 32-34.

WG II. Water pollution: "my brother's brother"

In a summary of the activities of WG II based on informal communication with American participants on collaboration and published in 1989, the American historian Donald Kelley described this group as producing "mixed results."[240] It certainly produced mixed feelings at the beginning, especially among the members of the American team on the project "Effects of pollutants on aquatic ecosystems and permissible levels of pollution." The main counterparts in this project, the EPA's National Water Quality Laboratory in Duluth, Minnesota, and the Institute of Inland Waters Biology in Borok, Yaroslavl region, Russia, were both well-respected and highly productive institutions in the field.[241] They embarked on the project in 1973 to exchange visits by groups of researchers. The first exchanges were not without mutual misunderstandings and frustrations. After the first trips, the Americans realized that the Soviets were eager to show them fish farms and water treatment facilities (which they "could have done without") but were reluctant to share specific data sets. The group also faced a failed planning effort with a workshop in Duluth, Minnesota, in 1974, when the Soviet scientists did not show.[242]

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[240] Donald R. Kelley, "Environmental Protection and Conservation," in *U.S.-Soviet Cooperation*, 103-104.

[241] The Duluth lab and the Borok institute were also alike in their histories, locations, and approaches to research. Popular press accounts of the histories of the Duluth and Borok facilities can be found, respectively, in English in John Myers, "Duluth EPA Lab Turns 50: Low Profile, High Outcome Science Mostly Behind the Scenes." June 4, 2017, *Duluth News Tribune*, https://www.duluthnewstribune.com/news/4278052-duluth-epa-lab-turns-50-low-profile-high-outcome-science-mostly-behind-scenes, and in Russian in Anna Titova, "Lesa Obetovannye: Kak v Sudbe Odnogo Instituta RAN Otrazilas Vsya Istoria Sovremennoy Rossii" [The promised woods: how the history of modern Russia was reflected in the fate of a RAS institute], *Kot Shredingera*, 5-8 (19-22), summer 2016, https://kot.sh/statya/3856/lesa-obetovannye.

[242] Donald I. Mount to Lloyd L. Smith, 24 December 1974, box 18, collection 403, Lloyd L. Smith papers, UMN. Slightly overdramatizing the situation, Mount wrote: "Words cannot express the frustration I felt when I heard that the Russians were not coming, and knowing that many of you, if not all, had already begun writing papers for the symposium."

The visits that did take place focused on presenting scientific research and data rather than creating opportunities for collaborative research. A small symposium would be organized with the goal of publishing the resulting papers in both languages. The Americans were somewhat disappointed in this—they found their own papers excellent and publishable, deeming Soviet ones generic and outdated thus unworthy of attention.[243] By mid-1976, the Americans felt the mission of the exchange visits had been accomplished, and it was time to move on to offering annual internships to one or two researchers from each country.[244] The compound proceedings of the Duluth symposium (1975) and the Borok symposium (1976) were published in English in 1978 and in Russian in 1979. The third bilateral meeting (Borok, 1979) concluded the exchange, and its proceedings came out in 1980.[245]

As a participant of another WG II project described the goal of American participation, it was "to acquire an understanding of the methods and effectiveness" of water pollution control in the U.S.S.R."[246] This objective was indeed reached through exchange visits. Even operating under the assumption that the Soviet environmental protection system was primitive, the

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[243] Richard A. Schoettger to Mount, 21 July 1976, box 18, collection 403, Lloyd L. Smith papers, UMN.

[244] I have not yet found evidence that this part of the program was ever implemented.

[245] Donald I. Mount, Wayland R. Swain, and Nina K. Ivanikiw, eds., *Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants upon Aquatic Ecosystems* (Duluth: Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency; Springfield: National Technical Information Service distributor 1978); N.V. Butorin, B.A. Flerov, L.B. Braginsky, and P.P. Umorin, eds. *Vliyanie Zagryaznyaushchih Veshchestv na Gidrobiontov i Ekosistemy Vodoemov* [Influence of pollutants on hydrobionts and aquatic ecosystems] (Leningrad: Nauka, 1979); Wayland R. Swain and Virginia R. Shannon, eds., *Proceedings of the Third USA-USSR Symposium on the Effects of Pollutants upon Aquatic Ecosystems: theoretical aspects of aquatic toxicology*, EPA-600/9-80-034 (Duluth: Environmental Research Laboratory-Duluth, Office of Research and Development, U.S. Environmental Protection Agency; Springfield: National Technical Information Service distributor, 1980).

[246] Daniel P. Loucks, "Water Quality Management in the Soviet Union," *Journal (Water Pollution Control Federation)* 49, no. 8 (1977): 1767-1778 (project "river basin water quality planning and management").

Americans found that "while the overall water pollution control technology in the U.S.S.R. lags behind that of the U.S., in certain areas they may be more advanced."[247] Despite the Americans' initial disappointments in the Soviet bureaucratic system, breaks in communication, and less than expected overlap in professional interests, this group was one of the CFEP program's successes.[248]

What experts from American research universities and EPA research facilities saw in the Soviet Union did not reflect the overestimated Soviet potential.[249] This did not necessarily mean that this group's collaboration failed, only that it failed to match the initial expectations of American environmental scientists, making them question the merits and the productivity of the program for the first years. Gradually, sustained face-to-face communication proved its worth. With recurring opportunities to travel to the Soviet Union for informal meetings, the Americans got a sense of the scope of Soviet research, available technology and equipment, and the structure of facilities.[250] The Soviets appreciated the chance to return to the U.S. for more visits, read the literature, and be prepared for meetings without the pressure of having to impress on the spot. Sharing specific strategies and technology for preventing water pollution produced useful and informative exchanges (e.g., a comparative analysis of efficacity of these

[247] Loucks, "Water Quality Management," 1778; Kelley, "American-Soviet Cooperation," 110-111.
[248] Mount to Nikolay V. Butorin, 10 March 1976, 12 April 1976, box 18, collection 403, Lloyd L. Smith papers, UMN. In 1976, the American group bound for the U.S.S.R. contacted their host, Nikolay V. Butorin (director, Institute of Biology of Inland Waters in Borok, Yaroslavl region, Russia) to announce the dates of the forthcoming visit and request to accommodate the wives of three participants. Inadequate communication was a problem and, unfortunately, Butorin not only received the wrong date for their arrival, but he was also not notified that the Americans had changed their mind and left the wives behind.
[249] US-USSR Environmental Agreement: Progress Report, box 1, folder "US-USSR Correspondence 1972-1975," 3-4, EPA records, NARA.
[250] Report of the U.S. water pollution delegation to the U.S.S.R., November 1972, box 1, folder "Miscellaneous," EPA records, NARA.

measures on the Connecticut River in the U.S. and the Dnepr and the Donets in the U.S.S.R.).[251]

Some communication problems persisted, but in the first six years WG II developed from an exchange of formalities and unpleasantries to a productive and enjoyable dialogue on important environmental issues. In 1979 American participants were calling for learning Russian and for engaging in direct dialogue with mid-level Soviet researchers who were collecting and processing data.[252] The Soviet ways no longer shocked or frustrated them. Seven years of experience with Soviet colleagues whose professionalism they grew to respect helped American participants to ease the rules and the judgements and focus on working together.[253] A direct line of communication was established between the two sides without EPA mediation. American scientists would use this new network to invite a Soviet colleague to speak at a seminar without third-party coordination and approval.[254] They could also exchange monographs frequently enough that the Fisheries Bioassay Laboratory at Montana State University (Bozeman, MT) was amassing "a library second only to the Soviet Library of Information in Washington."[255] Scientific exchange, if not fully problem-free, was productive now that the Americans found Soviet research "significantly different but quite

[251] Folder "Papers 1978", EPA records, NARA.
[252] John A. Robbins, Report on travel to the Soviet Union under the US-USSR environmental agreement, box 3, folder "Trips," 4, EPA records, NARA.
[253] Robert V. Thurston, Trip report: U.S.S.R. 6/30/1979-7/13/1979, box 3, folder "Trips," 4, EPA records, NARA. "…after an initial "culture shock" most U.S. scientists who express a desire to return to the Soviet Union do so because they have established what they consider a comfortable rapport."
[254] Michael Sydor to Robert L. Heller, September 27, 1978, box 2, folder "1978 (2) Misc. records," EPA records, NARA.
[255] "…or at least it's got to be the biggest collection of books on fishes and limnology in the tri-city area of Bozeman, Belgrade, and Manhattan." Thurston to Wayland R. Swain, 5 April 1978, box 2, folder "1978 (2) Misc. records," EPA records, NARA.

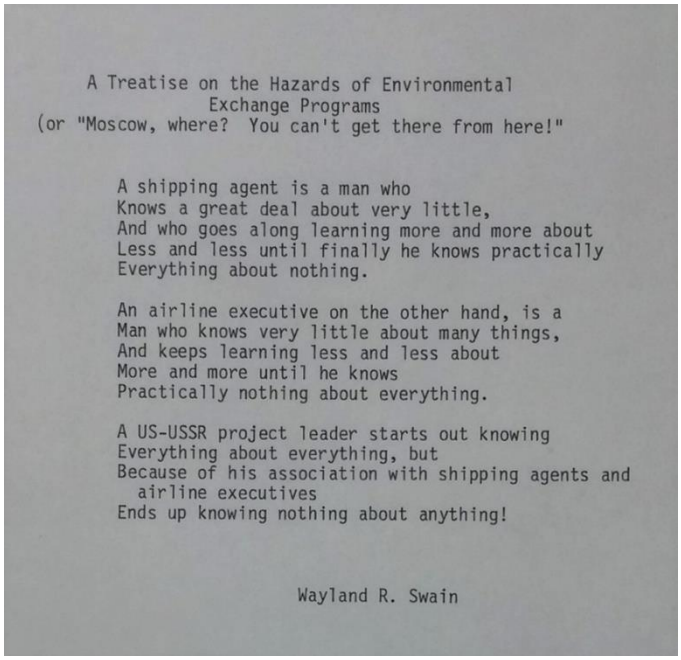
complimentary." Among the results were series of joint publications.[256] Last but not least, the Americans felt much more at ease with their Soviet experiences and one participant reported that he had ultimately "accomplished more and enjoyed the trip more than I had anticipated."[257]

In 1978 the new WG II program leader Wayland Swain, the director of the EPA's Large Lakes Research Station in Gross Ile, Michigan, submitted a report to his predecessor. He had come to the collaboration as a skeptic, giving himself two years to either make the program work to produce "significant progress and substantive contributions to new knowledge," or capitulate and resign, given the endless obstacles. Swain paid specific attention to practical assessments of work, plans for future joint publications, and "not so visible results" in the form of liaising with IIASA on aquatic ecosystem modeling (which was a chance to promote the station's work overseas at a cutting-edge international institution).

[256] For example, B. Thomas Johnson and Vitaly I. Romanenko, "Xenobiotic Perturbation of Microbial Growth as Measured by CO2 Uptake in Aquatic Heterotrophic Bacteria," *Journal of Great Lakes Research* 10, no. 3 (1984): 245-50; B. Thomas Johnson and Vitaly I. Romanenko, "A Multiple Testing Approach for Hazard Evaluation of Complex Mixtures in the Aquatic Environment: The Use of Diesel Oil as a Model," *Environmental Pollution* 58, no. 2/3 (1989): 221-35.

[257] Eugene F. Stoermer to Wayland Swain, 15 August 1979, box 3, folder "Administrative," EPA records, NARA.

Figure 2. Swain's facetious poem on his WG II experience.[258]



A Treatise on the Hazards of Environmental
Exchange Programs
(or "Moscow, where? You can't get there from here!"

A shipping agent is a man who
Knows a great deal about very little,
And who goes along learning more and more about
Less and less until finally he knows practically
Everything about nothing.

An airline executive on the other hand, is a
Man who knows very little about many things,
And keeps learning less and less about
More and more until he knows
Practically nothing about everything.

A US-USSR project leader starts out knowing
Everything about everything, but
Because of his association with shipping agents and
airline executives
Ends up knowing nothing about anything!

Wayland R. Swain

In addition to professional goals, Swain detailed his personal philosophical reasons for committing to the program: "…I am convinced that I am not my brother's keeper, I am, in fact, my brother's brother. <…> If my efforts and those of the other scientists and administrators involved with the project are successful and begin to achieve a greater reciprocal understanding between the humans that constitute our two nations, then maybe, just maybe, your son and mine and their sons will never have to face each other over the weapons of war."[259] Judging by the continuation of the CEFP program well into the 1980s and later joint American-Soviet work on peaceful resolution of nuclear arms issues, Swain's effort was not wasted.[260]

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[258] Wayland R. Swain, A Treatise on the Hazards of Environmental Exchange Programs, box 2, folder "1978 (2) Misc. records," EPA records, NARA.
[259] Swain to Donald I. Mount, February 23, 1978, box 1, folder "1972-1975 Misc. records," 1, EPA records, NARA.
[260] The significance of scientific initiatives motivated by peace efforts throughout the Cold War is discussed in depth in Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca: Cornell University Press, 1999). Chapter 13 is of particular relevance as it focuses on late CFEP work on nuclear test verification.

WG III. Pollution related to agricultural production: "to exchange information on environmental movement"

In retrospect, an emerging topic was particularly important to the scientific participants, namely the "forms and mechanisms by which pesticides and chemicals are transported in soil, water, and biota." It was not on the list of planned activities at the inception of the agreement but crystallized after the first discussions. Indeed, this project happened to be the one in WG III that lived to see a joint symposium in Tbilisi, Georgian SSR, in 1976.[261] With the results published in both languages, the Soviets gained access to recent studies from American environmental research and data centers (e.g., EPA, U.S. Department of Agriculture, University of California, Davis) and agricultural chemicals manufacturers (Dow Chemical, Stauffer Chemical) on transfer and absorption of pesticides in the atmosphere, live organisms, soil, and water.[262] After the extensive attention to harmful effects of pesticides in the early 1960s, their dangers became subject to scrutiny and research, and American environmental science had analytic tools to offer in this area to Soviet scientists.[263] The Soviets had not been surprised by the negative effects of agricultural chemicals on ecosystems and had also been looking for ways of predicting and reducing them. Research on generic properties of pesticides and their local manifestations was ongoing in several institutions across the country (Institute of Experimental Meteorology, Obninsk; Institute of Applied Geophysics, Moscow; Institute of Biological Methods of Plant Protection, Kishinev; and the Institute of

[261] "Symposium on Environmental Transport and Transformation of Pesticides," EPA-600/9-78-003 (Washington, D.C.: U.S. Government Printing Office, 1978), viii.
[262] Symposium on Environmental Transport, v-vii.
[263] Among those who pioneered environmental research and advocacy and were sounding the alarm about long-term detrimental effects of pollution such as pesticides and nuclear fallout were Rachel Carson, *Silent Spring* (London: Hamish Hamilton, 1963), E.B. White, *Essays of E.B. White* (New York: Harper & Row, 1977), and Barry Commoner, *The Closing Circle; Nature, Man, and Technology* (New York: Knopf, 1971).

Biochemistry and Physiology of Microorganisms, Pushchino).[264] By the time the collaboration began, the dangers of pesticides were known in the U.S.S.R.—all Soviet authors of symposium papers used the terms "pesticide pollution" and "contamination" extensively—but more advanced American research was helpful.[265] The Americans did not gain much from this short-lived program outside of the humanitarian mission to share their expertise, which was announced as one of the goals of the entire CFEP collaboration.[266] However, extensive detailed research on effects of pesticides was performed at the same time and later in WG II with much more satisfactory results for both sides outside the activities of WG III.[267]

WG IV. Enhancement of urban environments: no sister city

Plans for an urban exchange program were well articulated in the memoranda of implementation, practicable, and comfortably within the lines of established protocols for cultural diplomacy and technical exchanges of the 1970s. The earliest version of the plan suggested, as one project, an examination and comparison of four large cities, two in each country. The focus would be on identifying of "methods for planning and assuring a desirable environment in urban areas, with attention to planning for appropriate land use, transportation, noise abatement, solid waste management, water purification, recreation and park

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[264] S.G. Malakhov and V.A. Borzilov, eds., *Migratsia i Prevrashchenie Pestitsidov v Okruzhayushchey Srede: Trudy Sovetsko-Amerikansrogo Simpoziuma* [Migration and transformation of pesticides in the environment: Proceedings of the Soviet-American symposium] (Moscow: Moskovskoye Otdelenie Gidrometeoizdata, 1979).

[265] Kelley, "American-Soviet Cooperation," 111. On Soviet awareness and uses of pesticides, see Murray Feshbach and Alfred Friendly Jr., *Ecocide in the USSR*: *Health and Nature under Siege* (New York, NY: Basic Books, 1992), 65, and Paul R. Josephson, *Industrialized Nature: Brute Force Technology and the Transformation of the Natural World* (Washington: Island Press, 2002), 113.

[266] U.S.-U.S.S.R. Environmental Agreement: Progress Report, January 29, 1974, folder "US-USSR Correspondence 1972-1975," 7-8, EPA records, NARA; Nicholas A. Robinson and Gary R. Waxmonsky, "The U.S.-U.S.S.R. Agreement to Protect the Environment: 15 Years of Cooperation," *Environmental Law* 18, no. 403 (1988): 415.

[267] Malakhov and Borzilov, *Migratsia i Prevrashchenie Pestitsidov v Okruzhayushchey Srede.*

development, tourist zones and resorts, preservation of historic sites, etc."[268] The United States selected the Atlanta and San Francisco as representative urban areas, and the Soviet Union opened Leningrad for joint investigation but kept delaying the announcement of the second nomination. Eventually, this project dissolved.[269]

Another suggestion was to explore environments in "new communities," meaning planned cities that were designed and constructed as uniform urban infrastructures. By their very nature, each of them was unique as a project adapted to the social, economic, and industrial demands of the region, the availability of materials and resources in the country, and the landscape and the natural environment of the location. The American candidate cities for the study, Columbia, Maryland, and Reston, Virginia, were matched with Togliatti and the Novosibirsk akademgorodok (science city) in the U.S.S.R. They had excellent compatibility because all four were newly established urban areas with populations over four thousand residents, industrial facilities and other city-shaping enterprises, and environmental management experiences and solutions that would be relevant and beneficial for their counterpart.[270]

Regrettably, experts say, this WG never produced any results.[271] Some organizational meetings were held, and a Soviet group came to visit the U.S. in 1973, but no exchange of information, technology, or knowledge ensued. A project like this could have been useful and interesting. Planned cities were gaining popularity in both countries and elsewhere around the

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[268] "Memorandum of Implementation of Environmental Agreement," *International Legal Materials* 11, no. 6 (1972): 1410-1411.
[269] "Memorandum of Implementation," *International Legal Materials,* 8.
[270] "Report on the US-USSR Working Group on the Enhancement of the Urban Environment, US-USSR Working Group on the Enhancement of the Urban Environment" (Washington, D.C., U.S. Office of International Affairs, 1973), 5-8.
[271] Kelley, "American-Soviet Cooperation," 111.

world. Sharing newly acquired experiences could have been used for course correction in these projects before the mistakes and unproductive solutions became systematic. This could have made a valuable contribution to the international sister city initiative that had already been ongoing.[272] The failure of this WG may be attributed to the lack of resources, matching or mutual interests, and, importantly, a framework for joint investigation.[273] While the founding documents stated the goals and the objects of study, they did not offer suggestions or discuss protocols for conducting these assessments. The only available setup seemed to be "veni-vidi-recessi", to come for a visit, look at objects or places selected for demonstration, and leave. Each side pursued specific interests, but the visitors and receiving cities failed to discover common grounds, spaces, or activities for working together.

One project within this WG continued until 1981 but with somewhat limited success. Its final report is a good illustration of the participants talking past each other and approaching the assignment in a strictly formalistic manner. The investigation of urban transportation problems defined as "air and noise pollution, excessive pedestrian-automobile safety conflicts, excessive fuel consumption, aesthetic and visual impacts, and the need to provide for rational correlation between public transportation and private automobile use" resulted in a set of practical suggestions for both sides. Most of them came down to ways of reducing urban vehicular traffic, perhaps an obvious and reasonable common problem.[274] However, noise pollution was still a highly debatable term in the U.S.S.R. and was considered to be an exclusively American

[272] Wilbur Zelinsky, "The Twinning of the World: Sister Cities in Geographic and Historical Perspective," *Annals of the Association of American Geographers* 81, no. 1 (1991): 1-31.
[273] Kelley, "Environmental Protection and Conservation," 104.
[274] "Transportation and the Urban Environment: Traffic in the Centers of Large Cities: A Joint Report" (Washington: U.S. Department of Transportation Office of the Secretary of Transportation,
1981), 2-3.

issue, so it was largely ignored.[275] The suggested policy of raising parking fees would be inapplicable in the Soviet Union since there were no parking fees. "Increasing the use of mass transit and pedestrian and mechanical systems" was also a hollow point for the Soviets because public transportation and walking were already the primary options in cities.[276] The Soviet suggestion to create "high-capacity mass transportation systems", though feasible, had been discarded by the Americans for economic and social reasons decades earlier.[277] It seemed like each side compiled a list of measures that were in effect in their economy and already known to their counterparts without giving much consideration to their applicability or implementation but simply to fulfill their obligations.[278]

WG V. Nature and preserves: a pocketknife, twelve rolls of film, and a sense of humor

WG V created an unexpected but welcomed outlet for botanists and zoologists. An intergovernmental agreement, as it turned out, could truly open boundaries and create opportunities for joint field work. Out of all CFEP programs, WG V was among the largest, the most active and productive, and the longest running.

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[275] For example, A.S. Dangulov, "V poiskah besshumnoy tehniki" [In search of noise-free technology], *SShA: Ekonomika, Politika, Ideologiya* 3 (39) (March 1973): 115-118.
[276] "Report on Urban Environment," 2; Martin Crouch, "Problems of Soviet Urban Transport," *Soviet Studies* 32, no. 2 (1979): 236, 238.
[277] Report on Urban Environment, 2. The social, political, and economic challenges to American public transportation systems have been the subject of discussions for decades. See, for example, Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985); Robert D. Bullard, Angel O. Torres, and Glenn Steve Johnson, eds., *Highway Robbery: Transportation Racism and New Routes to Equity* (Cambridge: South End Press, 2004); Robert C. Post, *Urban Mass Transit: The Life Story of a Technology* (Westport: Greenwood Press, 2007); Kafui Ablode Attoh, *Rights in Transit: Public Transportation and the Right to the City in California's East Bay*. (Athens: University of Georgia Press, 2019).
[278] Crouch, "Problems of Soviet Urban Transport," 231-256; Evgeny D. Mikhailov, *SShA: Problema Bolshih Gorodov* [USA: the problem of large cities] (Moscow: Nauka, 1973), 148, 152.

While selection of projects and their supervision happened at the level of administrative joint committee meetings, the collaborative initiatives were designed and conducted by mid-level professionals at public gardens and university research departments. And they chose topics within the margins of declared themes, and those relevant for these staff and experts, a decision that contributed to the area's sucess. Among the more relevant concerns at the time were biosphere reserves defined in Russian as *zapovedniki*, a thirty-million-acre network of scientific nature reserves containing ecosystems protected by the state and serving as living laboratories for Soviet ecologists, evolutionary biologists, and conservationists.[279] They were, in many aspects, equivalent to American national parks, and they contributed to the development of a global environmental monitoring system. Already in place was a UNESCO Man and Biosphere program so the bilateral program could tap into the larger initiative.[280] Another timely research initiative was endangered plant species that also resonated with the participating natural scientists.

The botanists focused on expeditions that investigated endangered species, knowledge exchange, and collection of local plants. The most enthusiastic participants were researchers

[279] For more on Russian and Soviet nature protection in *zapovedniki*, see a classic in Russian environmental history, Douglas R. Weiner, *A Little Corner of Freedom: Russian Nature Protection from Stalin to Gorbachev* (Berkeley: University of California Press, 1999). For a discussion of the American-Soviet CFEP project on *zapovedniki*, see Alexey V. Sobisevich and Valerian A. Snytko, "Sozdanie biosfernyh zapovednikov i natsionalnyh parkov dlya razvitiya nauchnyh issledovaniy i ekologicheskogo turizma (na primere opyta SSSR)" [Creation of biosphere reserves and national parks for the development of research and ecological tourism (on the Example of the Experience of the Soviet Union)], *Bulletin of the Moscow Region State University, Natural Sciences series* 4 (2018): 50–61. DOI: 10.18384/2310-7189-2018-4-50-61.
[280] On the UNESCO MAB program and Soviet biosphere reserves as they were discussed at the time, see Vladimir Sokolov, "The Biosphere Reserve Concept in the USSR," *Ambio* 10, no. 2/3 (1981): 97-101.

from botanic gardens.[281] For Russians and the Americans, the botanical traditions of traveling to faraway lands in search of new species and sharing findings with foreign colleagues dated back to the eighteenth century.[282] It this sense, collaboration reflected normal practices rather than trailblazing unprecedented activities. In a new take on "botanizing the Levant", American researchers made a series of expedition trips to the Soviet Caucasus. Among other destinations were Central Asia, the Altai mountains and other Siberian ecosystems, lower Volga, lake Baikal, and the Moscow region. In fact, American public gardens and horticultural societies found this opportunity for collaborating with the Soviets so attractive that they pushed to be included.[283]

Between 1976 and 1982, the Americans annually facilitated expeditions for their Soviet colleagues from the Moscow Botanic Garden, taking them to the Adirondacks, the Rockies, the Northwestern Pacific Coast, the Great Plains, Dakota's Black Hills, and Cape Cod National Seashore.[284] Research visits to national parks and public gardens were a staple on

[281] For example, B.N. Golovkin, V.I. Nekrasov, A.K. Skvortsov, "Sovetskaya Botanicheskaya Ekspeditsiya v SShA" [Soviet botanic expedition to the USA], *Bulleten Glavnogo Botanicheskogo Sada* 111 (1979): 111-117.

[282] Western botanists' interest to the diverse flora of the Caucasus goes back to the seventeenth century. The expression "botanizing the Levant" (an outdated name for the region comprising the Caucasus, the Black Sea and the Caspian Sea shorelines) is used in a discussion of this interest by Rachel Koroloff, "Seeds of Exchange: Collecting for Russia's Apothecary and Botanical Gardens in the Seventeenth and Eighteenth Centuries" (PhD diss., University of Illinois, Urbana-Champaign, 2014), 73-81.

[283] Roy A. Mecklenburg to Thomas S. Elias, April 23, 1984, box 30, folder 2 "US/USSR Exchange Program. Research Correspondence, 1984," Chicago Botanic Garden Archives (hereafter CBGA). After the first exchanges that "proved eminently successful," the group solicited applications from interested individual scholars in the botany community to join expeditions in the Soviet Union. "Soviet-American Botanical Exchange Program," *Systematic Botany* 2, no. 2 (1977): 98.

[284] Thomas S. Elias, "Botanical Exchange Program between the U.S.A. and the U.S.S.R.," *Bulletin of the American Association of Botanical Gardens and Arboreta* 16, no. 1 (1982): 31-36.

these trips as well.[285] After 1982, the collaborative projects and exchanges continued with the same regularity and even expanded until the collapse of the Soviet Union.[286] American botanists came to the Soviet Union prepared, especially for field life, because differences in everyday comforts, accessibility of technology, and quality of medical assistance were anticipated. Just like other peers interested in international exchange, botanists had to familiarize themselves with the Soviet ways of life to avoid unnecessary disappointments that might disrupt their mission. The project leader, Thomas Elias, put together a list of recommendations and items to bring to expedition trips in the Soviet Union.[287] Based on his own experiences, Elias's list included things to bring such as a good pocketknife, Ziplock bags (which were definitely not part of Soviet reality), enough rolls of film for a photo camera to last an entire forty-five day trip (due to incompatibility of developing processes for Western

[285] Programma prebyvaniya v SShA sovetskih uchastnikov botanicheskoy ekspeditsii v iyule-avguste 1977 goda [U.S. trip program for Soviet participants of a botanical expedition in July-August 1977], folder "Programmy, protokoly, otchety i perepiska o sovetsko-amerikanskoy botanicheskoy ekspeditsii po ohrane okruzhayushchey sredy za 1977 god", 404-3-786 (records of the Moscow Botanic Garden), ARAN.

[286] Abby J. Hird, "International Collaboration among Public Gardens in the Russian Federation and the United States" (MA thesis, University of Delaware, 2007). Hird devoted her thesis to the history of American-Russian collaborations in botany, giving representation to both sides by conducting interviews and surveys of American and Russian participants equally. Approaching it from the perspective of public horticulture and using interviews with participants and quantitative statistical analysis, Hird followed change over time. She also emphasized participants' perceptions of collaboration. A graph on page 103 of the thesis demonstrates a progression of American-Russian collaborative activities in botany with a spike of all activities (fully coinciding with the work of WG V) in 1973-1991. Discussion of expeditions in 1982-1985 can be found in P.I. Lapin, V.I. Nekrasov, L.S. Plotnikova, A.K. Skvortsov, and T.S. Elias, *Introduktsiya i Ohrana Rasteniy v SSSR i SShA* [Introduction and protection of plants in the U.S.S.R. and U.S.A.] (Moscow: Nauka, 1986).

[287] Thomas S. Elias led the American team on the WG V endangered species program. Over the course of his career, the prominent author was the director of the Rancho Santa Ana Botanic Garden (Claremont, CA) and the National Arboretum in Washington, D.C.

and Soviet film), and a good sense of humor for "frustrating events; some [of which] will be outside of your hosts' power to do anything about."[288]

Elias dedicated twenty-five years of his career to working with Soviet (later Russian) colleagues. He developed close professional relationships and personal friendships with some of them. When his Russian colleagues had hard times, he offered them support from the West by helping them to acquire professional publications, medications, even clothes. They came to visit him at his home and welcomed him in Moscow and Novosibirsk.[289] One of the people he knew best was academician Igor Koropachinsky, a Russian dendrologist who made significant contributions to introducing and adapting new species of trees to the Siberian climate and developing a system of botanic gardens throughout the Urals.[290]

The impressive list of institutions involved in the botanical collaboration and exchanges continued to grow after the political situation in the early 1990s Russia stabilized and the agreement on cooperation in the field of environmental protection was renewed with the new administration of the Russian Federation in 1994. In 2014, Elias's American tree identifier was translated and published in Russian.[291] Although joint research expeditions ceased, public gardens, agencies and other institutions continued their specimen exchanges and shared

[288] Thomas S. Elias, Memo: Field Trip to the Caucasus Mountains, Southwestern U.S.S.R., box 30, folder 2 "US/USSR Exchange Program. Research Correspondence, 1984," CBGA.
[289] Personal communication with Thomas Elias, March-April 2021.
[290] "Akademiku Koropachinskomu Igoryu Yurievichu – 90 let!" March 16, 2018, *News of the Russian Academy of Sciences*, http://www.ras.ru/news/shownews.aspx?id=8894cc20-ea2c-411d-bdb9-4c615f29f28e [Academician Igor Yurievich Koropachinsky turns 90!].
[291] Tomas S. Elias, *Severo-amerikanskiye Derevyia: Opredelitel* (Novosibirsk: Geo, 2014).

findings at meetings and creating internships and new bilateral ties into the twenty-first century.[292]

WG V, the marine mammal project, focused on research in ecology, biology, and animal (seal and walrus) populations in the North Pacific. Members of this groups showed tremendous dedication to their joint work, devoting years of their careers to bilateral expeditions and data analysis. Some participants benefited professionally and personally from their involvement. Francis H. Fay learned Russian to be able to read and translate Soviet scientific papers on walruses, to serve on the planning committee for the project, and to join Soviet research cruises.[293] In a report on the project activities he expressed, perhaps unexpectedly for an official document, the sentiment behind researchers' enthusiasm and determination in joint work that was true for disciplines that rely on global data beyond local research in marine biology:

> "Some 25 to 30 years ago, when we as students were beginning our respective careers and were developing for the first time our awareness of marine mammals in the waters separating western North America from eastern Asia, we had visions of eventually bridging the communication gap which existed between our two countries at that time. Each of us was anxious to obtain information on the distribution, biology, and ecological relations of "our" seals and walruses on "the other side," beyond our respective political boundaries where we were not permitted to go to study them. We were concerned that the resource management practices on the other side of the Bering and Chukchi Seas, implemented in isolation, on a purely unilateral basis, might endanger the species which we had come to know and were striving to conserve. At once apparent to both of us was the need for free exchange of biological information between our two countries and, ultimately, joint management of our shared resources. In a small way, we and others made some initial efforts to generate that exchange by personal correspondence and through vocal interchange at the annual meetings of the North Pacific Fur Seal Commission. By the enabling Agreement on Cooperation in the Field of Environmental Protection, reached between our two countries in 1972, our earlier visions at last came true. Since that time, within the framework of the Marine Mammal Project under Area V of that

[292] Steven Kohl, "U.S. and Russia Unite for Conservation," *Endangered Species Bulletin* 35, no. 1 (2010): 42-43, Peter J. Olin, "Director's Message: Your Dollars Support Arboretum's Worldwide Conservation Effort," *Minnesota Landscape Arboretum* 24, no. 4 (2005): 2.
[293] Brendan P. Kelly, "Obituary: Francis Hollis Fay (1927-1994)," *Arctic* 48, no. 1 (1995): 107-108.

> Agreement, we and our colleagues have forged a strong bond of professional accord and respect, in an atmosphere of free intercommunication and mutual understanding."[294]

One may think it is not at all surprising that the most apolitical of all the eleven groups survives and thrives to this day. However, the "benign" nature of plant physiology, dendrology, and other disciplines that botany comprises does not fully explain the success of WG V for at least two reasons. First, the Cold War knew cases in which an epistemologically innocent discipline (not involving defense sensitivities or strategically valuable information, knowledge, materials, or fundamental expertise) was assigned symbolic features and became a bargaining chip in ideological or geopolitical disputes.[295] Second, another CFEP working group that survived the collapse of the Soviet Union and showed the highest productivity rates was the most politically charged of the eleven.[296]

WG VI. Marine pollution: twenty questions

At the beginning of negotiations in Working Group VI in May 1973, the participants at the first joint meeting in the U.S. aimed to follow the model of the inter-academy exchange. With twenty topics of interest highly relevant at the time (and to this day)—from sources of plastic particles in marine waters to problems of ocean dumping—the group was planning to

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[294] Francis H. Fay and Gennadii A. Fedoseev, eds., "Soviet-American Cooperative Research on Marine Mammals. Volume 1 – Pinnipeds," NOAA technical report NMFS 12, (U.S. Department of Commerce, 1984), ii.

[295] Textbook examples of an apolitical practice trapped in a proxy war are, for example, histories of contraception, post-WWII zookeeping, and development and distribution of vaccines during the Cold War. For example, the United States made an attempt to push the newly developed method of contraception for women onto third-world countries to control birth rates and pull it into the American zone of influence. Elaine Tyler May, *America and the Pill: A History of Promise, Peril, and Liberation* (New York: Basic Books, 2010), 35-70; J.W. Mohnhaupt, *The Zookeepers' War: An Incredible True Story from the Cold War* (New York: Simon & Schuster, 2019); Dóra Vargha, *Polio across the Iron Curtain*: *Hungary's Cold War with an Epidemic* (Cambridge: Cambridge University Press, 2018).

[296] WG IX, earthquake prediction, will be discussed in detail in chapter 4.

organize three- to ten-month internships for early-career scientists, an exchange of brief series of lectures by established experts, and direct exchanges of mid-level researchers directly between institutions. In addition to that, the committee declared a plan to organize research projects and bilateral symposia, an exchange of scientific literature, marine expeditions, and possibly creation of a bilingual journal on marine pollution.[297]

These ambitious projects, however, would need to be matched with financial, technological, and human resources that the collective of involved organizations hardly possessed. After the first meetings, in which experts from top-level research centers (U.S. Geological Survey, Scripps Institution of Oceanography, Soviet Academy of Sciences) and executives of major oil companies (Shell, Chevron, and Placid Oil, Soviet Ministry of the Oil Industry, Kaspmorneft) participated, the responsibility for this group shifted. On the American side, the Coast Guard assumed leadership with some support from the EPA, and on the Soviet side, the Ministry of the Merchant Marine took responsibility, neither of which had research experience or resources comparable to an established scientific institution.[298]As with WG X, the planned activities of this group were reassigned to others better equipped to handle them. The joint study of the effect of pollutants on marine organisms was in capable hands of marine biologists (WG V) and geneticists (WG VII). Ocean mapping and meteorological research were well underway in another, much a larger project in satellite observations LANDSAT combined with the POLYMODE marine vessel exploration. LANDSAT and POLYMODE

[297] Folder "Marine reports 1973," EPA: Records of the U.S./U.S.S.R. Joint Commission on Environmental Programs, 1972-1976, 3-4, ProQuest History Vault.
[298] Pervy doklad o vypolnenii soglasheniya mezhdu SSSR i SShA po sotrudnichestvu v oblasti ohrany okruzhayushchey sredy, [First report on fulfilling the U.S.S.R.-U.S. agreement on cooperation in environmental protection], folder "Materialy o sovetsko-amerikanskom sotrudnichestve v oblasti ohrany okruzhayushchey sredy v ramkah proekta VII (1) "Biologicheskiye i geneticheskiye effekty zagryazniteley" za 1972-1975 gody," 192-1-1859 (records of the Institute of General Genetics), 10-11, ARAN.

already had in-built environmental components into their research.[299] Everything the marine pollution group set out to do outside of scientific research fell apart.

WG VII. Biological and genetic consequences of pollution: focus on mutagenic potential

The group on biological consequences of pollution was another example of counterproductive overlap of topics influenced by political considerations. The "comprehensive analysis of the environment" project was assigned to develop a comprehensive view of environmental concerns. That intention was too grandiose to handle with the modest resources of any one group and both inappropriate and unmanageable for the principal collaborator on the Soviet side, the Institute of General Genetics in Moscow, which was highly specialized and relatively small research facility. This topic became, as American experts later described, "a podium from which to lecture colleagues on the importance of a holistic approach to environmental affairs" for representatives of Gidromet.[300] The director of Gidromet, academician Yuri Izrael was a creator of the "comprehensive monitoring" concept for the environment and a staunch proponent of the systems approach.[301] It is little wonder that he used this opportunity to promote it, but apparently it did not appeal to his American colleagues. The Americans tried to push for what they considered more specific topics rather than the sweeping systems approach of comprehensive monitoring and more institutional interaction in WG VII, but the Soviets resisted. Moreover, some American interests were

[299] Itogovy document shestogo soveshchaniya obyedinennoy sovetsko-amerikanskoy rabochey gruppy po prirodnoy srede, May 28, 1976 [Final report of the 6th meeting of the joint Soviet-American committee on environment], folder "Protokoly, spravki, predlozheniya i perepiska ob uchastii instituta v sovetsko-amerikanskom sotrudnichestve po ohrane okruzhauyshchey sredy," 4-8, 126-1-2020, ARAN; "International Decade of Ocean Exploration: Progress Report, vol. 7 (April 1977-April 1978)," NOAA (Washington, D.C.: U.S. Government Printing Office, 1978), 21.
[300] Kelley, "Environmental Protection and Conservation," 105.
[301] A.I. Bedritsky, Yu.S. Tsaturov, eds., *Akademik Yuri Antonievich Izrael: Chelovek i Ucheny* [Academician Yu.A. Izrael: a person and a scientist] (Moscow: Rosgidromet, 2018), 15-18.

considered restricted topics in the U.S.S.R. and had already been rejected by the authorities for another bilateral program under a separate Moscow summit agreement intended to collaborate on public health.[302]

The more specialized project on the biological and genetic effects of pollutants brought helpful (including unintended) results to both sides. Probably caught somewhat unprepared given the disrupted national history of genetics, the Soviets hastily sanctioned and funded two new laboratories at the Institute of General Genetics to accommodate the activities of the project.[303] In addition to that, direct contact between the researchers at the institute and their American colleagues ensured continuous exposure to current work in the U.S. on hazards to human health caused by mutagen buildup from pollution. They also had opportunities to share their own recent findings in this rapidly growing field of knowledge with peers from Britain, India, Japan, Canada, Germany, and Sweden at international conferences held in the U.S. American geneticists received data from Soviet studies of toxic effects of heavy metal salts and cancerogenic effects of industrial chemicals including asbestos, vinyl chloride, and DDT.[304]

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[302] Otchet o sovetsko-amerikanskom sotrudnichestve v oblasti ohrany okruzhayushchey sredy v ramkah proekta VII (1) "Biologicheskiye i geneticheskiye effekty zagryazniteley," 1975 [Report on Soviet-American collaboration in environmental protection under project VII (1) "Biological and genetic effects of pollutants"], folder "Materialy o sovetsko-amerikanskom sotrudnichestve v oblasti ohrany okruzhayushchey sredy v ramkah proekta VII (1) "Biologicheskiye i geneticheskiye effekty zagryazniteley" za 1972-1975 gody," 192-1-1859, ARAN. Here, the restricted topic is epidemiological research in the U.S.S.R.

[303] On the institutional power dynamics in post-Lysenko Soviet genetics at the time of the CFEP agreement and the director of the Institute of General Genetics Nikolai P. Dubinin, see Michael Gordin, "Lysenko Unemployed: Soviet Genetics after the Aftermath," *Isis* 109, no. 1 (2018): 61-64.

[304] Otchet o poezdke v SShA sovetskoy delegatsii, prinyavshey uchastiye vo 2-m sovetsko-amerikanskom simpoziume po mutagenam okruzhayushchey sredy [Report on the trip of the Soviet delegation to the 2nd Soviet-American symposium on environmental mutagens], folder "Otchety o komandirovkah sotrudnikov Instituta v zarubezhnye strany za 1975 god," 194-1-1859, ARAN.

International discussions involved such pressing concerns as developing effective and affordable testing for fast identification of toxins, mutagens, and cancerogenic chemicals to prevent their harmful effects. Identifying professional groups at risk for exposure to toxins could prove helpful in preventing occupational hazards such as cumulative toxin poisoning. Introducing national control systems of testing new medications, foods, and body-care products for mutagenic and teratogenic properties would provide safety for consumers. Discovering connections between mutagens in pollutants and carcinogenicity would advance public health research demonstrating the necessity of protecting humans from pollutants .[305] Participants believed exchanges on these matters were helpful in developing a better understanding and protective measures against toxic pollutants.[306] Given the relatively limited exchange visits and conference attendance, this group failed to go beyond science diplomacy and transform into joint research as did, for example, WG V. Despite the importance of the subject, scientific cooperation in biological and genetic consequences of pollution succumbed to Soviet system's claims to secrecy in science and topic overlap with more influential WGs.

WG X. Arctic and subarctic ecological systems: a change in shooting limits, so to speak

Putting arctic research on the list of CFEP activities was a bold move. U.S.-Soviet collaboration in permafrost areas had been a challenge for a long time due to security considerations on both sides. The expectation for some restrictions to be lifted under CFEP was not unfounded given the new level of openness in this program but still a gamble. The initial arrangements in WG VI clearly showed that access to the Arctic was still an issue: "The

[305] Kratky otchet o rabote mezhdunarodnogo obshchestva po mutagenam vneshney sredy [Brief report on the work of the international society of environmental mutagens], folder "Otchety o komandirovkah sotrudnikov Instituta v zarubezhnye strany za 1975 god," 194-1-1859, ARAN.
[306] Philip E. Schambra, "Office of Associate Director for Interagency Programs: Summary Statement," *Environmental Health Perspectives* 20 (1977): 184-185.

Soviets later said they would not send an observer to the US Alaska test, apparently because they did not want to incur any commitment to let a US observer see any goings-on in Soviet cold waters."[307] This did not mean that the Soviet authorities and scientific community ignored the environmental challenges of arctic ecosystems or failed to address them.[308]

By late 1973 the CFEP joint committee put this program's affairs in order. Citing too much topic overlap led leaders to reassign all projects to other WGs with a plan to "review the progress under this area". [309] Protection of northern ecosystems went to WG V. Interestingly, this group did not experience any challenges in accessing the Soviet Arctic to monitor seal migrations, snow goose and walrus population and to collect specimens of microarthropods.[310] Furthermore, the Arctic work of this group was lauded as an achievement of the CFEP program in Train's testimony before Congress after "the first American to visit this remote Soviet island in the Arctic Ocean only 320 miles west of Alaska became part of a joint effort which is already providing valuable information on <…> snow goose population. This information has already been the basis of a change in shooting limits on our own Pacific

[307] Jack Perry, Cover page, October 5, 1973, "Marine reports 1973," EPA.
[308] Pey-Yi Chu, *The Life of Permafrost: A History of Frozen Earth in Russian and Soviet Science* (Toronto: University of Toronto Press, 2020), 18-19.
[309] Memorandum of the second meeting of the U.S.-U.S.S.R. joint committee on cooperation in the field environmental protection, Washington, D.C., 13-16 November 1973, box 1, folder "US-USSR Correspondence, 1972-1975," 18, EPA records, NARA.
[310] For example, S.F. MacLean, V. Behan, and A. Fjellberg, "Soil Acari and Collembola from Chaun Bay, Northern Chukotka," *Arctic and Alpine Research* 10, no. 3 (1978): 559-687. For a full list of eight CFEP projects relating to northern ecosystems and their progress as of 1978, see R.A. Scriabine, "U.S.-Soviet Program on the Protection of Northern Ecosystems: A Commentary," *Arctic and Alpine Research* 10, no. 3 (1978): 553-557.

flyway."[311] The Americans finally succeeded in breaking the "Soviet ice" over joint Arctic research.

WG XI. Legal and administrative issues: cross-examination is a necessary skill

With the goal for this group stated as exchange of information and expertise, the legal team settled on holding biannual joint meetings of experts in environmental law and its enforcement on the federal and regional levels. They alternated in hosting these meetings in the U.S.S.R. and the U.S., with funding arranged based on the "sending side pays" principle extended to most CFEP travel expenses.[312] Regardless of differences in standardizing and enforcing environmental safety, for example industrial pollution levels, the two teams were focused on sharing their experiences, and not just among themselves but also with a wider audience.[313] One item on the agenda for the 1974 meeting was a possibility of translation into Russian and publication by a Soviet press of William O. Douglas's *The Three Hundred Year*

[311] *U.S.-U.S.S.R. Cooperative Agreements in Science and Technology: Hearings Before the Subcommittee on Domestic and International Scientific Planning and Analysis of the Committee on Science and Technology*, 94th Cong. 127 (1975) (statement of Russell E. Train, Administrator of the Environmental Protection Agency).
[312] Conditions and methods of financing participation of specialists under the U.S.-U.S.S.R. agreement on cooperation in the field of environmental protection, box 1, folder "1972-1975 Misc. records," EPA records, NARA. The "sending side pays" rule was an innovation, the opposite of the "hosting party pays" arrangement of the earlier inter-academy program discussed in chapter 1. For American participants, this new setup meant procuring funding for travel. The employer institutions covered expenses of state officials (e.g., CEQ or EPA representatives) and employees of public gardens and private companies. Participants of some WGs treated them like other research projects and applied for grants from the National Science Foundation.
[313] Thomas J. Schoenbaum, Report on the work of the first American legal scholar to go to the Soviet Union under the U.S.-U.S.S.R. environmental agreement, 28 July 1975, box 1, folder "1972-1975 Misc. records," EPA records, NARA.

War: A Chronicle of Ecological Disaster. In 1975 thirty thousand copies of the translation became available to Soviet readers.[314]

The first experience of an American legal scholar in the Soviet Union was challenging. An exchange of interns had been established for this group to give individual specialists an opportunity to have a hands-on experience in learning from the other party. This included access to law libraries, relevant research institutions for discussions, and protected areas (offices of national parks, local nature reserves, etc.). The American internship was hosted by the Woodrow Wilson Center in Washington, D.C. The Institute of State and Law of the Soviet Academy acted as the principal responsible institution in the U.S.S.R.[315] The two-month pioneering adventure of Thomas J. Schoenbam, a professor of law at the University of North Carolina at the time, began with substandard accommodation and a slew of organizational problems. Pre-approved traveling plans to nature reserves in the Stavropol region and Lake Baikal were cancelled. Only one of two trips to substitute locations, in Latvia and Voronezh, happened, and there the local administration refused to show him their regulatory documentation. Having worked hard to prepare for the trip, he had not anticipated problems.[316] Armed with the tools of his trade, Schoenbam negotiated, argued, read the fine

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[314] "Otchet o provedenii v Sovetskom Soyuze vtoroy vstrechi sovetskih i amerikanskih spetsialistov po pravovym i administrativnym meram sohraneniya kachestva okruzhayshchey sredy," folder "Dokumenty o provedenii 2-oy sovetsko-amerikanskoy vstrechi po pravovym aspektam ohrany okruzhayushchey sredy/ 11-26 maia 1974," 8, 1934-7-703 ARAN; William O. Douglas, *The Three Hundred Year War: A Chronicle of Ecological Disaster* (New York: Random House, 1972), in Russian: William O. Douglas, *Trehsotletnyay Voina. Khronika Ekologicheskogo Bedstviya* (Moscow: Progress, 1975), was printed in 30 000 copies.

[315] Embassy of the United States to O.S. Kolbasov, 16 April 1974, folder "Dokumenty o rpovedenii 2-oy sovetsko-amerikanskoy vstrechi po pravovym aspektam ohrany okruzhayushchey sredy (programma, otchet, spiski uchastnikov i perepiska)," 703-7-1934, ARAN.

[316] Thomas J. Schoenbaum, Report on the work of the first legal scholar to go to the Soviet Union under the U.S.-U.S.S.R. environmental agreement, May-July 1975, box 1, folder "1972-1975 Misc. records," EPA records, NARA.

print on everything he signed—and his efforts paid off, resulting in a "experience useful beyond my expectations." Realizing that "Soviets are genuinely interested in aiding research and opening within certain limits their administrative process to legal scholars," he managed to conduct two case studies, meet with high-ranking officials, and draft two papers, one for the American *Journal of Comparative Law* and the other for the Soviet *Sovetskoye Gosudarstvo i Pravo*.[317]

The biannual joint meetings of jurists and environmental experts continued into the mid-1980s. Each meeting included a day of presentations on relevant topics from members of the hosting and the visiting team, discussions, and a trip to facilities outside the host city to survey regional environmental control and safety measures. While the group made no breakthroughs in international law, the exchange of useful information was abundant. Evidence of such information reflected in work of EPA, CEQ, and Sierra Club experts as well as university law scholars on the American side and representatives of the Supreme Soviet, the Ministry of Justice, law scholars in Moscow, Kiev, Baku, Tashkent, and Vilnius.[318] The Soviets took a special interest in U.S. strategies for introducing environmental regulations with immediate

[317] Schoenbaum, Report, 3-5; Thomas J. Schoenbaum, "Natural Area Preservation in the Soviet Union and the United States: A Comparative Perspective," *American Journal of Comparative Law* 24, no. 3 (1976): 521-539.

[318] American delegations to the U.S.S.R. in from 1974 to 1983 included John Busterud (CEQ, Chairman), Henry L. Diamond (New York State Department of Environmental Conservation, Commissioner), Nicholas A. Robinson (Sierra Club, Member of the Board of Directors), Dinah Bear (CEQ, General Counsel). Folder "Dokumenty o provedenii 2-oy sovetsko-amerikanskoy vstrechi po pravovym aspektam ohrany okruzhayushchey sredy (programma, otchet, spiski uchastnikov i perepiska)," 703-7-1934 (records of the Institute of State and Law), ARAN; folder "Dokumenty (programma, protocol, spisok uchastnikov sovetskoy delegatsii, otchet) o provedenii chetvertoy vstrechi sovetskih i amerikanskih spetsialistov po pravovym i administrativnym meram sohraneniya kachestva okruzhayushchey sredy," 988-7-1934, ARAN.

neighbors, Canada and Mexico—possibly to incorporate them in negotiations with their neighboring nations.[319]

Section 4. A slightly bigger picture

These collaborative programs were in no way unique. In fact, one might argue they were almost trivial. In the late 1960s to the early 1970s, numerous bilateral and international scientific exploration projects involving American and Soviet scientists were operational. Examples include U.S.-U.S.S. R. collaboration in radio astronomy and the search for extraterrestrial intelligence, the creation of the International Institute for Applied Systems Analysis (IIASA), exchanges in computer science, high-energy physics, health care, and the list did not end there.[320] In earth sciences, historians argue, American-Soviet joint work rode on the long echo of the International Geophysical Year (July 1957 – December 1958):

[319] Otchet o provedennoy v Sovetskom Soyuze vstreche sovetskih i amerikanskih spetsialistov po pravovym i administrativnym meram sohraneniya kachestva okruzhayushchey sredy [Report on a meeting between Soviet and American environmental law experts held in the Soviet Union], folder "Dokumenty o rpovedenii 2-oy sovetsko-amerikanskoy vstrechi po pravovym aspektam ohrany okruzhayushchey sredy (programma, otchet, spiski uchastnikov i perepiska," 26, 703-7-1934, ARAN.

[320] Rebecca A. Charbonneau, "Different Worlds: The Challenges of US and Soviet SETI Collaboration During the Space Age," *NASA History: News and Notes* 34, no. 4 (2017): 18-21. Charbonneau is currently at the University of Cambridge exploring the subject further in a doctoral thesis, 'A Friendly Civilization': Intelligence and Communication in Cold War Radio Astronomy." Matthias Duller, "Internationalization of Cold War Systems Analysis," *History of the Human Sciences* 29, no. 4/5 (2016): 172-90; Ksenia Tatarchenko, "A House with the Window to the West": The Akademgorodok Computer Center (1958-1993)" (PhD diss., Princeton University, 2013); Glenn Schweitzer, "Who Wins in U.S.-Soviet Science Ventures?" *Bulletin of the Atomic Scientists* 44, no. 8 (1988): 28-32; Anna Geltzer, "In a Distorted Mirror: The Cold War and U.S.-Soviet Biomedical Cooperation and (Mis)understanding, 1956–1977," *Journal of Cold War Studies* 14, no. 3 (2012): 39–63.

LANDSAT (satellite observations), JOIDES and POLYMODE (ocean exploration), Antarctic research (with its heavy political intentions), and the Nazca Plate Studies (plate tectonics).[321]

Furthermore, in a recent paper on WG VIII, historian Katja Doose maintains that between 1955 and 1980 "most Soviet scientists were not isolated but actually well integrated in the international research community."[322] With this statement, she suggests that there was not a significant gap between Soviet research communities and American academe. She notes that they created access to each other's published papers, data, and discussions, and catching up on recent advancements through bilateral exchanges and collaborative programs, becomes redundant —it seems there was no gap. Or was there? Doose's judgement, based on historians' explorations of individual contacts between representatives of the highest level of Soviet scientific hierarchy and their Western colleagues, is illuminating—except for the word "most". In reality, there is no simple answer to the question of Soviet integration. Members of the *presidium* of the Academy were routinely involved in international affairs. For advanced graduate students, junior faculty, and mid-level practitioners, however, consistent contacts with the West were sporadic, volatile, and in many cases impossible outside of inter-academy and bilateral frameworks.

In fact, each of the eleven programs was distinctive in its framework, participation, and outcomes for those privileged to be invited to participate. This kind of support could readily

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[321] Christopher C. Joyner, "U.S.-Soviet cooperative Diplomacy: The Case of Antarctica," in Nish Jamgotch Jr., ed., *U.S.-Soviet Cooperation: A New Future*, 43-44, 52-53; Vicky Cullen, ed., *Report of the Decade: The International Decade of Ocean Exploration* (Washington, D.C.: Division of Ocean Sciences, National Science Foundation, 1982), 7.
[322] Katja Doose, "A Global Problem in a Divided World: Climate Change Research during the Late Cold War, 1972–1991," *Cold War History* (2021): 3, DOI: 10.1080/14682745.2021.1885377.

impel careers forward, and, where there was mutual synergy between individual careers and larger projects, there could be excellent outcomes. The entire CFEP program provided an unprecedented human experience for participating mid-level scientists. When put in charge of organizing and conducting joint research, they built their projects from ground up, relying on their professional skills, common sense, ingenuity, and intuition.[323] A few of them may have participated in other international projects, but the majority had not, particularly with the "other side" of the Cold War. Being a limited number and largely narrowly engaged in specific projects They could not easily share their experiences to educate other groups beyond generic manuals on how to survive in the Soviet Union or lists of dos and don'ts in America.[324] Word of mouth could only go so far—a strategy that worked for collecting propagules in Siberia was of little value for negotiating access to a law library in Moscow or arranging a shipment of seismological equipment to Kazakhstan. In retrospect, what is impressive is the productivity despite multiple challenges and carried on through joint publications or meetings that were not cancelled. They thus evaded the failure to understand

[323] A good example of the balance of responsibility for these projects between officials and scientists comes from Wayland Swain (director of the Large Lakes Research Station, Michigan), program leader, WG II: "The commentary from Washington, relative to the project, has been largely less than useful. With a few notable exceptions … the direction, coordinative assistance, and constructive advice has been conspicuous by its absence. This has left me largely in the role of decision maker, with little or no programmatic accountability except for that dictated by morality and conscience." Swain to Mount, February 23, 1978, box 1, folder "1972-1975 Misc. records," 1, EPA records, NARA.

[324] Handbook for travel to the Soviet Union under the U.S.-U.S.S.R. environmental agreement, April 1978, box 1, folder "1972-1975 Misc. records," EPA records, NARA. Albeit generic, these inhouse manuals show the level of dedication of American scholars to these exchanges. They cover topics from what clothes to pack for a trip to the U.S.S.R. to which books to read in preparation for better understanding of Soviet history and culture.

the science on the other end to which an earlier cooperative initiative in biomedical research succumbed, overpowered by the Cold War mentality.[325]

Conclusion

The second EPA administrator, Russell Train, thought the U.S. benefitted very little from environmental collaboration with the Soviets, and his diplomatic efforts were wasted.[326] Announcing the signing of the CFEP agreement in 1972, he proclaimed, "It's a new ball game with the Soviets!" but took back these words in his largely negative memoir.[327] Train was also under the impression that despite organizational and political support these projects petered out and dissolved by the mid-1980s.[328] From his perspective as a government official, this may have been a fair assessment of what emerged from the collaboration. However, closer investigation among a range of the active participants provides a different perspective from the point of view of scientists who conducted these collaborative projects. Many of them reported on and later reflected that the collaboration had been mutually beneficial, productive, and generated new scientific results. The outcomes were varied, and several projects turned out to be short-

[325] Geltzer, "In a Distorted Mirror," 40-41. Geltzer argues: "When exchange participants were interpreting and responding to interactions with their foreign colleagues, the analytical framework they used was the Cold War. Their adoption of this framework posed a barrier to achieving mutual understanding not only of the other side's motives or intentions, but also of the *science itself*. The exchange participants came away with a distorted picture of the structure and function of each other's research enterprise."

[326] Train's biographer, J. Brooks Flippen, also discussed Train's involvement in the CFEP agreement in J. Brooks Flippen, *Conservative Conservationist: Russell E. Train and the Emergence of American Environmentalism* (Baton Rouge: Louisiana State University Press, 2006), 125-129 and 153-154.

[327] Train, *Politics, Pollution, and Pandas,* 127: "I said, somewhat expansively, "'It's a whole new ball game with the Soviet Union!' I must have been practicing my sound bites." Ironically, some historians quote this phrase as evidence of significance of the CFEP agreement.

[328] By that time Train likely lost touch with this program, having resigned from the EPA and returned to leading the World Wildlife Fund.

lived, somewhat formalistic, and only minimally fulfilled the obligations of the CFEP agreement. Others carried on for up to a decade and dissolved once the participants exhausted their research topics. A few flourished and continued into the post-Soviet time, even if acquiring new titles, shapes, and objectives; for example, as WG V evolved into a permanent American-Russian wildlife conservation effort.[329] Ultimately, these American-Soviet collaborations were much more than intellectual endeavors. They aspired to combine the Cold War track-two diplomacy, exchange of valuable data, access to previously restricted areas for research, and the nascent call to address global environmental issues.

Why did some projects live, and others perish? And what was their significance for the history of science or Cold War history? As the reader may have noticed, two working groups are missing from the list in this chapter: WG VIII, "influence of environmental changes on climate," and WG IX, "earthquake prediction." They will be the focus of chapters three and four respectively as more detailed case studies of the "anatomy and physiology" of these collaborations. Looking at them from the top down, from the point of view of officials who commissioned them, obscures the perspective of practitioners when, as we saw in WG II and WG V, their control seemed to have constrained participants. In the case of participants of WG VIII and WG IX, their professional interests, scientific ambitions, personalities, as well as their cultural differences, and similarities shaped these projects as much as politicians' ambitions shaped the CFEP agreement.

[329] Other examples of CFEP projects from WG VIII and WG IX that outlived the Cold War and the agreement will be discussed in chapters three and four.

The overview of the groups discussed in this chapter reveals patterns of interaction and the relative challenges and successes experience by specific working groups. It is hardly coincidental that CFEP programs that survived the longest and were successful were field disciplines. The next two chapters will discuss how such collaborations played out in earth sciences. Among the more "science intensive" projects under the agreement, these WGs stood out as two of the most active, long-lasting, and productive.[330] Each ran a large operation involving symposia and discussions, data sharing, fieldwork, lab experiments, equipment exchanges and design, expeditions—almost the entire spectrum of scientific activities—and most of them had been previously unavailable for American-Soviet or other Western-Soviet projects.

The curious thing is that the CFEP agreement long-term results matched ***what*** the American intended them to be at the inception of the agreement, just not ***how*** they wanted to obtain them. At the beginning, before the Moscow summit, there was a desire to refocus the Soviets from competition to collaboration—despite inherent biases and Cold War competitiveness that both American and Soviet scientists initially brought to the program. After the first few years, the surviving projects gravitated to genuinely collaborative work. The Americans hoped to negotiate current regional and local data for comparative and cumulative assessments and through on-site symposia and fieldwork, the Soviets provided such access. The EPA aspired to open a meaningful dialogue on environmental policy making and do some "planet-saving"—CFEP initiated discussions on previously neglected environmental topics, raised environmental awareness in the country (at least among scientists), informed the U.S.S.R.'s position on these issues in international organizations, and

[330] Kelley, "American-Soviet Cooperation," 112-113.

strengthened several environmental disciplines in the Soviet Union. The U.S. academic community aimed to gain hands-on access to Soviet advancements in earth and environmental sciences—and the CFEP program made this happen in in the field, in expedition, and experimentation. It just happened without the fanfare of the Apollo-Soyuz mission. While the space programs had active publicity arms and required dramatic sums of money, the CFEP program relied on the engagement of scientists and their professional communities, making policy makers tangential once things were in motion. They could and did often ignore the drama of Cold War politics as they pragmatically pursued their scientific research. As CFEP activities lost visibility to top-level officials, mid-level scientists conducted the surviving projects with less governmental control and pressure and more independence in making professional choices.

CHAPTER 3
Working Group VIII: talking face-to-face

Introduction: environmental ideologies

The Americans had a mixed set of goals for the environmental agreement. On the one hand, as official pronouncements of political leaders stated, there was a call for openness between the United States and the Soviet Union and a show of mutual preparedness to coexist and collaborate despite Cold War controversies. The commentary emphasized a common environmental cause of joining forces in an effort to mitigate anthropogenic damage to the planet. On the other hand, the scientists had a genuine interest in learning what the Soviets knew about a range of environmental topics and finding opportunities to organize exchanges and joint research in scholarly fields and geographic locations previously inaccessible. In addition, interspersed in Environmental Protection Agency's discussions was a twist of reasoning for promoting the cooperation in the field of environmental protection (CFEP) agreement. At the outset of joint work under the agreement, American objectives encompassed the following: "Anything we do to increase Soviet attention to environmental quality is good because of the vast Soviet impact upon the world environment, and also because they gain a competitive advantage if they run their economy without pollution controls while we run ours with strong pollution controls."[331] In the best tradition of Cold War rationality that the authors of *How Reason Almost Lost Its Mind* laid out, this goal was as logical as any. Not

[331] Paul Erickson, Judy L Klein, Lorraine Daston, Rebecca Lemov, Thomas Sturm, and Michael D. Gordin, *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality* (Chicago and London: University of Chicago Press, 2013) 5-7.

surprisingly, a pragmatic economic benefit for the U.S. provided the potential opportunity for selling U.S. manufactured monitoring and testing equipment to the Soviet Union.[332]

What was it that the Soviets wanted? What did they stand to gain directly or vicariously from CFEP exchanges and research? Beyond formally complying with the newly introduced pollution control policies in the United Nations and thus continuing to uphold their status in the global community, what were their interests? Like the Americans, they had a mixed bag of political and professional interests. Two misunderstood goals are of particular significance for earth science WGs. It was presumed that the Soviets anticipated gaining access to American technology and showcasing their own achievements. The Americans from Congressmen to scientists often expressed skepticism toward the Soviets' benevolence in the agreement, arguing that their ulterior motive was appropriating American technology. Soviet scientists presumed this was not an ulterior motive and welcomed an opportunity to learn American techniques of digital data processing. They openly acknowledged the inferiority of some of their own equipment and young core-level scientists were eager to join the CFEP program for a chance to work with more sophisticated instruments. They may have been taken aback if they ever heard the allegations. Yes, digital technology was lagging in Soviet science, but the Academy and the Hydrometeorological Service (Gidromet) were willing to negotiate purchasing American computers. Academic institutes and facilities were motivated to have hands-on experiences with American technology as well as to communicate directly with Western colleagues. In exchange, they offered to share their

[332] US-USSR environmental agreement: progress report, "US-USSR correspondence, 1972-1975," Box 1, Records Relating to the US-USSR Joint Committee on Cooperation in the Field of Environmental Protection 1972-1980, EPA Office of Research and Development, Record Group 412, National Archives at College Park (hereafter EPA, NARA II), 3-4.

data, processing methods, and conclusions, open research sites for American scientists, and host long-term projects. Was this not what collaboration meant?[333] Furthermore, where American-Soviet trade and technology transfer were concerned, there was even less ground to assume ulterior motives because by the mid-1970s it was known that "the flow of knowhow and technology is by no means only a one-way street, flowing from capitalist to communist countries. Since 1962, the U.S.S.R. has sold an increasing number of licenses to Western and Japanese firms, and in a number of recent years it has sold more rights than it has bought."[334]

Soviet climate scientists had yet another objective for CFEP. At that time, the intensity of advocacy for environmental protection and safety in the capitalist world was second only to that against the nuclear threat. Research and analysis reached broad audiences in the form of published books. Written by economists, sociologists, philosophers, and they contained appeals to the global community to rethink economies, policies, industries, demographics, and laws. Charles Reich prophesied in his explosive book that a coming revolution that would bring about "a renewed relationship of man to

[333] NOAA statement on USSR computer requirements in support of international meteorological programs, box 3, folder 12 "USSR Hydromet, 1977," James J. Bowe 1975-1982, series 1 (Executive Papers), Executive Files 1957-1991, Control Data Corporation records CBI 80, Charles Babbage Institute Archive, University of Minnesota.
[334] Barry M. Richman, "Multinational Corporations and the Communist Nations," *Management International Review* 16, no. 3 (1976): 10, 20.

himself, to other men, to society, to nature, and to the land."[335] If the Soviet society had an opinion on environmental threats, someone would have to voice it. In the absence of a strong informed position by officials, the best group to set specific goals were the experts, namely earth and environmental scientists.

Soviet scientists had long-standing traditions of studying nature and its resources and negotiating the human-nature interactions.[336] Focusing the joint research on climatic patterns, anthropogenic climate change, climate modeling, and global transfer of pollutants in the atmosphere, Working Group VIII was the quintessence of the entire CFEP program, and the Soviets wanted it to be this way. Most other working groups' foci were applied. Water pollution or urban development undoubtedly required professional knowledge, technologies, and skills, but such common concerns did not necessarily involve a broader scientific context or theorizing. By contrast, the WG VIII target issues were being actively studied at the time, and scientific consensus was yet to be achieved. For the Soviets, this was an opportunity to showcase their own philosophic-scientific-logistical approach.

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[335] Charles A. Reich, *The Greening of America* (New York: Random House, 1970), 4, 7. I refer, in the first place, to the canonical Paul R. Erlich, *The Population Bomb* (New York: Ballantine Books, 1971); E.F. Schumacher, *Small Is Beautiful: Economics as if People Mattered* (New York: Harper & Row, 1973), Barbara Ward and Rene Dubos, *Only One Earth: The Care and Maintenance of a Small Planet* (New York: Norton, 1972); Christopher D. Stone, *Should Trees Have Standing: Towards Legal Rights for Natural Objects* (Los Altos: W. Kaufmann, 1974); William O. Douglas, *The Three Hundred Year War: A Chronicle of Ecological Disaster* (New York: Random House, 1972); and Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, and William W. Behrens III, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972).

[336] Douglas R. Weiner, *A Little Corner of Freedom: Russian Nature Protection from Stalin to Gorbachev* (Berkeley, Los Angeles, and London: University of California Press, 1999), 1-21.

Section 1. WG VIII: the structure

While the National Oceanic and Atmospheric Administration (NOAA) was the lead agency coordinating US participation in WG VIII and supervised all the activities, the process of recruiting diverse and talented participants was not straightforward.[337] In fact, administrating WG VIII was never simple or problem-free. This chapter focuses on the complexities and the efforts to find a common language for the collaborating scientists, but the importance of networking runs through the entire history. In the initial stages, coordinating committee members invited colleagues they knew to join the program, but that required more than simply sending out invitations. Given the contemporary reality of working with the Soviet Union, potential invitees needed to understand what a commitment implied. Their participation would concern scientific engagement as well as political choices and safety considerations.

Outside commentators looking back at WG VIII sometimes reflect an undertone of disappointment that, while the projects were productive, they were mostly helpful to the Soviets. The incompatibility of regional data, especially in quality, and reluctance of the Soviets to share their data undermined strong collaboration. The Soviet administrators of pushed their approach to climate change very aggressively. The bureaucratic setup of the group was complicated and created, it seems, as much hindrance as assistance. In addition, the political perturbations of the Cold War created interference. On several occasions, confrontations meant visits were cancelled, budgets cut, and participants were denied access to international travel. Another concern was that even though WG VIII

[337] Renee L. Tatusko, *Cooperation in Climate Research: An Evaluation of the Activities Conducted under US-USSR Agreement for Environmental Protection since 1974* (Washington: National Oceanic and Atmospheric Administration, 1990), 10.

activities continued into the mid-1990s, they petered out as the overall number of CFEP visitors decreased gradually over the years, dropping from three hundred and sixteen people in 1977 to sixty-seven in 1984.[338]

Nonetheless, the internal documentation and participants' notes and recollections of those involved in joint projects tell stories of successful coping with political pressures, satisfactory productivity, and a relative balance between scientific and cultural for both parties. An explanation of this discrepancy between those commenting on overall outcomes and those mid-level scientists reflecting on modest but real collaboration may lie in different expectations of narrators and in changing perspectives over time. Rather than looking for explanations, which would be highly speculative, several accounts of WG VIII projects may be more helpful as they create a more detailed and nuanced picture of these twenty years of interaction.

Compared to most other CFEP programs, WG VIII ran a massive operation requiring complex technology and extensive budgets: ocean and lake research cruises, regular bilateral symposia with up to forty participants in locations across and beyond both countries, astronomical observations of the solar corona in Siberia, atmospheric aerosol

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[338] Kelley, "Environmental Protection and Conservation," in *U.S.-Soviet Cooperation*, 105; *The Soviet Role in Pacific Rim Trade: US-Soviet Environmental Cooperation: Hearing Before the Special Subcommittee on U.S-Pacific Rim Trade of the Committee on Energy and Commerce*, 99th Cong. (1985) 10 (statement of Fitzhugh Green, Associate Administrator, Office of International Activities, Environmental Protection Agency); Katja Doose, "A Global Problem in a Divided World: Climate Change Research During the Late Cold War, 1972–1991," *Cold War History* (2021): 9, DOI: 10.1080/14682745.2021.1885377 (The author of this paper must have accidentally mistaken the overall CFEP numbers from two above sources for the quantity of Area VIII participants in 1977-1984. No one CFEP working group had an exchange of three hundred participants in any given year. Numbers for each group oscillated between twenty and forty at most. This is important to realize given the already unreasonably high expectations for the program and, most importantly, the more personal nature of CFEP exchanges as compared to many inter-academy ones. The value of CFEP WGs was in sustained face-to-face communication rather than a big turnout.

radio sounding field experiments, lidars, and last but certainly not least, launching a satellite into the earth's orbit. The size and status of its administrative structure also surpassed other programs, and managing it was time consuming and labor intensive.

Over the first fifteen years of WG VIII's existence, there was so much rotation in its administration that it makes one wonder how the group navigated through planning and coordinating so efficiently that it was, by popular vote, "among the most active programs."[339] Rotation in the joint committee of two co-chairs and two executive coordinators was such that over the time of its existence WG VIII had a succession of five American co-chairs, four Soviet co-chairs, and four American executive coordinators. In addition, every one of five projects within the program had its own project leaders, one on each side. Neither joint committee members nor project leaders necessarily participated in the actual research. This administrative hierarchy had its benefits in securing funding and pulling in other resources to the program, as most members had administrative clout and scientific expertise to contribute. Representatives of forty-one American universities, thirteen NOAA laboratories, five NASA facilities, and the EPA, NSF, and USGS had one-time or long-term commitments with the program. On the Soviet side, which, as we know, had a very differently organized system for research and education, only two universities were involved in addition to two major scientific structures, the Academy (with eighteen participating institutes) and Gidromet (with twelve research facilities). Within the Soviet system this meant that considerable weight of the academic system was thrown behind the program, and the leadership

[339] Donald R. Kelley, "American-Soviet Cooperation on Environmental Protection," in *Sectors of Mutual Benefit*, 112.

belonged to Gidromet, where comprehensive environmental monitoring was developed.[340]

The creator and proponent of the concept, Yuri Izrael, introduced it in 1974 when he replaced academician Evgeny Fedorov as the head of Gidromet and, consequently, as co-chair of the CFEP joint committee; he thus became the person responsible for running the Soviet half of CFEP. Izrael incorporated Fedorov's views on anthropogenic ecological crisis into the system. Among Soviet environment and climate scientists, Fedorov, Izrael, the geographer Innokenty Gerasimov, and the climatologist Mikhail Budyko had the most visibility in the West.[341] Each of the four had an articulated approach to human-nature interaction with the overarching goal of achieving a balance among harmful anthropogenic impacts on global ecosystems, state economic needs, and protection of natural environments to preserve their capacity to regenerate. These concepts, for which

[340] Tatusko, *Cooperation in Climate Research,* 98-100; US-USSR environmental agreement: progress report, January 29, 1974, "US-USSR correspondence, 1972-1975," Records relating to the US-USSR joint committee on cooperation in the field of environmental protection, 1972-1980, EPA records, NARA.

[341] All four scientists took on administrative functions serving on national and United Nations committees; they were active in the global scientific community and belonged to a variety of international professional unions. For example, Fedorov was among the few Soviet members of the Club of Rome. Izrael led Soviet delegations in United Nations negotiations and occupied administrative positions (second vice-president, head of committee) in the World Meteorological Organization. Gerasimov was a member, award recipient, and vice-president of the International Geographical Union. Julia Lajus, "Soviet Official Critiques of the Resource Scarcity Prediction by Limits to Growth Report: The Case of Evgenii Fedorov's Ecological Crisis Rhetoric," *European Review of History: Revue européenne d'histoire* 27, no. 3 (2020): 321-341; Yu.A. Izrael, "Avtobiografia," in *Akademik Yuri Antonievich Izrael: Chelovek i Ucheny* [Academician Yu.A. Izrael: a person and a scientist], ed. A.I. Bedritsky, Yu.S. Tsaturov (Moscow: Rosgidromet, 2018), 41-42; "I.P. Gerasimov Is Dead; Top Soviet Geographer," *New York Times*, April 4, 1985, D30; V.P. Chichagov, "Velikie Sovetskie Geografy I.P. Gerasimov i K.K. Markov: K 110-letiyu so dnya rozhdeniya," *Astrakhansky Vestnik Ekologicheskogo Obrazovaniya* 3 (33) (2015): 169 [Acclaimed Soviet geographers I.P. Gerasimov i K.K. Markov: to the 110th anniversary]; Jonathan D. Oldfield, "Mikhail Budyko's (1920–2001) Contributions to Global Climate Science: From Heat Balances to Climate Change And Global Ecology," *WIREs Climate Change* 7 (2016): 683;

they strongly advocated, came together as a governing framework for climate science in the U.S.S.R. In ways that American colleagues found frustrating, CFEP became a testing ground and a promotion platform for environmental monitoring. Yet this outcome had to be tolerated given, first, the status of its proponents—Izrael oversaw CFEP, and Gerasimov and Budyko were running sections of WG VIII—and second, their suggestions were original, insightful, and available in English, which increased their visibility.[342]

Based on Vernadsky's structural approach to the planet, Izrael's comprehensive environmental monitoring system aimed at optimizing human-nature interactions. He outlined its main features as "prerequisite consideration of all basic aspects of interactions and connections in the natural environment. To accomplish it, a large number of issues must be resolved that pertain to multiple scientific disciplines. Another feature of comprehensive monitoring is that not even one significant aspect of these interactions can be left uninvestigated in such analysis." To illustrate the approach, Izrael created an algorithm. Analysis (research) of factors impacting the environment fed into limit determination (i.e., developing levels of acceptable human impact on organisms and ecosystems within a region), implementation of criteria and norms for controlling release

[342] Yu.A. Izrael, "Sovremenny Etap Sovetsko-Amerikanskogo Sotrudnichestva v Oblasti Ohrany Prirodnoy Sredy," *Vestnik Akademii Nauk SSSR* 10 (1976): 114-119 [The current state of Soviet-American cooperation in environmental protection]; V.A. Snytko and A.V. Sobisevich, "Vklad Akademika I.P. Gerasimova v Problemu Monitoringa Prirodnoy Sredy" [Scientific contribution of academician I.P. Gerasimov to environment monitoring], *Problemy Ekologicheskogo Monitoringa i Modelirovaniya Ekosystem* XXVIII, no. 1 (2017): 12, 15.

of pollutants, and introduction of regulation mechanisms for limiting harmful effects of pollutants.[343]

The Soviet environmental monitoring concept also contained hidden agendas. As Weiner discusses, it contained a claim for geography (Gerasimov) and climatology (Izrael and Budyko) of the "central role in developing environmental theory" in the power struggle for status, state support, and funding. The more economic and ideological significance a discipline had in the Soviet system, the more funding it would receive. It was also part of the Soviet ideological self-promotion strategy abroad. As Russian historians point out, the Soviet ideologues "tied environmental protection into the struggle of two systems [i.e., socialism and capitalism] with an imminent victory of socialism."[344] This did not mean that the actual Soviet research was substandard or superficial. It was not by mere coincidence that American climate scientists were initially interested in collaborating with the Soviets to find out about their newly developed weather modification techniques.[345] Nor did it mean that the Soviet scientists feigned interest in anthropogenic or natural environmental threats. On the contrary, they contributed cutting-edge approaches and technologies to the global environmental research and mitigation of industrial damage to the planet. Gerasimov was one of those

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[343] Yu.S. Tsaturov and V.V. Chelukanov, "Nauchnoe Obosnovanie Vsestoronnego Analiza i Monitoringa Sostoyania Okruzhayushchey Sredy," in A.I. Bedritsky, Yu.S. Tsaturov, ed., *Akademik Yuri Antonievich Izrael: Chelovek i Ucheny* [Academician Yu.A. Izrael: a person and a scientist] (Moscow: Rosgidromet, 2018), 84.

[344] Weiner, *A Little Corner of Freedom*, 374-375, 401-403; Barbara Jancar, "Environmental Issues: The Soviet View," *Science* 207, no. 4438 (1980): 1458-1459; Aleksey V. Sobisevich and Aleksandr A. Fokin, "Nam Otnyud ne Bezrazlichno, v Kakom Vide Sotsializm Otvoyuyet Planetu u Imperializma." Formirovanie Sotsialiticheskoy Ekologii: Mezhdu Ideologiey i Praktikoy" ["We are far from indifferent to how socialism will win the planet over from imperialism." The development of socialist ecology: between ideology and practice], *Sotsiologia Nauki i Tehniki* 11, no. 3 (2020): 50.

[345] Doose, "A Global Problem in a Divided World," 4.

scientists within the Soviet system who, if very cautiously, sounded the alarm on the consequences of technocratic "reshaping the Earth."[346]

To understand the complex motivations for environmental monitoring to be continually and forcefully promoted in the Soviet Union, four points would be helpful to consider. First, environmental scientists did not equal conservationists or environmental activists either in the United States or the Soviet Union. We cannot expect the CFEP group to be nature advocates or ecologists, they approached environmental issues from the perspectives of their own disciplines.[347] Second, at the top level, CFEP chairs and co-chairs were involved in the politics of the Cold War and their disciplines' struggle for existence. For people like Gerasimov and Izrael, CFEP was among other things a career opportunity, "a means of enhancing their standing both internally and abroad."[348] Third, modeling as a method of scientific investigation was *a la mode* in the West. Drawing from strong mathematical traditions, the Soviets had been developing alternative ways to model mathematically and sought recognition for their techniques.[349] Fourth, interests and motivations of higher-ups and core-level scientists only partially overlapped. The

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[346] Marshall I. Goldman, *The Spoils of Progress: Environmental Pollution in the Soviet Union* (Cambridge: MIT Press, 1972), 189-190 and 262-263; Sobisevich and Fokin, "Nam ne Bezrazlichno," 47. Gerasimov was among scientists who openly critiqued the plan to build an ecologically devastating paper mill on the shore of Lake Baikal. However, he did so only when other prominent Soviet academics were advocating for saving the lake.

[347] This should not be understood as stating that the Soviet society in general or individual groups within it (intelligentsia, scientists, journalists, dissidents) were indifferent to or never engaged in environmental advocacy. On the contrary, despite the common belief that the official ideology suppressed all opposing opinions and the very real censorship in public media, Soviet environmentalists were consistently active in voicing their concerns. Marianna Poberezhskaya and Teresa Ashe, ed., *Climate Change Discourse in Russia: Past and Present* (London and New York: Routledge, 2019).

[348] Weiner, *A Little Corner of Freedom*, 372; Gordon MacDonald, interview by Ronald Doel on 1993 November 15, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD, USA, www.aip.org/history-programs/niels-bohr-library/oral-histories/4361-1.

[349] Weiner, *A Little Corner of Freedom,* 388-389.

latter group prioritized developing their disciplines and expanding their professional expertise through research including, one could only hope, international communication and bilateral projects.

Section 2. The paleoclimatic league

Before the collaboration started, American organizers faced the challenge of selecting specialists who would match the Soviets in the scope of research and level of expertise. This pool of climate researchers was still relatively small. Inviting experts to take administrative positions in WG VIII, the EPA chose from among the scientific leaders in the agencies involved. The 1974 list of U.S. members of WG VIII was a dream team of scientists and administrators. This group and others who joined the WG VIII administration and events are a testimony to the American commitment to its projects.

Figure 3. U.S. members of Working Group VIII (coordinating committee as of 1974)[350]

Dr. Edward S. Epstein	NOAA
Dr. Joseph Smagorinsky*	NOAA
Dr. Lester Machta**	NOAA
Dr. John M. Wilcox	Institute for Plasma Research (Stanford)
Dr. S.C. Coroniti	Department of Transportation
Prof. Robert Charlson*	University of Washington
Dr. A. J. Grobecker	Department of Transportation
Dr. John Imbrie**	Department of Geological Sciences (Brown)
Dr. Cecil E. Leith**	National Center for Atmospheric Research
Dr. J. Murray Mitchell*	NOAA/Environmental Data Services
D.H. Pack	NOAA/Air Resources Laboratory
Dr. E.W. Bierly	NSF
A. Fowler	NSF

[350] Edward S. Epstein to William A. Brown, December 6, 1974, folder 103967-015-0093 "USSR Working Group VIII: Climate 1972-1974," Environmental Protection Agency, Records of the U.S./U.S.S.R. Joint Commission on Environmental Programs, 1972-1976, ProQuest History Vault; The first session of the Working Group VIII on the influence of environmental changes on climate, June 10-21, Leningrad, Herbert E. Wright papers, box 1, drawer 2, University of Minnesota archives. For reference about their contributions to American climate science, individuals whose names are marked with [*] are discussed in Spencer R. Weart, *The Discovery of Global Warming* (Cambridge and London: Harvard University Press, 2003), 82-83, 107-109, 133. Oral history interviews with those whose names are marked with [**] can be found in the Niels Bohr Library collection at the American Institute of Physics.

For joint research, the American glaciologist John Imbrie was invited by NOAA to assemble a team of experts for the WG VIII climate change project and run it. He specialized in climatic changes in geology, paleoceanography, glaciology, and radiocarbon dating and knew most of his U.S. colleagues in these fields. At the time of collaboration, he was the Henry L. Doherty Professor of Oceanography at Brown University, continued to work at Columbia's Lamont-Doherty Earth Observatory, and was leading the inter-institutional Climate Long-Range Investigation, Mapping, and Prediction (CLIMAP) project. He certainly possessed scientific expertise, academic status, and administrative experience needed for leading the American team of experts in WG VIII on the project officially listed as "effects of changes in the heat balance of the atmosphere on climate," which, apropos, was the area of Budyko's main expertise and achievements.[351]

In other words, Imbrie was a star in his field. When CLIMAP and, coincidentally, WG VIII began, he was doing pioneering research in "solving the riddle of the ice ages." Through applying multifactor analysis to a combination of available sources of knowledge about the geological past (ice cores, paleomagnetic and stratigraphic data, isotopes, etc.), this project aimed to explain the occurrence of ice ages by reconstructing them. The goal of CLIMAP was to assemble a map of the earth as it was during the last glacial period (i.e., ice age). One of the challenges of this NSF funded project was that

[351] For a brief discussion of CLIMAP at the time of the events and a list of participating researchers, see Allen L. Hammond, "Paleoclimates: Ice Age Earth Was Cool and Dry," *Science* 191, no. 4226 (1976): 455. John Imbrie, interview by Ronald Doel on 1997 May 21, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD USA, www.aip.org/history-programs/niels-bohr-library/oral-histories/6924.

there were no data available for, as it was customary to point out, the one sixth of the planet's landmass that was the U.S.S.R.[352]

Imbrie was not the only star in WG VIII. On the reciprocity scale based on academic status and assignment in WG VIII, Imbrie's counterpart was academician Innokenty P. Gerasimov. And he was also a notable figure in his field. In the Soviet Union. The standard protocol was that collaboration with a capitalist country had to be supervised by a member of the Academy, who was in good standing with the Communist party bureaucracy, familiar with the research field in question, and cleared to travel to Western countries. This role was bestowed upon Gerasimov, an expert in geomorphology and paleogeography and a "scientist-politico hybrid", as *Science News* described him.[353] The director of the Institute of Geography of the Soviet Academy for thirty years, he was a towering, autocratic man of power, and the "politico" part in his description was also scientific. Most of what Imbrie sensed about him was accurate. In Russian colloquial terms, Gerasimov was "tsar and god" at his institute. A proponent of the concept of transforming nature to suit human needs that was popular in Stalin's time, he could "snap his fingers" and fix an issue with one quick phone call.[354]

Imbrie anticipated some difficulties with establishing contacts with the Soviets in paleoclimatology. When he and his colleagues arrived in Moscow in 1976 to conduct the initial negotiations for the paleoclimatic project, he could not have foreseen, however,

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[352] Leo F. Laporte, "Matching Mind and Method with Material: John Imbrie and Quantitative Facies Analysis," *Earth Sciences History* 30, no. 2 (2011): 165-167.
[353] Susan West, "Negotiating the Ice Age", *Science News* 114 (1978): 122-123.
[354] Imbrie, interview by Doel, AIP. As Imbrie recalled, "Gerasimov was a very powerful man because his party card was the next one after Gromyko. Gromyko was number seven and Gerasimov was number eight. They were early big communists and had been through the World War II together. And he was part of the power structure."

that nobody knew what it was. Paleoclimatology did not exist within the Soviet academic system as a separate discipline, and the initial meetings were frustrating. Meteorologists and hydrologists, with whom Imbrie was "matched" at the Academy at first, knew little about paleoclimates and had trouble understanding what it was that Imbrie planned to work on and what kind of experts would be right for this collaborative project.[355]

The confusion was eventually clarified. While the discipline with that name did not exist, competent scientists who specialized in it did. It was simply considered part of geology.[356] This was one of those instances where informal scientific networks could solve a problem, where formal top-down directives failed. The glaciologist Stephen Porter from the University of Washington had previously met his Soviet colleague Mikhail Grosswald in the U.S. and communicated his desire to work with Grosswald again. The pioneer of Beringia research and champion of collaboration with the Soviets, David M. Hopkins, knew other colleagues, with whom he had worked earlier.[357] A pleasant surprise came with meeting Natalia Kind, a knowledgeable and experienced Quaternary geologist, who quickly found a common language with the visitors. Grosswald, who had been perfecting his English on visits to the West and his wry sense

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[355] To clarify, the paleoclimatic project of WG VIII sought to exchange and analyze data from a specific geologic period. We live in the Cenozoic geologic era. Its current geologic period is the Quaternary that began with the formation of the Arctic ice sheet and consists of two epochs, earlier Pleistocene and later Holocene. The current geologic epoch within the Quaternary period is Holocene. It began when the last of the ice ages, also called glaciations, of the Quaternary ended. The research questions of the paleoclimatic project included exploring a possibility of modeling or predicting future climate changes based on patterns of geologic, glaciologic, and paleobotanic data from past Quaternary climates.

[356] Mikhail G. Grosswald, *Polveka v Poiske Otzvukov Velikih Oledeneniy* [Half a century of searching for echoes of great glaciations] (Moscow: Nauchny Mir, 2004), 84; Imbrie, interview by Doel, AIP.

[357] Dennis McLellan, "David Hopkins, 79; Geologist Studied Bering Land Bridge," November 25, 2001, *Los Angeles Times*, B.14; Stephen C. Porter, "In the Heart of the Soviet Union: A Meeting of Working Group VIII of the US-USSR Joint Committee on Cooperation in the Field of Environmental Protection (Moscow and Baku, November 1976)," James Hays's personal archive.

of humor and skepticism on a regular basis at home, translated when interpreters without knowledge of specific geological terminology were unhelpful and offered eye-opening insights into the Soviet academic system behind the scenes. The royal treatment of the Americans (Imbrie, Porter, Lamont's James Hays and Theodore Moore, Thompson Webb from Brown University, and Herbert Wright from the University of Minnesota) at Moscow meetings and social events continued with excursions to Azerbaijan's capital Baku and a tour of the republic's beautiful historic and natural sites, the ancient city of Shamakhi and the mud volcanoes in Gobustan. The groundwork done on this reconnaissance visit gave a good start to the paleoclimatic project.[358]

The adventure of the lost purse

In June 1978, a group of Soviet geologists (Andrei A. Velichko, Evgenia E. Gurtovaya, Vladimir G. Khodakov, A.V. Mamedov) came to the United States on a return visit with Gerasimov as the head of the delegation. They came to be introduced to contemporary paleoclimatic research in the United States. Two years earlier, the visit of a group of American researchers to the Soviet Union was formal, quite taxing for the host

[358] Imbrie to Andrei Velichko, 16 June 1976, box 1, folder "Moscow 1976," drawer 5, Herbert E. Wright papers, University of Minnesota Archives (hereafter UMN). At the time of accessing, the Wright collection was unprocessed. This accounts for unconventional identifiers in citations and absence of the collection number. Wright's papers remain semi-processed as of August 2021 and do not appear in the University of Minnesota Archives digital catalogue, but they are available to researchers. I would like to thank Erik Moore for granting me access to this collection and Sally Kohlstedt who made sure Wright's papers would not perish and did everything to have them donated to the archives.
Porter, "In the Heart of the Soviet Union;" Grosswald, *Polveka v Poiske,* 84, 90-93. Grosswald is one of those earth scientists whose career challenges the idea of Soviet scientific isolation and inaccessibility of collaborative work with Westerners. In the 1960s and 1970s he lecture-toured and held research fellowships in the U.S. and Canada, traveled extensively in Europe, joined Scandinavian and Antarctic glaciological expeditions, hosted international field research, and co-authored papers in Western peer-reviewed journals (e.g., T. Hughes, D.H. Denton, and M. G. Grosswald, "Was There a Late-Würm Arctic Ice Sheet?" *Nature* 266 (1977): 596–602). Grosswald, who knew everyone in the American group personally or by their works, referred to them as the "luminaries of paleoclimatology in the U.S."

party, and slightly awkward for the guests but successful in establishing the initial contacts and making plans for joint work. The 1978 trip to the United States meant to be on a smaller scale, more seminar oriented rather than organizational, and was anticipated to be much less stressful. After all, six people with limited fluency in English were coming to the Lamont-Doherty Geological Laboratory for a meeting "aimed at exchanging ideas and data dealing with the geological record of climate change" together with local tours over ten days.[359] What could possibly go wrong?

Figure 4. Soviet visitors with their hosts at Lamont, June 1978 (sitting left to right: Wright, Khodakov, Velichko, Imbrie, Webb, standing left to right: Hays, Porter, Gurtovaya, Gerasimov, Mamedov)[360]

A curious challenge arose in compiling the program for this visit. The American hosts had trouble finding a way to match the lavishness of their Soviet adventures in

[359] John Imbrie, Second reciprocal US-USSR conference on climate of the Pleistocene and Holocene: Diary of events, June 18-27, 1978, 1, box 1, drawer 2, cabinet 5, Herbert E. Wright papers, UMN.
[360] Undated photograph, box 1, drawer 2, cabinet 5, Herbert E. Wright papers, UMN. The date (during the Soviet visit in 1978), the location (Lamont-Doherty Earth Observatory), and the list of names of people featured in the photograph were verified with Theodore Moore, Evgenia Gurtovaya who owns a copy, and James Hays.

1976. They were not obligated to reciprocate in the same manner, but it would be diplomatic to offer something to the guests. Hays arranged a boat tour around the Manhattan Island for them, and all the Soviets received as souvenirs inexpensive pocket calculators that had just come on the market.[361] After a few days of discussions at Lamont they planned a short geological field trip to Utah. Then, on their way to a dinner at Lamont Gerasimov asked Imbrie if they could stop at Sangamon, Illinois, on the flight to Utah because he as a geologist would like to see the Sangamon interglacial deposit. Baffled, Imbrie explained that they had booked tickets for a direct flight to Salt Lake City. Could he not have the pilot make a stop along the way? He was a member of the National Academy of Sciences. Did that not give him the privilege of planning his own trips? When they were late for a plane one night in the U.S.S.R., Gerasimov made a phone call and had the takeoff of an Aeroflot flight delayed until they got to the airport. Besides the already booked tickets and the fact that he lacked the power to stop American Airlines, what Imbrie was reluctant to disclose to his colleague was that the geographic location of an additional stop for the Soviets would have to be reported to the State Department and cleared with them before going. While the CFEP agreement events were exempt from all travel restrictions in the U.S., the State Department still insisted on knowing where official Soviet delegations were at all times. Feeling as if between the devil and the deep sea, Imbrie realized he had no way of explaining: Gerasimov simply "didn't understand the system." They booked a flight to Chicago for Gerasimov and his right hand Velichko, Wright called a geologist friend in Illinois and asked him to meet

[361] Theodore C. Moore Jr., interview by author, June 2019.

the Soviets and take them to Sangamon. At two in the morning, they obtained a permission from the State Department.[362]

Another challenge puzzled the Americans and interfered with the plans of the leaders of the Soviet delegation. Halfway through the visit, an unfortunate incident occurred to the only woman on the Soviet delegation, Evgenia Gurtovaya.[363] Imbrie committed it to his report explaining that in the middle of a field trip in Utah Gurtovaya realized that she must have left her pocketbook somewhere by the trail. She was beside herself and not so much about one-hundred and twenty dollars and plane tickets but about the prospect of reporting to the authorities the loss of her Soviet passport. She explained to her colleagues that it would be considered "a serious breach of security." Although Gerasimov was determined to continue the excursion, Velichko did not share Gurtovaya's concern, and Imbrie failed to understand why this would be an issue, "after a

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[362] Jack Perry, Memorandum to participants in the Soviet program, December 29, 1972, folder "Memoranda and letters," EPA records, NARA; Imbrie, interview by Doel, AIP; Imbrie, "Diary of events." Interestingly, the State Department's control seemed to loosen when it came down to one or two individual Soviet scientists traveling in the U.S. A glaciologist from the same Institute of Geography Igor Zotikov traveled to the U.S. several times in the 1970s from Antarctica to work at the U.S. Army Corps of Engineers' Cold Regions Research and Engineering Laboratory under NSF grants. On his own he drove an army vehicle across the country from New Hampshire to California discovering "real America". This and other journeys are described in his memoir-travelogue Igor A. Zotikov, *Piknik na Appalachskoy Trope* [A picnic on the Appalachian Trail] (Moscow: Sovetsky Pisatel, 1989).

[363] Gurtovaya was an active researcher at the Institution of Geography with a Candidate of Science degree. Women were well represented in Soviet earth sciences and had good opportunities to advance their professional careers even in such male dominated disciplines as field geology, prospecting, polar studies, and oceanography. Ekaterina Kalemeneva and Julia Lajus, "Soviet Female Experts in the Polar Regions,' in *The Palgrave Handbook of Women and Gender in Twentieth-Century Russia and the Soviet Union*, ed. Melanie Ilic (London: Palgrave Macmillan, 2018), 267-283, https://doi.org/10.1057/978-1-137-54905-1_18; K.A. Skripko, G.V. Bryantseva, et al., "Zhenshchiny-Pervootkryvateli v Oblasti Geologii" [Women discoverers in geology], *Zhizn Zemli* 40, no. 4 (2018): 446-458.
Somehow, only a few Soviet women researchers involved in CFEP projects throughout their operation (I can count eight). Women scientists began to appear on American CFEP teams in the mid-1980s. So far, I have one documented example in WG IX.

series of heated discussions" (nobody wanted to cut the field trip short), it was decided to look at another outcrop first. Then a van took Gerasimov further on the trail separately, and a group of participants organized a search party for the purse and retraced their steps. The search was, in Imbrie's words, "handicapped by the fact that the pocketbook was a brown shoulder bag about the size and shade of a typical stone in the glacial moraines" and thus unsuccessful. The loss was reported to the University of Utah's Salt Lake City campus and the police.[364]

Gurtovaya was terrified that the Soviet bureaucrats would see the loss of the passport as an act of negligence. She could have been asked to submit an explanation in writing, subjected to humiliating questioning, or denied further opportunities to travel abroad. She was even more worried about possible implications for her husband, the nuclear physicist Evgeny Abramyan. She had trouble sleeping that night. The next day was Sunday, the Soviet embassy was closed, and another search yielded nothing. On Monday the incident was reported to the Soviet officials who insisted that Gurtovaya immediately return to Washington and report to the embassy. Meanwhile, the meeting was coming to a close, and the Soviets were scheduled to leave the country on Tuesday. When they boarded the plane from Salt Lake City to Washington, "as the plane door was being bolted, the on-board party was startled to see Cline wedge herself through the door, and hand Gurtovaya's purse to Academician Gerasimov." Apparently, a University of Utah student found the purse and returned it to the campus. Imbrie's assistant Rose Marie L. Cline, who handled all communications and administrative issues on the Soviets' visit, took the

[364] Imbrie, Second reciprocal US-USSR conference, 5, UMN.

purse to Washington. Gurtovaya was profoundly shaken by the incident. To this day she finds it hard to believe that there was no foul play involved. [365]

It is difficult to judge how justified Gurtovaya's fears were. A set of rigid protocols was in place for Soviet identification papers. For instance, up to this day in modern Russia the Soviet custom persists of having two passports, one for internal use ("civil"), the other for external travel ("foreign"). Nowadays, the foreign passport can be used as identification in certain situations within the country, and a Russian citizen is free to take the civil one wherever desired. In the 1970s, it was strictly prohibited to take the internal passport anywhere outside the country. Losing a passport could have a connotation of being reckless with the Soviet citizenship or simply used as a pretext for punitive action.[366] In all probability, in 1978 Gurtovaya would not be legally prosecuted for losing her passport, but Soviet authorities were notorious for blowing things like this out of proportion. The boundaries of the rule book were blurry. More conclusive is that Gurtovaya was afraid of having to deal with that system, the others in the group failed to empathize, but every measure was taken to resolve the incident. The Americans were simply unaware of the inner workings and perils of the Soviet bureaucratic system. Or were they if "it was likely that a letter from Congressmen Hallenbeck and Harkin, expressing U.S. concern over the treatment of dissidents in the Soviet Union, would be

[365] Imbrie, Second reciprocal US-USSR conference, 6-7, UMN; Evgenia E. Gurtovaya, interview by author, June 2016. Nobody was completely immune to being cut off from foreign travel for a myriad of esoteric reasons that were known only to the foreign relations departments and were rarely disclosed. See, for example, Grosswald, *Polveka v Poiske Otzvukov Velikih Oledeneniy,* 88.
[366] I.B. Orlov and A.D. Popov, *"Skvoz Zhelezny Zanaves." Russo Turisto: Sovetsky Vyezdnoy Turizm*. 1955-1991 (Moscow: Vysshaya Shkola Ekonomiki, 2016), 38 ["Through the Iron Curtain." Russo Turisto: Soviet tourism abroad. 1955-1991].

handed to Gerasimov as he boarded the plane for Moscow?"[367] The Soviets probably wanted to avoid a scene or a distraction from scientific negotiations scheduled for the remainder of the visit. Nonetheless, having an intimate knowledge of the system, Gerasimov graciously cut the passport incident from his official report on the trip. Word got out nonetheless, but there was little proof. An employee of the foreign relations department at her institute told Gurtovaya that she could "kiss goodbye" future trips abroad, but that turned out to be an empty threat.[368]

The visit was deemed a success. With the detailed and coordinated work plan, the Americans were now zeroing in on obtaining the Soviet data on frequencies of climatic variance. Imbrie's assistant wrote to the Minnesota geologist and a fellow sufferer of the Soviet dealings, Herb Wright: "The Russians departed at 5:30 p.m. on day 10, as scheduled with Eugenia clutching her purse. I appreciate your help in coordinating the Sangamon field excursion; it greatly pleased Gerasimov."[369] Imbrie was exhausted: After waving goodbye to his Soviet colleagues, Imbrie retired to the nearest bar with Basil Lukianoff, and reflected that—whatever other constraints might be placed on bilateral agreements by Congressional action—one Soviet-American Conference per two-year interval was enough."[370] He may have felt a share of what Gurtovaya, who was the administrator of WG

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[367] Imbrie, "Second reciprocal US-USSR conference," 5. Gerasimov declined to accept this letter or meet with representatives of Senate and Congress to discuss "rights of Soviet scientists" on the last day of the visit. Innokenty P. Gerasimov, Otchet ob uchastii sovetskoy delegatsii vo vtoroy sovetsko-amerikanskoy konferentsii po voprosam paleoklimatologii, "Otchety o poezdkah sovetskih uchenyh v kapitalisticheskie i razvivayushchiesya strany, 1978," 430-1-200, ARAN [Report on participation of the Soviet delegation in the second Soviet-American conference on paleoclimatology].

[368] Gerasimov, Otchet ob uchastii, ARAN; Gurtovaya, interview.

[369] John Imbrie, "Climatic Collaboration," *Nature* 274, no. 5674 (1978): 844; Rose Marie Cline to Wright, 11 July 1978, box 1, folder "USSR 1978 visit," drawer 2, cabinet 5, Herbert E. Wright papers, UMN.

[370] Email correspondence with Gurtovaya, March 2016; Imbrie, "Second reciprocal US-USSR conference on climate of the Pleistocene and Holocene," 7.

VIII at the Institute of Geography, went through repeatedly. Once an entire visit of a Soviet group to the U.S. she helped to organize was cancelled at the last minute because there were not enough Communist party members on the team. The tickets and hotels were booked, visas obtained, American colleagues were expecting them, but all that was immaterial. Clearly, the two societies had very different rules and values that would take longer than two encounters to bridge, but the first results were promising. Unfortunately, the inter-system gap that had just begun to grow smaller split open again eighteen months later.[371]

When Imbrie was gathering his paleoclimatic team in 1974-1976, he sent out invitation letters to colleagues. In one of them, to Herbert E. Wright, a geologist from the University of Minnesota, he outlined the reasons to consider for joining the program in a succinct and ironic manner. His informal list of perhaps seven reasons is probably the best, most comprehensive argument for why American earth and environmental scientists would choose to join a CFEP program. These points were made individually in previous discussions of CFEP explicitly, or between the lines, but never grouped together and put so bluntly.

[371] Gurtovaya, interview.

Table 6. Imbrie's list of "equally valid and persuasive" reasons for joining WG VIII with selected comments sent to Wright.[372]

	reason	comment
1.	patriotism	"I'd be the last to send for the band and recall the great expectations of Nixon and Brezhnev when they outlined this program; but still, we are the delegates appointed to represent our country and its scientific community in an international program which promises to have a long and useful life."
2.	international harmony and good will	"Détente, and all that. Here it is working and producing real if modest results. Would you thwart it?"
3.	courtesy	"Can one really reject a White House invitation? Does that not come before other obligations, especially invitations from geochemists?"
4.	standing of Quaternary geology	"Long ignored by the mainstream of science, our field is now gaining rapidly its deserved stature."
5.	professional opportunity	"Your work in nearby Iran shows how closely your interests lie in this area. For funding, perhaps you could ask for a modest supplement to whatever you had to use before?"
6.	uniqueness	"For us, your talents really are a unique combination, and I really can't think of a substitute."
7.	scientific communication	"Living by ourselves for two weeks, forced to interact each day with our Russian hosts, and with a diet limited to soup, vodka, and black bread, you will find that our own delegation members will gain a deeper and more unified understanding of current paleoclimatic problems."

This peculiar mix of pragmatic and ideological motives encompassed all there was for a scientist in the U.S. to think about—compliance with the official government policy, promoting the discipline, prestige, a chance to broaden expertise and request additional funding, prove one's worth professionally, get a bit of fun out of traveling to the Soviet Union, and even hoodwink the rival discipline (geochemists).

Indeed, in the name of détente, the paleoclimate group's work seemed to evolve. By 1979, however, détente on whose impetus the CFEP agreement had been struck was nothing short of dead. The invasion of Afghanistan, which historians suggest had the American intelligence successfully playing the Soviet authorities, was a formal pretext

[372] Imbrie to Wright, 12 June 1976, box 1, drawer 2, cabinet 5, Herbert E. Wright papers, UMN. All language in the table qoutes Imbrie's original text, including the wording for reasons.

for ending the amicable period in U.S.-Soviet diplomatic relations.[373] Track-two diplomacy lost if not priority—it rarely was prioritized—but appeal for policy makers. Furthermore, it was time for punitive action against the Soviets. In 1979, President Carter pivoted foreign politics toward rearmament, his successor Ronald Reagan supported and expanded this policy during his presidency, and it immediately affected U.S.-U.S.S.R. scientific relations. In fact, bilateral collaboration had been broadcast as a political carrot for the Soviets and was now being withheld as a stick in retaliation. Major cuts were made to collaborative science and technology program budgets on all fronts including CFEP. "Deferral of U.S.-Soviet cultural and scientific exchanges" was officially one of the eight sanctions imposed on the Soviet Union by the U.S. government in retaliation for Afghanistan. The State Department strongly advised American scientists involved in or planning to join bilateral projects to withdraw from them.[374] The Reagan Administration declared that scientific and technical agreements due for renewal in 1982 and 1983 would be ceased. Scientists viewed this as counterproductive because, in material terms, the U.S. was benefitting from cooperation with the U.S.S.R. by accessing climatic, oceanographic, and other data and using Soviet equipment, research vessels, and facilities. It was, nonetheless, a decision not to be ignored.

The financial cutback was not the only blow to the program. A controversy shook the foundation of the program and the entire twenty-year-old system of exchanges and collaborations, threatening to send it backward to the mid-1960s, when concerned

[373] Jonathan Haslam, *Near and Distant Neighbors: A New History of Soviet Intelligence* (Oxford University Press, 2015), 245.
[374] Martin Walker, *The Cold War: A History* (New York: H. Holt, 1995), 250; Gordon B. Smith, Preface to *The Politics of East-West Trade* edited by Gordon B. Smith (Boulder and London: Westview Press, 1984), xi.

citizens were appalled at the NAS's decision to fraternize with the enemy and open the American society to the Soviets. Officially, the issue was that the political elite in the U.S. and the Jewish lobby actively disapproved of the policy that denied Soviet Jews permits to exit the country and emigrate to Israel and subjected them to ostracism. In the early 1970s, the U.S. had attempted the so-called linkage strategy, granting the U.S.S.R. the most-favored nation status by binding the volume of American-Soviet trade to the numbers of Jews the Soviet Union would annually release to leave the country.[375] This measure proved unsatisfactory. Previously, in the 1960s the American Jewish community had expressed concerns over Soviet antisemitism, also with little success in eliciting government action.[376] Now it could be used as leverage in the renewed conflict.

No other Soviet transgression perturbed American academics before (or, frankly, after) more than persecution of the nuclear physicist Andrei Sakharov, the travel restrictions imposed on ethnically Jewish Soviet scientists, the sanctions against them for applying to emigrate to Israel, and the trials of Soviet dissidents.[377] American academics had more tolerance for Soviet hostilities toward their own colleagues—speculations about visitors' ties with intelligence agencies, accusations in Soviet press, and an occasional

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[375] Gordon B. Smith, "The Politics of East-West Trade," in *The Politics of East-West Trade* edited by Gordon B. Smith (Boulder and London: Westview Press, 1984), 6; Christopher Andrew and Vasili Mitrokhin, *The Sword and the Shield: The Mitrokhin Archive and the Secret History of the KGB* (New York: Basic Books, 1999), 239-240.

[376] Rabbi Daniel L. Kaplan to the Honorable Hubert Humphrey, Vice President of the United States, 17 Feb 1965, folder "Europe. USSR. 1965 (2)," Vice Presidential Files, Foreign Affairs General Files: Foreign Aid, 1965-1968, Hubert H. Humphrey papers, Minnesota Historical Society; *Anti-Semitism in the Soviet Union: Hearings Before the Subcommittee of the Committee on Un-American Activities*, 90th Cong. (1968); An incredibly rich source on this subject is the Cleveland Council on Soviet Anti-Semitism Records, 1960-1983, at the Western Reserve Historical Society.

[377] There are numerous sources of information on the complex story of the Sakharov case with a wide range of opinions. For example, the Mitrokhin archive offers a KGB perspective as the case unfolded, Andrew and Mitrokhin, *The Sword and the Shield*, 322-336.

early termination of an internship—which usually ended in a statement by the NAS that they discussed it with the Soviet Academy and agreed to disagree or disregard the matter in the name of peace and continued dialogue.[378] This outspoken denunciation of a violation of human rights in the Soviet Union was laudable in itself, but it created a schism within the American academic community about the continuation of cooperative work with the Soviets. Some scientists made a faulty association between a noble cause (the fight for Soviet intelligentsia's rights), self-serving Cold War moves (President Carter's message to Sakharov and the Soviet treatment of Jewish emigration as a diplomatic bargaining chip), and the realistic outcomes of curtailing bilateral sci-tech programs (retaliation tactics barely ever worked, stopping the dialogue would not help to achieve the goal).[379]

As a result, some American academics advocated for persevering in exchanges with the Soviets arguing that only dialogue would bring change and that boycotting bilateral programs would punish those scientists who did nothing to deserve it. Others vehemently opposed this position and called for severing ties with the Soviets immediately. Those molded by a totalitarian system, they argued, could not aid in any benign collaborative effort. Apropos of the system, Americans knew nothing about it, claimed the experimental microbiologist David Apirion. He just returned from a month-long visit to the Soviet Union, where he was mistreated for openly visiting refuseniks and raising their

[378] For example, Lawrence C. Mitchell, Memorandum, 3 June 1971, folder "IR: Exchange Programs. USSR. Difficulties of American scientists in USSR, 1971," NAS.
[379] 26; Odd Arne Westad, *The Cold War: A World History* (New York: Basic Books, 2017), 485; Smith, "The Politics of East-West Trade," 26; Victor F. Weisskopf and Robert R. Wilson, "United States-Soviet Scientific Exchanges," *Science* 208, no. 4447 (1980): 977; Lincoln Wolfenstein to V.F. Weisskopf, 9 June 1980, Betsy Ancker-Johnson to Philip Handler, 4 June 1980, folder "IR: Exchange Programs: USSR. NAS suspension of bilateral scientific meetings, Feb 1980," NAS.

issues at the beginning of his lecture in Kiev. During this eye-opening trip he learned that full members of the Academy of Sciences of the USSR were "extremely privileged people (very high salaries, a special car provided with two chauffeurs and many other perks)," and that Soviet science was "highly politicized, and the 'Commissar' or his equivalent, not the Scientist, is supreme." Ultimately, the system functioned to maintain secrecy and control, so it was difficult to deal with it, and little valuable information could be extracted from it for the advancement of research. In view of all this, Apirion asked: "Should we sacrifice our principles and dignity to the Moloch of scientific progress?"[380] Collaboration with the Soviets was becoming a matter of moral choice and not an easy one.[381]

The tension was building up with a flow of testaments of Soviet insidious actions from unexpected sources. In June 1980, one Ludmila Kuznetsova mailed a letter addressed to President Carter, NAS President Philip Handler, the United States Congress, and the executive director of the American Association for the Advancement of Science William D. Carey. Kuznetsova was an ardent supporter of Soviet avant-garde artists and an underground art dealer, who fled arrests, humiliation, and assaults by the Moscow police for what was considered unlawful activity. She falsified her identification papers to claim Jewish heritage and applied to leave for Israel with her twelve-year-old daughter. In Vienna, halfway to her false destination she flew to the United States, where she had friends. In a letter from North Dakota Kuznetsova relayed alleged calls from "many

[380] David Apirion, US-USSR Scientific Exchanges: Whom Do They Serve? IR: Exchange Programs: USSR. NAS suspension of bilateral scientific meetings, Feb 1980, NAS. Apirion wrote this as a letter to the editor of *Science*, but it was not published.
[381] Statement on policy with respect to the inter-academy exchange program, folder "IR: Exchange Programs: USSR. NAS suspension of bilateral scientific meetings, Feb 1980," NAS.

scientists from Moscow and Leningrad" to "fight Soviets" and never let any more of them (by which she meant all Soviet scientists who could travel abroad) into the United States. The reason for such harsh measures, Kuznetsova argued, was that "scientific and cultural exchange has always been used and continues to be used by the Soviets only for the spread of their ideology, scientific and technological espionage, and the repression of their own intelligentsia, any dissidence and opposition." Now, it seemed, not only American scientists would be discouraged from visiting the U.S.S.R., but the American government was to repel all options for Soviet scientists to enter the U.S. Why? Kuznetsova explained: "They come to the USA, learn of new scientific discoveries, steal your new preparations or obtain your secrets, complete with descriptions, obtain materials about the most recent research results and inventions and later use them in secret KGB institutes and military industrial institutes for development of various types of weapons, even bacteriological, chemical and psychological."[382] Passionate appeals like Apirion's and Kuznetsova's make one wonder how, in the wake of an impending witch-

[382] Ludmila Kuznetsova to President Carter, President Handler, Representative Carey, and U.S. Congress (translation), IR: Exchange Programs: USSR. NAS suspension of bilateral scientific meetings, Feb 1980, NAS. On Kuznetsova's life story, see her brief biography and the story of her involvement with the late Soviet avant-garde art in the special online project of the Bulgakov museum in Moscow, http://dom10.bulgakovmuseum.ru/apartments/kvartira-44-neofitsialnoe-iskusstvo-1974-1979/, accessed on 4 August 2021. On Soviet intelligence operations to extract information on American technology in the 1970s see Greg Whitesides, *Science and American Foreign Relations since World War II* (Cambridge and New York: Cambridge University Press, 2019), 188. Flying under the radar of diplomatic conflicts had its advantages for CFEP teams. It granted them access to continued contacts that Whitesides describes as unofficial because "collapse of détente temporarily ended official U.S./Soviet cooperation" including an EPA program (Whitesides, *Science and American Foreign Relations*, 187, 188). For a detailed and insightful analysis shortly after the controversy with more examples of personal opinions of scientists on continuing or discontinuing scientific contacts see Linda L. Lubrano, "National and International Politics in US-USSR Scientific Cooperation," *Social Studies of Science* 11, no. 4 (1981): 451-480. Lubrano shows that individual contacts and small-scale joint events continued when high-visibility gatherings were suspended.

hunt in the name of human rights, scientists from either country would have a chance or be willing to meet again.

There is currently a consensus among historians, journalists, authors, philosophers, and all those whose value human life on the unjustifiable hypocrisy and cruelty of the Soviet penal system against its own citizens. There should be neither denial nor diminishing of endless violations of human rights by that system. I would, nonetheless, like to point out that the system was not as efficient or omnipotent as is often assumed and as those letters to the NAS implied. Indiscriminate demonization of Soviet science would be a distortion of reality and unfair to all researchers who avoided or resisted the pressure of the system. In a philippic on the alliance of Soviet science and the KGB, Vadim Birstein provides the following evidence:

> "…the KGB controlled every institution in the former Soviet Union and exercised this control in many different ways. First, the head of the personnel department in every institution was usually a retired KGB officer. Second, a special "First Department" in every institution was in charge of "secrets." No scientific papers (or books) could be published in any Russian or international journal without the approval of the head of the First Department of the Institute. These people were connected with a higher body, a special Academy First Department headed by a KGB general. Another KGB general headed the Academy Department of Foreign Relationships, which controlled and approved contacts with foreign colleagues. Moreover, the details of everyday life in all Academy institutes were controlled by a KGB "curator," located at KGB headquarters."[383]

Every word of this passage is true, and this evidence helps historians to understand the constraints, biases, tensions, and drama of Soviet science. What stays behind the scenes is that there were loopholes in the system. The retired KGB officers who examined scientific papers in the 1970s and 1980s were not always savvy about the subjects, and their judgements could be random and superficial. Soviet scientists would

[383] Vadim J. Birstein, *The Perversion of Knowledge: The True Story of Soviet Science* (Boulder: Westview, 2001), 176.

be summoned to report their foreign travel to the KGB, like their American colleagues could be invited to a meeting with a CIA agent for debriefing after a trip to the Soviet Union.[384] Soviet scientists sometimes "played dumb", gave selective and meaningless information, or honestly described in copious detail all they learned at a conference (with copies of brochures and long lists of foreign colleagues they met there). Some even taunted the KGB curator. Interactions with the first department could turn pro forma if they complied with bureaucratic regulations. A considerable portion of information simply slipped through the cracks of bureaucracy, especially with mid-level field researchers.[385]

The adventure of a Minnesota geologist

As a facet of bilateral collaboration, the cutbacks and the impending boycott could not leave the CFEP projects unaffected. Imbrie's tone changed from humorous to grave in communicating with seven potential participants of another biannual meeting planned for July 1980 in the Soviet Union. In February of that year, he sent out a poll asking everyone's opinions on joining the delegation. Responses, he reported, ranged "all the way from "I would definitely not go" to "I would definitely go" with many shades of

[384] Ray F. Weiss, interview by author, June 2021; David Simpson, in discussion with author, January 2019.

[385] I offer this opinion against my own reservations. This topic merits much deeper exploration and a source base that cannot be given in a paragraph. My first understanding of it comes from private conversations and interviews with scientists at the Russian Academy of Sciences (Nina Zaytseva, Boris Kazak, Sergey Negrebetsky, Vyacheslav Pilipenko, and Alexander Ponomarev) and with American geophysicists (Michael Hamburger, David Simpson, Ray Weiss, and Vladislav Martynov), a review of Birstein's book by an expert on Soviet science, Douglas R. Weiner, review of *The Perversion of Knowledge: The True Story of Soviet Science*, by Vadim J. Birstein, *Journal of the History of Biology* 35, no. 2 (2002): 389-392, a memoir of a Soviet seismologist, Viktor Shteinberg, *Vremya i Sudby* [Time and fates] (Moscow: Drofa Plus, 2008), 315-316, 337-340, 355, 376, and formal (informal ones did not exist as a genre) reports on trips abroad at the Russian Academy of Science archives, including Gerasimov, Otchet ob uchastii, ARAN, discussed previously.

indecision in between." The State Department, the EPA, and the NAS provided guidance. The Academy froze all its joint meetings with the Soviets for six months. The government was recommending to "thin out our relations with the Soviets without dismantling the existing framework of science and technology exchanges." The EPA encouraged "low-level, substantive activities of humanitarian concern or of clear benefit to the U.S." Ultimately, it was everyone's personal decision whether to come to the Soviet Union on the dates of the U.S.-boycotted Moscow Olympics. [386]

Five people volunteered to go on a scientific tour of Siberia: Imbrie, McIntyre, Porter, Wright, and Alan D. Hecht, a WG VIII co-chair from NOAA. Gilbert Peterson, a young researcher from the University of Wisconsin in Madison on a six-month internship in the Soviet Union, was to join them on site. Unfortunately, the sarcastic but enthusiastic Imbrie, who had first-hand if not intimate knowledge of the Soviets by then and excellent leadership and communication skills, withdrew at the last moment due to a sudden illness. Hecht reluctantly assumed the role of the head of the delegation, for which he may not have been fully prepared. His experience, reflected in the official diary of events for the trip, shows his personal set of concerns and prejudices amplified by being on foreign turf. If it were not for other participants of the group, especially Porter and Wright who had had previous interactions with the Soviets and were more inclined to befriend them, the trip under Hecht's leadership could have been more pro forma. His diary assumed a querulous tone from the beginning, and, in his opinion, many aspects of Soviet life that he encountered was tainted with shabbiness and mishaps (which was not

[386] Memorandum by Imbrie, box 1, drawer 2, cabinet 5, Herbert E. Wright papers, UMN.

untrue, we must admit).[387] Hecht's diary was not a personal journal but an informal report of the visit to be circulated and filed with the EPA as evidence of collaborative work. The status of the report and its intended audience make it even more interesting to examine. What would compel a scientific team leader to include in a report that he noticed "two prostitutes on the side of the road" as he entered the city of Khabarovsk on 17 July 1980 or air choked with dust in Yakutsk on 21 July? What was the significance of derisive language, for example, "filthy", "very shoddy", "noisy", "unruly"?

It must have been Hecht's individual perception of either unfamiliar environments or Soviet life specifically that invoked such negativity. It did not affect his dedication to administrating WG VIII for years, and he was certainly one of the people who brought the paleoclimates project to success. Several arrangements went awry on that trip to Khabarovsk, Irkutsk, and Yakutsk, from unseasonably hot weather (actually, quite typical for a Siberian summer) and lost luggage to dirty hotel rooms, indigestion, and a delayed boat trip on Lake Baikal with a drunk crew. Caviar and delicious ice cream could hardly save the day when, as Americans often assumed, Soviet professionals were ten years behind in research. Surprisingly, Hecht also found the Soviets' understanding of permafrost weak and their knowledge of field geology substandard. Given the Soviets had pioneered and shaped the field of permafrost studies and received wide recognition

[387] As a contrast to Moscow, cities in remote regions of the Soviet Union could look economically destitute and more ridden with social issues of a declining economy, among which were alcohol abuse, low quality of life, and failing urban infrastructures. Andrey V. Doroshenko, "Borba s Pianstvom v SSSR v 1970-h – Pervoy Polovine 1980-h gg." [Fighting alcohol abuse in the U.S.S.R. in the 1970s – early 1980s], Candidate of Historical Sciences dissertation, Omsk State Technical University, 2015; Liubov B. Kokorina, "Osobennosti Sotsialno-Bytovogo Razvitia Gorodov Zapadnoy Sibiri v 1925-1985 gg." [Features of social-infrastructural development of western Siberian cities in 1925-1985], *Istoricheskaya i Sotsialno-obrazovatelnaya Mysl* 8, no. 6/1 (2016): 62-67.

for achievements in field geology and glaciology, Hecht's assessment here gives cause for doubt.[388] Regardless, Hecht was prepared to put up with the shortcomings for the sake of the ultimate goal: "Yet, they have some very important basic, raw data (particularly pollen and glacial data) which are vital to a global understanding of climatic change. We should push ahead and work together to obtain these data." CLIMAP could do without Soviet oceanographic data but not without terrestrial glacial, pollen, and soil features.[389]

The core issue may have been deeper than personal preferences. There was a range of scientific theories on origins of geologic phenomena such as glaciation, methods of climate reconstruction, and predictions for effects of climate change, some of which persist to date. More fundamentally, there was a philosophical difference because Budyko's climate modeling suggested positive outcomes of global warming for humans when Western scientists argued for negative ramifications using much the same data.[390] Hughes and Grosswald developed a concept of Beringia's glaciation that had no room for

[388] Pey-Yi Chu, *The Life of Permafrost: A History of Frozen Earth in Russian and Soviet Science* (Toronto, Buffalo, and London: University of Toronto Press, 2020), 167. Several Soviet geologists were well known in the international community from the 1950s onward, including the above-mentioned Gerasimov, Kind, Grosswald, and others among whom Ksenia V. Nikiforova who held the position of vice president of the International Union for Quaternary Research at the time of CFEP. M.N. Alexeev, A.A. Velichko et al., "K Yubileyu K.V. Nikiforovoy" [On the anniversary of K.V. Nikiforova], *Izvestiya Akademii Nauk SSSR, Geology Series* 11 (1991): 115-117.

[389] Theodore Moore, interview; John Imbrie, Summary of progress and plans made by the first session of Working Group VIII (Leningrad, June 1974), box 1, folder "Quat. Books – Imbrie," drawer 1, cabinet 1, Herbert E. Wright Papers, UMN.

[390] Doose, "Global Problem in a Divided World," 20.

a firm-ground ice-free bridge between Asia and America that another team argued.[391] There are two ways of managing this diversity of opinions in earth sciences, accepting it as contemporary understanding or perceiving one perspective as "right" and others wrong.[392] At that time, Hecht might have seen the Soviet approaches, data, and ways of life as inferior and wrong, and any aspects of Soviet life seen through that lens simply followed suit. It is, of course, conjecture but what source of annoyance would make him to give this conclusion to the report: "After spending one week in the Soviet Union, I have great admiration for Gil Peterson, who spent 6 months in the Soviet Union in what must have been frustrating and difficult circumstances. He deserves a medal"?[393] It would be intriguing to see if other Americans had similar reactions on that visit.

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[391] Grosswald, *Polveka v Poiske*, 105-106. The debate is ongoing. One of the more recent rounds of it is in this exchange in the *Quaternary Research* journal. Julie Brigham-Grette, Lyn M. Gualtieri, Olga Yu. Glushkova, Thomas D. Hamilton, David Mostoller, and Anatoly Kotov, "Chlorine-36 and 14C Chronology Support a Limited Last Glacial Maximum across Central Chukotka, Northeastern Siberia, and No Beringian Ice Sheet," *Quaternary Research* 59, no. 3 (2003): 386–98. doi:10.1016/S0033-5894(03)00058-9. A response to this critique is in Mikhail G. Grosswald and Terence J. Hughes, "Comments on Brigham-Grette et al. (2003), "Chlorine-36 and 14C Chronology Support a Limited Last Glacial Maximum across Central Chukotka, Northeastern Siberia, and No Beringian Ice Sheet," *Quaternary Research* 62, no. 2 (2004): 223–226. doi:10.1016/j.yqres.2004.05.001. A response to the critique from the Russo-American Brigham-Gretter team is in Julie Brigham-Grette and Lyn Gualtieri. "Response to Grosswald and Hughes (2004), Brigham-Grette Et Al. (2003). 'Chlorine-36 and 14C Chronology Support a Limited Last Glacial Maximum across Central Chukotka, Northeastern Siberia, and No Beringian Ice Sheet,' and Gualtieri et al. (2003), "Pleistocene Raised Marine Deposits on Wrangel Island, Northeastern Siberia: Implications for Arctic Ice Sheet History." *Quaternary Research* 62, no. 2 (2004): 227–32. doi:10.1016/j.yqres.2004.05.002.

[392] Chu, *The Life of Permafrost*, 167.

[393] Hecht, Trip report, UMN. Gilbert M. Peterson, fresh from a PhD program at the University of Wisconsin, was on a six-month internship at the Institute of Geography in Moscow. There he gathered and reviewed Soviet publications on pollen, and his compilation provided the missing data for American climate reconstructions of the Northern hemisphere, which was Imbrie's ultimate goal. Eugene W. Bierly and John A. Mirabito, "The U.S.-U.S.S.R. Agreement on Protection of the Environment and its Relationship to the U.S. National Climate Program," *Bulletin of the American Meteorological Society* 65, no. 1 (1984): 17.

Herbert Edgar Wright Jr. was a geologist by discipline affiliation. His interests and expertise, however, were so broad that it would be more accurate to call him an earth sciences polymath. Regents' Professor of Geology, Ecology, and Botany at the Department of Geology of the University of Minnesota, he was a member of the National Academy of Sciences, and one of the leading specialists in Quaternary geology. His other interests included paleoecology, glaciology, and paleoclimatology. He also contributed to archaeological studies of ancient Middle East cultures and environments at the dawn of radiocarbon dating techniques. The list of his awards, achievements, publications, distinctions, and commendations can go on and on, providing an image of the top-ranking academic he unquestionably was, but to all his friends and colleagues he was known as Herb.[394]

Whether because of Wright's better connection with Soviet colleagues, his good temper and modesty, or the indifference to life's comforts and luxuries he was famous for among those who had been in the field with him, he seemed to have a less tumultuous time in Siberia than Hecht. Wright connected readily with his Soviet colleague Andrei A. Velichko. Like Wright, Velichko had a broad spectrum of research interests and a considerable overlap with his American colleague. Velichko ran the Laboratory of

[394] This dissertation required consulting numerous obituaries in peer reviewed journals. Those in memoriam of Herb Wright are probably the most personal and warm recollections I have come across. H. John B. Birks, Brigitta Ammann, and Ivanka Stefanova, "In Memoriam: Herbert E. Wright Jr. (1917–2015)," *The Holocene* 26, no. 4 (2016): 507– 510; Svante Björck, "Herbert E. Wright Jr., 1917–2015: Personal Memories of a Giant in Quaternary Sciences," *Boreas* 45 (2016): 377–379.

Evolutionary Geography at Gerasimov's Institute of Geography in Moscow.[395] He became the most actively involved researcher from the Soviet side. Administratively, while Gerasimov acted as the head of the Soviet team and as the figure of authority, he was less involved in the day-to-day activities of Working group VIII than Velichko, whose status as the head of a laboratory at one of the leading academic institutions in geography and geology in the country allowed him to access scientific resources and invite participants from other institutions. Velichko who, like Wright, was at heart a "polevik" (Russian scientific jargon for "field scientist") and enjoyed seeing local geology and geography with his own eyes.

One of Wright's investigation areas was reconstruction of vegetational and environmental history with the help of palynology (pollen studies). He was also an expert in geomorphology and glaciology. These sub-disciplines contributed to understanding the Quaternary as a geological period that contained important evidence of formation of climates and environments of the Anthropocene. Before CFEP began, Wright had no known contacts with Soviet scientists, nor was he specifically interested in the geology of the Soviet Union. He did have some experience in the neighboring Middle East as far as Central Asia was concerned. As Imbrie stated in his 1975 call to arms, Wright was one of the few experts with a combination of interests that truly suited the mission.[396] He did not hesitate to incorporate topics of interest, responded to Imbrie's suggestion with

[395] Velichko's professional interests over the course of a career that spanned sixty years included late Cenozoic paleogeography, paleoclimatology, paleocryology, paleoglaciology, paleoecology of the early man, and analysis of the environment and climate evolution for the assessment of their present state and further development. "Anniversary of Andrei Alekseevich Velichko," *Geography, Environment, Sustainability* 24, no. 2 (2011): 85-86; László Bassa, "In Memoriam Andrei Velichko (1931–2015)," *Hungarian Geographical Bulletin* 64, no. 4 (2015): 355-356.
[396] Imbrie to Wright, June 1976, box 1, folder "Moscow 1976", drawer 2, cabinet 5, Herbert E. Wright papers, UMN.

enthusiasm, and defined the goals for his first trip to the Soviet Union: "Conference in Moscow should give me for the first time an overall appreciation for the scope and variety of Quaternary history of the Soviet Union, especially with respect to the climatic history at the border between forest and grassland, i.e. the Soviet analogue for the Minnesota vegetation zones."[397]

With his pragmatism and determination, Wright quickly identified trouble areas in collaboration, such as the poor quality of data representation of contemporary Soviet geological research reports and the language barrier. He also started looking for solutions to problems that hindered the work on integrating understandings of paleoclimates between American and Soviet geologists. He liked his professional commitments to be well thought through and fulfilled to the best of his ability.[398] When in 1976 Gerasimov began insisting on a large joint publication, a pair of edited volumes with current research results on Quaternary geology in the United States and the Soviet Union, Imbrie was not supportive of the idea. Wright took more interest in it, conferring with Velichko. It somehow flowed out these discussions that Wright would assume responsibility as the executive editor of the book project.[399] On the day the Moscow Olympic games opened, the timeline for the monograph project was finalized.[400]

A shrewd scholar, Wright saw the Soviets' weaknesses, but he also admitted their strengths. Undoubtedly this balanced view gave him the patience to bring the book

[397] Wright, NSF international travel report, box 1, folder "Moscow 1976," drawer 2, cabinet 5, Herbert E. Wright papers, UMN.
[398] Wright, Application for the NSF international travel grant, box 1, folder "Moscow 1976," drawer 2, cabinet 5, Herbert E. Wright papers, UMN.
[399] Imbrie, Second reciprocal US-USSR conference, UMN; Gerasimov, Otchet ob uchastii, ARAN.
[400] Hecht, Trip report, UMN.

project to completion. In 1983 two edited volumes on Quaternary geology of the United States were published, and a year later (1984) the Soviet volume edited by Velichko came from the press. The three monographs were translated to make all of them available in both languages, and the *Choice* magazine named the American volumes among its outstanding academic books of 1984.[401]

Judging by how history unfolded, the American sanctions against the Soviet Union had little effect. Sakharov was released from exile only when Mikhail Gorbachev came to power in 1986, and troops were recalled from "Soviet Vietnam" as late as 1989.[402] One positive if reverse outcome can be named for the scientific relations, however. In a way, this and other outbreaks of Cold War brought those scientists closer together. Their common effort to ignore politics and bureaucracy was a kind of binding mechanism.[403] In 1980 the American team certainly made a bold choice as they pursued the plans for the Siberian visit. It was hardly an act of defiance toward the U.S. policy of cutting back

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[401] Wright, NSF international travel report, UMN; Hecht, Joint US-Soviet Paleoclimate Monographs, 23 April 1985, box 1, folder "Quat. books – letters," drawer 4, cabinet 1, Herbert E. Wright papers, UMN; Stephen C. Porter, ed. *Late-Quaternary Environments of the United States: The Late Pleistocene* (Minneapolis: University of Minnesota Press, 1983); H.E. Wright and Stephen C. Porter, eds., *Late-Quaternary Environments of the United States: The Holocene* (London: Longman, 1983); A. A. Velichko, H.E. Wright and C.W. Barnosky. *Late Quaternary Environments of the Soviet Union* (Minneapolis: University of Minnesota Press, 1984).

[402] Wolfgang Saxon, "10 Years in Afghanistan: The Soviet Vietnam [Chronology]," April 15, 1988, *New York Times,* A.13.

[403] For example, William S. Leith, interview by author, August 2018. Leith: "…this is certainly not a full answer, and maybe not a right answer, but I heard a long time ago that friendships are bonded through shared adversity. As I think back on my own friendships, I go back to, say high school, high school is a difficult time for all teenagers. We're all in an adverse situation and we develop friendships then through that adversity, and that adversity helped to bond us together in those friendships. Military service is certainly shared adversity. And so, to some extent, I think that geology and geological and seismological fieldwork is also adversity. We were living in a camp for a month with what we had referred to, "all these crazy Russians," and you know, cooking our own meals together and so it was kind of a mix of the burden of not living in our comfortable environments and the joy of doing some really fun things together at the same time. Telling stories and listening to music and all of that stuff that we did."

scientific and technological ties with the Soviet Union. In fact, such low-visibility and less politically significant contacts were advised by the State Department, especially when they had a clear benefit to the U.S. However, the apparent gesture of compliance was, in fact, an act of trust in the sanity and kindred spirit of Soviet colleagues. Easier for some, more intense for others, this trip constituted another step toward integration of data and knowledge into one global system and toward releasing tensions between scientists that stemmed from not knowing what to expect of the other. While the project was, in some sense, modest, it reflected the essence of the diplomacy part in science diplomacy with a component of genuine human interest.[404] The activities of the paleoclimatology group continued in the same small-conference format until 1989, when a joint field study was conducted to collect ice cores in the Soviet Far East.[405]

The adventure of a Wyoming meteorologist

Atmospheric aerosols are tiny suspensions in the air of liquid, solid, or compounded particles with highly variable chemical composition and physical characteristics, typically with short lifetimes. Aerosols can be natural (sea spray, volcanic dust, smoke from burnt biomass, mineral dust from winds) and anthropogenic (products of fossil fuel combustion, ashes, smoke, road dust). Their distributions are found in the two bottom layers of the atmosphere, the troposphere and the stratosphere. The overarching goal of the aerosol projects in WG VIII was experimental research in this new area of study.

[404] Gerasimov, Imbrie, and Hays had a private exchange set up of publications that were difficult to obtain. Folder "Perepiska ak. I.P. Gerasimova s inostrannymi uchrezhdeniami po nauchnym svyazyam, 1979" [Correspondence of academician I.P. Gerasimov with foreign institutions on scientific relations], 448-1-200, ARAN. Whenever possible, on the way to see his son in Norway Wright would make a brief stop in Moscow to meet with his colleagues and friends. Gurtovaya, interview.

[405] The field study was preceded by a joint workshop at the University of Wisconsin in Madison in 1988. Tatusko, *Cooperation in Climate Research*, 13.

Experiments were to determine the amounts, composition, localization (in polar regions, over the oceans, etc.), and transfer patterns of aerosols for assessing their distribution, potential of its sources globally, and harmful effects.[406]

Based on WG VIII aerosol research, a joint monograph summing up the accumulated knowledge of natural and anthropogenic atmospheric aerosol and climate came out in Russian in 1991. Even within a big scientific and administrative enterprise like WG VIII, the aerosol project looked impressive.[407] Like in a set of nestling dolls, WG VIII held the aerosol project inside, and then smaller collaborations were nested inside that larger one. The smallest of them all was the University of Wyoming-Gidromet series of field experiments to analyze the composition of stratospheric aerosol. with results sufficient to earn a chapter in the monograph.[408]

The Wyoming-Gidromet team chose to do their experiments in the tiny town of Rylsk some five hundred kilometers from Moscow. Every other year beginning in 1975, the meteorologist James Rosen and the engineer Norman Kjome from the University of Wyoming and researchers from an array of Gidromet research groups would spend a month or two at the field station. Earlier Rosen and Kjome developed an elegant and effective apparatus for studying aerosols experimentally. One of the challenges of aerosol experiments was sending a probe high enough into the stratosphere to capture the air there. Rosen and Kjome created a set of equipment that weighed a few kilograms and could be sent up on balloons. Their solution was simple, compact, and much more affordable than other existing options. The equipment could be easily assembled by other

[406] K.Ya. Kondratiev, ed., *Aerozol i Klimat* [Aerosol and climate] (Leningrad: Gidrometeoizdat, 1991), 5-15.
[407] Tatusko, *Cooperation in Climate Research*, 24-32.
[408] Kondratiev, *Aerozol i Klimat*, 252-299.

scientists and engineers making it available for similar experiments in other locales. Consolidating the data from multiple experiments, combined with other measurements, would eventually produce a global picture of stratospheric aerosol distribution and composition.[409]

Rylsk and Laramie suited the experiments because of their locations on continental plateaus in areas free of air traffic. If conditions of life in Siberian cities seemed substandard to a Western newcomer, the Rylsk area was even more challenging. There was no running water available at the field station and no bathrooms, and little of either utility was available in the nearby town. Surrounded by fields and woods, Rylsk had a population of approximately eighteen thousand. Half-ruined churches stood abandoned as witnesses of the town's long-gone prosperity. One hot summer the Soviet team organized a bath day for the Americans. A traditional Russian bathhouse, *banya*, is not for the weak of heart who are not accustomed to sharing a bathing space with five or six naked colleagues in a tiny wooden structure full of hot steam. The bath was followed by a feast of pickles, pies, and moonshine whose surface would burn with a blue fire in evidence of its quality if lit with a match, all prepared by a local woman for a small recompense. Commenting on the circumstances, Jim Rosen reflected that, in fact, the landscape and

[409] Vyacheslav U. Khattatov, interview by author, July 2019; A.L. Schmeltekopf, P.D. Goldan, et al., "Measurements of Stratospheric $CFCl_3$, CF_2CL_2, and N_2O," *Geophysical Research Letters* 2, no. 9 (1975): 393-396; J. M. Rosen, N. T. Kjome and D. J. Hofmann, "Cooperative U.S.-U.S.S.R. balloon flights," *Bulletin of the American Meteorological Society* 57, no. 2 (1976): 225.

the experience could be similar to life in the American Northwest a hundred years earlier.[410]

The final report on WG VIII history mentioned "technical and logistic problems" in the Rylsk experiments. One of these challenges was less trivial than some. At the beginning of the work, a few people from the field team would drive out in an off-road vehicle to search and retrieve the instrument box after the balloon flight. This practice soon had to be replaced with a much more expensive way of tracking the descent. They had to resort to following the balloons in a helicopter and retrieving the equipment with the samples and recordings as soon as possible after it landed. Before this decision and despite the markings on the box and an attached envelope with instructions for handling and reporting, local villagers would simply grab the carefully packed box out of curiosity and rip it apart destroying the film by exposure to light.[411]

The concluding experiment was held in Rylsk in 1987 preceded by twelve years of back-and-forth annual visits between Moscow, Rylsk, Laramie, and Boulder, Colorado, where another experimental group involved in WG VIII, NOAA's Environmental Research Lab, held joint field work and workshops.[412] The meteorologist Dr. Nina

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[410] Khattatov, interview, and James Rosen, in discussion with author, August 2019. I would like to give my thanks to Jim Rosen for inviting me to his Minnesota childhood home for a lovely weekend and sharing with me his memories and perspectives. For information on the long history and culture of the Russian *banya* see Ethan Pollock, *Without the Banya We Would Perish: A History of the Russian Bathhouse* (New York: Oxford University Press, 2019).

[411] Nina A. Zaytseva, interview by author, October 2018. Establishing friendly/neighborly relationships with locals could be crucial for the success of Soviet field work. There were cases when local residents had little tolerance for those they saw as intruders on their land and would sabotage the work. Things worked best when visiting scientists found a way of communicating the significance of scientific work to those unfamiliar with it. In cases of seasonal or stationary field research, there were temporary or permanent jobs available for local people.

[412] V.U. Khattatov and J. Rosen, Pamyatnaya zapiska o rezultatah vypolnenia sovetsko-amerikanskogo eksperimenta po issledovaniyu atmosfernogo aerozolya, radiatsii I ozona, folder "US-USSR cooperation", Central Aerological Observatory, Dolgoprudny, Russia.

Zaytseva, who was an employee of the Gidromet Central Aerological Observatory, wore two hats in this collaboration. She was a scientific contributor with previous experience in international projects as an administrator and organizer. It was not uncommon that women scientists were put in charge of "taking care of the everyday things" in the exchanges.[413] Over these years the work connection also became a way to visit friends. Zaytzeva, who was friends with Rosen and Kjome and their wives, was spending a summer in Boulder on a project. Missing her Wyoming friends, she got in touch with Kjome, and he invited her to spend a weekend with him and his family. He told her which coach bus to take and were to get off and change buses to get to Laramie where he would be waiting to pick her up at a time based on the bus schedule. The first bus took her to a rural station, but the one to Laramie did not show up. Nina called Kjome from a phone booth, but no one was home, and she left a panicked message on the answering machine. A strange woman must have overheard her cries into the phone and asked if she was trying to get to Laramie. The woman and her husband could give her a ride in their car. This timely offer scared Zaytseva even more. The stranger looked like a transient, unkempt and scraggly, so did the husband and the rusty pickup truck, but the alternative of being stranded at the bus station seemed worse. After two hours on the road, she safely arrived in Laramie, and the good Samaritans declined her offer to pay for the ride.[414]

[413] Other examples are Evgenia Gurtovaya and Imbrie's assistant Rose Marie Cline as administrators of the paleoclimatology group, Renee Tatusko in the American climate group, and Irina Belozerskaya in WG IX.

[414] Zaytseva, interview. Adventures like this were never included in official trip reports for the employer institution.

The Soviets' last bow

In a historical analysis of WG VIII contributions to climate change knowledge, Katja Doose mentions: "This was the only Working Group of the Agreement that continued until 1995, well beyond the fall of the Soviet Union."[415] Indeed, the program was active until 1995 when most other CFEP WGs ceased operation. One of the achievements of WG VIII was the launch of a Soviet Meteor-3 weather satellite with a NASA total ozone mapping spectrometer (TOMS) device on August 15, 1991. Although the previously secret military-operated Plesetsk cosmodrome had been opened for foreign press for the first time two years earlier in 1989, the 1991 launch was a newsworthy event and an important step not just for the improvement of American-Soviet diplomatic relationship. It was a timely environmental research project.[416]

Since the late 1970s, the discovery of the ozone hole over Antarctica had been discussed in atmospheric sciences. The issue required further investigation as questions were arising about the scale of the phenomenon, its potential dangers to the planet and humans, the rate of its growth, and possible natural and anthropogenic causes. It also quickly became an international concern and a matter for legislative deliberations.[417] NASA's contribution to this new research was a data collection project, for which TOMS was developed. In 1978, the agency sent the Nimbus-7 weather satellite for two years of measurements. Simultaneously, a search for possibilities to continue observations and possibly increase the range, accuracy, and quality of data continued. By the beginning of

[415] Doose, "A Global Problem in a Divided World," 9. Doose must not have had the full data. WG IX continued for at least as long as WG VIII, and WG V is still active in 2021.
[416] "NASA's TOMS to launch on Thursday," *Defense Daily* 172, no. 30, August 12, 1991, 241.
[417] Alexander Gillespie, *Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries within the Context of Science and Policy* (Leiden and Boston: M. Nijhoff, 2006), 135-140.

the 1990s, Nimbus-7 was running on borrowed time having surpassed the time limits of its technological capacity but has readily demonstrated the benefits to collaborating with the Soviets. A satellite launched from the Russian north would follow a different orbit than an American-launched one. It would allow to "help fill gaps in the observations" previously conducted by NASA. In addition, it would fulfill the practical application of the project,to "do future planning to take measures to save the ozone layer."[418]

A joint group from WG VIII had a lot to accomplish in preparation for the event. The challenges came from the bureaucratic arrangements as well as scientific requirements. Negotiating launch dates with the cosmodrome, delivering the device, ensuring access to its data for American engineers, and requiring adherence to a strict set of technical specifications without which the data would not be comprehensive or accurate—everything took time, work, and patience.[419] The deputy director of the Central Aerological Observatory, Vyacheslav U. Khattatov, ran the Soviet team. Given the high-profile nature of the project, he had the weight of Gidromet behind him and the support of NASA. The political clout to negotiate the launch in Russia, the media visibility, and the money all came into place. Gidromet's director Yuri Izrael spoke proudly at the press conference after the launch, but the work on the ground was Khattatov's. He had been studying the problem for years by then and had extensive hands-on experience working

[418] Warren E. Leary, "An American Device on a Soviet Satellite Collects Ozone Data," November 23, 1991, *New York Times*.
[419] "1980 Soviet Rocket Accident Killed 50," September 28, 1989, *New York Times*; Gillespie, *Climate Change, Ozone Depletion and Air Pollution*, 138; folder "SAGE TOMS," Central Aerological Observatory archive on site (CAO), Dolgoprudny, Moscow region; Douglas Birch, "Soviets Share Space Data on Depletion of Ozone," November 23, 1991, *Baltimore Sun*; Proposal 1: Flight of U.S. total ozone mapping spectrometer (TOMS) on USSR Meteor satellite, and Joint US-USSR TOMS mission: first-order issues to be resolved, folder "SAGE TOMS," CAO.

with the Americans since the mid-1970s on the aerosol project with Jim Rosen. This experience and contacts with Western scientists helped him to navigate the onerous preparations. The bureaucratic workload got on participants' nerves as anxiety was developing in Russia.[420] To relieve the pressure, a group of anonymous authors wrote an ode to the project expressing their feelings:

To 16 TOMS
Some say a scientist is made out of mud,
But we know he's made out of muscle and blood.
Muscle, and blood, and skin, and bone,
A back that's weak and a mind that's strong.

Chorus 1
We write protocol and what do we get? –
Editorial comments and nyet, nyet, nyet.
Our bosses say finish or else we can't go.
We owe ourselves to that damn protocol.

We left from the hotel, the sun didn't shine,
We picked up our pencils and sharpened our minds.
We wrote twenty-seven pages of protocol,
And our bosses said, "why bless your soul."

Chorus 2
We wrote protocol and what did we get? -
Lots and lots of comments that make you sweat.
You know you aren't finished so you can't go
You owe your soul to that damn protocol.

We returned the next day, it began to snow,
The travel and progress were really quite slow.
We broke for coffee, Fanta, and tea
And resolved our problems with great certainty.

Chorus 1
Doctor Petrov, let us be and please don't call,
Esenwein said keep working until you fall.
We've got wills of iron and minds of steel,

Figure 5. TOMS sticker on a cabinet in a laboratory at the Central Aerological Observatory (Dolgoprudny, Russia), 2019.

[420] Vanda Beletskaya, "Signal iz Budushchego," *Ogonek* 30 (3235), July 22-30, 1989, 24-25 [A signal from the future]; NASA has a video of the launch, press conference, and the banquet posted on YouTube: https://www.youtube.com/watch?v=AaIrjID6oU4. Khattatov never had much interest in taking a position in scientific administration, he prefers doing research. He was invited to co-run the observatory in the 1990s but soon returned to his lab. Khattatov, interview.

And if Ops don't get you, then the E and M will.[421]

The launch from Plesetsk was successfully conducted four days before the infamous August 1991 coup in the Russian government. By the end of the year, there was no U.S.S.R. any longer. WG VIII survived the ensuing turmoil for a while, but personal connections between participants survived much longer.[422]

Conclusion

WG VIII was the largest-scale program of the entire CFEP, and it was designed by the top-level academics and strategists to be so. For Soviet academics it was an excellent opportunity to showcase their environmental monitoring approach, to reinforce their claim on a proactive leading position in environmental studies. Basing on his atmospheric heat balance research, Budyko suggested that global warming would work in favor of humans and promoting this theory could be part of establishing a strong position of Soviet science, a position that differed from Western approaches.[423] For EPA scientific administrators this project provided guaranteed access to Soviet data for building American climate models and thus strengthening their status in environmental politics and scientific dominance. Motivations at the top were understood and easily complemented their distinctive goals. Researchers involved in WG VIII paleoclimatic, atmospheric aerosol, and oceanographic and limnology studies were less interested in and

[421] Anonymous, To 16 TOMS, Folder "SAGE TOMS," CAO. The poem was clearly inspired by the 1940s song, Tennessee Ernie Ford, vocalist, "Sixteen Tons" by Merle Robert Travis, recorded August 1946, track 3 on *Folk Songs of the Hills*, Capitol, 78 rpm. It was made popular in the later decades by numerous singers who covered it. Among the most well-known versions is one by Johnny Cash.

[422] Rosen, Zaytseva, and Khattatov still keep in touch. Rosen, discussion; Khattatov, interview; Zaytseva, interview.

[423] Alan D. Hecht and Dennis Tirpak, "Framework Agreement on Climate Change: A Scientific and Policy History," *Climatic Change* 29 (1995): 384.

had little power over proving economic benefits of global warming, influencing climate policies, or complying with manipulating military interventions. Their agency lay elsewhere: in contributing to their fields, professional careers, and cultural cognizance. Through these means they could make a difference by achieving mutual understanding, creating dialogue among professionals, and normalizing scientific contacts in earth sciences between the U.S. and the U.S.S.R.

In personal accounts by American participants of WG VIII, things about the Soviets they found unexpected or going against their previous assumptions come through as most insightful. Having met no one from the Soviet Union face-to-face before, American scientists were surprised. The glaciologist Stephen Porter wrote in 1976: "It is noteworthy that all people seem to be clean and well dressed. I saw no poor or shabby people in Moscow."[424] It sounds like Porter anticipated a different picture and was pleased to admit he had been mistaken. Another discovery was that some colleagues had a good sense of humor or that, in fact, humor could serve as a survival mechanism to deal with hardships in life. For the meteorologist Nina Zaytzeva accepting an offer from strangers at a rural bus station in the West was somewhat of a leap of faith in the goodness of the common American.[425] These revelations on the individual level were no less valuable to science diplomacy and world peace than summit talks were politically.

It is illuminating to see in these interactions how science diplomacy gradually gave way to scientific dialogue in WG VIII. This is not to say that science diplomacy is an inherently manipulative strategy. As Melvin Kranzberg famously noted about technology, the choices are neither binary nor absolute: "neither good nor bad, nor is it

[424] Porter, "In the Heart of the Soviet Union."
[425] Zaytseva, interview.

neutral."[426] The two-fold development WG VIII underwent a transformation of the scientific relationship between American and Soviet climatologists and geologists. The shift in mutual understanding on the human level comprised both science proper and science diplomacy in ways the engineers of the collaborative policy did not foresee. No public officials encouraged or required scientists to gain insight into the mindset of colleagues, share their values and worries, or open their homes to each other. Participants of WG IX, as we will see, took this a step further, becoming involved in their colleagues' lives far beyond data sharing and exchanges of pleasantries and introduced scientific expertise as a conflict resolution technique.[427]

Examining the work of WG VIII from the top-down perspective, Katja Doose argues that "while this collaboration certainly had political intentions, it was foremost a scientific undertaking aided by diplomacy rather than the other way around." Even when their prognoses for the impact of climate change on society differed radically (American scientists argued for negative ramifications, and the Soviets for beneficial), she states, they still focused on shared interests and continued to collaborate.[428] The bottom-up perspective of this chapter supports Doose's argument and adds another dimension to it. Government officials and science administrators who signed and supervised the CFEP agreement prioritized track-two diplomacy and other national political agendas. The core-level researchers were primarily interested in professional tasks that advanced their field

[426] Melvin Kranzberg, "Technology and History: "Kranzberg's Laws," *Technology and Culture* 27, no. 3 (1986): 545.
[427] The definition of track-two diplomacy closest by context is used here: "A term referring to the use of unofficial channels to facilitate negotiations between governments, to promote international engagement without arousing hostility, or to build confidence among elites across international boundaries." Glenn E. Schweitzer, *Scientists, Engineers, and Track-Two Diplomacy* (Washington, D.C.: National Academies Press, 2004), v.
[428] Doose, "Global Problem in a Divided World," 2.

and developed and broadened their scientific expertise. They were also influenced by a human impulse to respond to adversity between their nations. Responses to that impulse took various shapes. Some were reluctant to embrace the otherness of a different scientific and human culture. Others chose to get more involved and mitigate the tensions through work and personal connections to colleagues on the other side of the Cold War. None were simply sticklers for ideology or involved in explicit or covert partisan activity. And all made a fair share of contributions depending on their knowledge, professional outlooks, and personal philosophies on life.

WG VIII can be described as gravitating toward ideological dialogue with elements of controversy at the outer layer and to a productive scientific exchange at the core. Did the Cold War constraints leave any room for improvement beyond this? What could bring more success to this kind of bilateral collaboration? The history of WG IX, earthquake prediction, demonstrates that more independence from state systems was possible. Moreover, such independence offered more opportunities to pursue professional goals and even influence state policies.

CHAPTER 4

Area IX: working face-to-face

Preface: the many narratives of an invisible class

Seismology stands out even among the eleven CFEP working groups. All lines of CFEP collaboration were unprecedented in one way or another and happened against many odds with varying degrees of productivity. Area IX was transformative for its core participants, the larger scope of the discipline, and strikingly personal scientific diplomacy.[429] It reshaped the relationship between Soviet (and later Russian) and American seismological communities. It produced a new way of scientific resolution to a lengthy political dispute and stimulated several lines of research still pursued in seismology beyond earthquake prediction. Here, again, early- and mid-career core-level scientists were instrumental in these changes. To explore their contributions, I chose not to follow the political Cold War framework of "collaboration and competition."[430] It was obviously present in CFEP history at the ideological level, and many historians have researched it before me in other contexts, but very little in this particular story is revealed or explained through its lens. Few primary sources—interviews with American and Soviet participants, their memoirs, academic papers, archival documents, material objects—indicate competition as motivation or governing force of actions. They do, however, speak in abundance about collegial values, mutual interests and benefits, and

[429] Participants of all other CFEP projects identify them as Working Groups (WGs). The working group central to this chapter is known as Area IX. Both terms were used interchangeably in CFEP protocols, but participants of this one WG consistently refer to it as Area in conversation and publications and might correct you if you call it differently. To honor their tradition, I refer to it as Area IX.

[430] Greg Whitesides, *Science and American Foreign Relations since World War II* (Cambridge: Cambridge University Press, 2019), 259.

What approach would penetrate this extraordinary yet perfectly run-of-the-mill story of bilateral scientific program deeper than political history?[431]

In the 1970s and 1980s, Western historians of early modern Europe began to develop the field of microhistory using elements of cultural anthropology. An important facet of this new kind of history was the focus on the culture of "subaltern classes" as opposed to the grand narratives of royalty making history and ruling the world of inert masses. Instead, some historians turned their gaze to peasants, craftsmen, artisans, healers—those historical actors who had been previously thought of as insignificant. Since then, microhistory has grown into a fruitful and rich field of study.[432] Its approaches have been occasionally applied in the history of science but rarely to twentieth-century scientific knowledge makers. The "worker bees" of science—mid-level practitioners—often stand behind the scenes of Cold War history. There are many excellent illuminating biographies of distinguished intellectuals, papers on personal journeys of extraordinary citizen scientists, discussions of research schools and practices, all of which encompass mid-level practitioners in one way or another. A recent book explored the microcosm of a research facility in a small Soviet town based on the author's interviews with scientists who worked there.[433] Analytical disciplines in which less visible actor networks are

[431] As described in previous chapters, by the 1970s bilateral scientific, technological, and medical programs of exchanges or forms of collaboration became an established practice at the intersection of science and diplomacy within each bloc and across the Cold War divide.
[432] Among the most influential classic works of microhistory are Carlo Ginzburg, *The Cheese and the Worms: The Cosmos of a Sixteenth-Century Miller* (Baltimore: Johns Hopkins University Press 1980), Natalie Zemon Davis, *The Return of Martin Guerre* (Cambridge: Harvard University Press, 1983), Robert Darnton, *The Great Cat Massacre and Other Episodes in French Cultural History* (New York: Basic Books, 1984), and Laurel Thatcher Ulrich, *A Midwife's Tale: The Life of Martha Ballard, Based on her Diary, 1785-1812* (New York: Knopf, 1990).
[433] Maria Rogacheva, *The Private Life of Soviet Scientists from Stalin to Gorbachev* (New York: Cambridge University Press, 2017).

widely discussed are, of course, sociology of science and science and technology studies. Scholars in social studies of science apply tools like direct communication with actors (interviews with participants) and their published works to complement computerized statistical analysis.[434] Patterns of interconnection between personal experiences, social skills of scientists, and efficiency of research that Chandra Mukerji noted were tremendously helpful for understanding how the seismological community functioned.[435]

In the history of science, the view of mid-level practitioners remains on the margins. Inspired by the classics and the recent works discussed above, this chapter zooms in on WG IX to investigate is as a network of mid-level geoscientists. Because academic hierarchies in geophysics are less rigid than is often assumed and because of the extraordinary circumstances around Area IX mid-level scientists exercised freedom of choice to pursue research not dictated by the state or by science diplomacy protocols. I argue that the same activities of Area IX seen through different lenses by administrators and participating geophysicists received two partly contradictory measures of success. Within the reference frame of the formal managerial rhetoric, the program failed to produce breakthroughs in earthquake prediction but was helpful in science diplomacy. From the involved practitioners' perspective, it succeeded in expanding scientific knowledge and reached beyond that in conducting research to resolve a diplomacy issue. Each assessment was valid and acknowledged by both groups. Exploration of mid-level

[434] Alberto Cambrosio, Peter Keating, and Andrei Mogoutov, "Mapping Collaborative Work and Innovation in Bioscience," *Social Studies of Science* 34, no. 3 (2004): 325–364.
[435] Chandra Mukerji, *A Fragile Power: Scientists and the State* (Princeton: Princeton University Press, 1989).

scientists' accounts offers an insight into the ways in which the culture of scientific networks created new knowledge in a bilateral collaboration program.[436]

A seventeenth-century community of amateur scientists could be brought together by shared intellectual curiosity, topographic locations (living on the same street in Elizabethan London would count), and extended networks of the republic of letters.[437] The twentieth-century geoscientists being no amateurs and living on opposite ends of the world had, nonetheless, a similar set of commonalities that mattered. The same professional sphere and similar research questions but varied analytical approaches, accumulated knowledge, and supporting technology gave opportunities to learn from each other. Extraordinary locations and conditions of travel and field research offered challenges to be conquered. Less planned were the long-term professional and personal connections or emotional attachments many of them developed along the way. The political backdrop added an extra layer of meaning to their mission. The republic of letters—exchange of ideas across geographical, linguistic, and conceptual borders sustained through personal relationships—can be traced in Cold War academic geophysics.

Alongside commonalities there were differences. Before the joint work began, each group of actors had their own narrative of the history and methodology of seismology. The interaction merged these visions in scientific circles to a degree of visibility that has not been matched among historians of science in this field. For example, in historical

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[436] I would like to thank Nicole Nelson for suggesting to me this framework of analyzing oral sources as it appears in Nicole Nelson, "Shooting Genes, Distributing Credit: Narrating the Development of the Biolistic Gene Gun," *Science as Culture* 21, no. 2 (2012): 205-232.
[437] Deborah E. Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven and London: Yale University Press, 2007).

accounts, Russian and Soviet seismologists are often written out of the history of the discipline even while Western earth scientists discuss, acknowledge, and appreciate their contributions.[438] Person-to-person communication facilitated this merge not only retrospectively and at the time but for the future as well. The collaboration in seismology became one of the models for American-Russian projects that scientists continue to value and maintain.[439]

On the question of success or failure of Area IX, it seems to be a matter of the power of narratives that survive and strata in which they survive: "Power is about *whose* metaphor brings worlds together, and holds them there."[440] The official rhetoric of administrators has been quite pronounced and became part of public knowledge. Mid-level scientists' perspective has not been as well publicized or understood by historians. Thus, instead of seeing this community as manipulated by Cold War powers I explore it as a group of independent actors with freedom of choice in joining the program,

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[438] See, for example, Frank Press, interview by Ronald Doel, July 1, 1997, Niels Bohr Library & Archives, American Institutes of Physics, College Park, MD, https://www.aip.org/history-programs/niels-bohr-library/oral-histories/6929-2 (hereafter AIP), where Press said about the 1970s: "I had a Russian friend, Professor V. I. Keilis-Borok — Volodya we called him — who I wrote several papers with. And he introduced me to one of the world's great mathematicians, a man named [Izrail Moiseevich] Gelfand. They introduced me to a lot of techniques in computer learning and prediction that I used subsequently in my other work. I learned that technique from them."

[439] Irina Dezhina and Elizabeth Wood, "Benefits of Differences in the U.S.-Russia Collaboration" (Power Point presentation, Russian Science, Technology, and Education Conference (RUSTEC2020), online conference, October 5-16, 2020), program and abstract https://nanoandgiga.com/rustec2020/program, presentation video https://www.youtube.com/watch?v=cnv3c6zyAjI.
The Unique U.S.-Russian Relationship in Biological Science and Biotechnology: Recent Experience and Future Directions, Report by Committee on U.S.-Russian Bioengagement, Development, Security, and Cooperation, NRC and Russian Academy of Sciences (Washington (DC): National Academies Press, 2013); Siegfried S. Hecker, ed., *Doomed to Cooperate: How American and Russian Scientists Joined Forces to Avert Some of the Greatest Post-Cold War Nuclear Dangers* (Los Alamos: Bathtub Row Press, 2016).

[440] Star, "Power, Technology, and the Phenomenology of Convention," 284.

contributing time and energy, making sacrifices and reaping benefits, and being involved professionally and emotionally. I argue that these choices of mid-level practitioners ensured a break from Cold War patterns of mistrust, misunderstanding, prejudice, and resentment in science and beyond. They nonetheless needed to negotiate that diplomatic context, but it became a backdrop against which they pursued their scientific agenda. And the transformation of views and practices happened through internalized experiences of communication, joint work, and travel beyond brief one-time encounters and were made possible by the qualitative shift in professional and personal mutual understanding.

Section 1. A white hope turned bête noire and a bit of tsunami warning

As evidence shows, the productivity and longevity of all CFEP working groups depended less on Cold War barriers or limitations in communication between the U.S. and the U.S.S.R. than it did on the internal setup, rigor of joint research, and involvement of individual participants in each group.[441] Out of the eleven WGs, earthquake prediction came the closest to defense sensitive locations and issues of national security, which typically meant trouble in the Cold War playbook. Nonetheless, Area IX turned into one of the most prolific, persevering, and expressly productive joint research initiatives and peace efforts that scientists ran. I argue that it happened due to a constellation of factors that tend to affect international collaboration projects within or outside of the Cold War context including those that often elude the attention of scholars—personal involvement of participants to the success of a politicized scientific experiment. More specifically, it

[441] As a point of comparison for how influential (and just shy of Machiavellian) national politics could be in a scientific exchange program and how involved scientists could mitigate it in Sino-American relationships, see Pete Millwood, "An "Exceedingly Delicate Undertaking": Sino-American Science Diplomacy, 1966-1978," *Journal of Contemporary History* 56, no. 1 (2021): 166-190.

was not dominated by overwhelming political pressure like other science diplomacy undertakings in the 1970s and did not disintegrate like some CFEP programs but became a fruitful exchange because of mid-level scientists' intellectual, practical, and emotional experiences connected with Area IX.[442]

Area IX had its own set of impact factors that differed importantly from those of other groups. For example, Area VIII (climate studies) was a story of a fortuitous confluence between sufficient government funding, administrative support from "institutions of power" pulling in the best available resources to collaborate, and scientists exploring these opportunities and acting independently while complying to the authorities' call to action in the name of détente. The history of Area V (nature protection) convincingly demonstrates that a possibility existed for a CFEP program within a non-strategic discipline to remain productive and be minimally influenced by the geopolitical, diplomatic, or ideological interplay. In fact, the endurance of the wildlife conservation projects was such that they survived the Cold War, the collapse of the Soviet Union, and the subsequent loss of political interest on both sides. To date, this program is active administered by the U.S. Fish and Wildlife Service and the Russian Ministry of Natural Resources and Environment.[443] Area IX tells a story of going a step further in designing projects and riding the political wave to pursue field studies. Some of the commonalities between these three CFEP programs are, for instance, the rising status of their disciplines, their connection to Cold War military explorations or to

[442] Simona V. Samuilova, "The International Scientific Cooperation between the United States and The People's Republic of Bulgaria during The Cold War," *Educational Alternatives* 12 (2014): 203-211.
[443] Email correspondence with Peter Ward (U.S. Fish and Wildlife Service Headquarters, International Affairs, Eurasia Branch) who currently supervises the program, May 2021.

environmental protection, and the patronage of high-level academic administrators on the Soviet side that ensured a green light to some of the riskier endeavors. In all three mid-level practitioners engaged in field research, joint publications, and cross-cultural interaction (scientific and otherwise). What was it about seismology or seismologists that took this group to the next level of operation—to finding a way of ignoring or even interjecting in Cold War politics rather than being continuously influenced by it?

In fact, the umbrella title "earthquake prediction" did not fully fit Area IX. "Seismology" would have been more accurate, but the expectation to channel all seismic data and scientific findings into prediction gave it this somewhat misleading title. Prediction held the biggest stake in the program for reasons that will be revealed later in this chapter. The 1970s were a time of hopes around the world for developing reliable methods of forecasting earthquakes. The next thirty years of research reduced those hopes to almost null. U.S. geophysics, in fact, has since reduced prediction research significantly in favor of hazard assessment, physics of the earthquake source, and rock mechanics.

Area IX had a simple structure: two areas of joint investigation, tsunami warning systems with one project and seismology (earthquake prediction) with four projects: field research on earthquake prediction, laboratory and theoretical investigation of physics of the earthquake source, mathematical and computational methods of prediction of areas of strong earthquakes, and evaluation of seismicity and seismic risk (engineering-seismological research).[444] By the end of the 1980s, the two areas evolved in very

[444] Memorandum of the second meeting of the U.S.-U.S.S.R. joint committee on cooperation in the field of environmental protection, Washington, D.C., November 13-16, 1973, folder "IR: US-USSR Cooperation: Environmental Protection, 1974," 15-17, NAS.

different ways. The earthquake prediction group "emerged as one of the real showcase projects" and the tsunami warning one, as experts concluded, dissolved.[445] It did, however, fulfill its mission.

Tsunami warning

In analyzing CFEP programs, it is helpful to go back to their original framing to maintain realistic expectations for their accomplishments. The plan for the tsunami warning project was confined to "investigating the possibility of creating a consolidated tsunami early-warning system," and eventually taking steps toward developing such a system by merging national scientific and technical resources, if possible.[446] As an intellectual problem to solve, it was an intriguing one. In fact, both themes of Area IX were academic challenges at the cutting edge of their fields. Research into connections between the geophysical phenomena of earthquakes and tsunamis that were commonly (and erroneously) described at the time as tidal waves, their prognosis, and their computational modeling had just begun.[447] The accumulation and processing of global data, active theoretical advancement in understanding geophysical processes, and fast application of their analysis to practical matters were signatures of many earth science disciplines in the

[445] Nish Jamgotch Jr., ed., *U.S.-Soviet Cooperation: A New Future* (New York: Praeger, 1989), 105.
[446] Memorandum of the second meeting, 17, NAS.
[447] For a concise description of the tsunami phenomenon and the "tidal wave" misnomer, see Donald R. Prothero, *Catastrophes! Earthquakes, Tsunamis, Tornadoes, and Other Earth-Shattering Disasters* (Baltimore: Johns Hopkins University Press, 2011), 60-62.

second half of the twentieth century.[448] These were very true for marine science, to which the tsunami project was assigned institutionally.

One segment of the project was joint expeditions to the Pacific to make measurements by U.S., Soviet, and Japanese equipment. The other segment was tsunami modeling that required the measurements. Jointly, they served the purpose of creating at least two more data points to add to the developing Pacific tsunami warning system. The system, a "cooperative effort among nations bordering the Pacific Ocean to provide early warning of potentially disastrous tsunamis," was a U.S.-led project.[449] It had changed ownership several times until it was assigned to NOAA's National Weather Service, where it lodged and where it functions to this day.[450] Plugging data points (seismic stations) along the Pacific coastline of the Soviet Union into the system would cover a gap in input information about tsunami activity from the Soviet Far East, which would increase accuracy of early warnings for all participating nations. For the Soviets, being included in the system meant, in terms of public safety, potentially keeping the region most threatened by tsunamis, Kamchatka and the Kuril Islands, better informed about impending hazards. The joint project was also beneficial for research, drawing funding, data, attention, and intellectual resources to tsunami studies. An emerging sub-field of geophysics with national observations geographically confined mostly to the Pacific coast, tsunami studies appeared in the Soviet academic system in the 1950s. By the end

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[448] For a discussion of the "meteoric growth of oceanography, marine sciences and ocean engineering during and after the [second World] war" and the historical progression of their practical applications see Helen M. Rozwadowski, *Vast Expanses: A History of the Oceans* (London: Reaktion Book, 2018), 161-187.
[449] Mark G. Spaeth, *Communication Plan for Tsunami Warning System* (Silver Spring, MD: U.S. Department of Commerce, NOAA, National Weather Service, 1980).
[450] https://www.weather.gov/safety/tsunami-twc.

of the decade, given growth of population in tsunami hazardous areas academic scientists began developing an early warning system. Outside of the U.S.S.R. regional instrumentation systems were already functioning in Japan and Hawaii. The latter could benefit from a joint Pacific warning system more than some—the 1952 Kamchatka (U.S.S.R.) earthquake, for example, generated a tsunami that reached Hawaii in six and a half hours. With data from Soviet stations, it would allow plenty of time to issue local warning. While Kamchatka is close to an oceanic seismic zone, Hawaii lies far away from such active areas.[451]

Two expeditions were conducted in 1975 and 1978 aboard the Soviet research ship *Valerian Uryvaev* along the shore of the Kuril Islands and in the open sea to observe long-wave activity and collect hydrographic measurements, later to be digitally processed.[452] In between, a small bilateral meeting was held in Novosibirsk in September 1976. The hosts were top experts in the field, from observations (Mikhail V. Popov, Hydromet), to theory and methods of detection (Sergey L. Soloviev, director of the Sakhalin Complex Scientific Research Institute), to computer modeling (Anatoly S. Alexeev, deputy director of the Novosibirsk Computing Center).[453] Traditionally, until the end of the twentieth century the leading approach to tsunami studies was earthquake-

[451] A.E. Svyatlovsky, "Tsunami Tihookeanskogo Poberezhya SSSR" [Tsunami of the Pacific coast of the U.S.S.R.], *Priroda* 4 (April 1959): 93-97.
[452] S. L. Soloviev, et al., *Preliminary Results of the First Soviet-American Tsunami expedition* (Honolulu: Hawaii Institute of Geophysics, University of Hawaii), 1976; Patricia E. Pullen and H. Michael Byrne, *Hydrographic Measurements during the 1978 Cooperative Soviet-American Tsunami Expedition*, NOAA Data Report ERL PMEL-4 (Seattle: Pacific Marine Environmental Laboratory, 1981).
[453] The second USA-USSR meeting of experts on integration of tsunami warning system, September 22-26, 1976, Novosibirsk, USSR, "02.09-21. 1974-76," EPA: Records of the U.S./USSR Joint Commission on Environmental Programs, 1972-1976, ProQuest History Vault (folder 103967-016-0761).

centric (tracing seismic activity to calculate the time and location of an impending tsunami). Since the 1960s the Soviets worked on a different, tsunami-centric approach (tracing ocean wave activity to predict tsunamis) which proves to yield more accurate predictions and is used currently.[454]

Digital processing and modeling were new and promising tools in geophysics in the 1970s. Part of the project focused on exchanging and calibrating digital data for compatibility, as the Americans and the Soviets used different technology, models, and codes. NOAA's Eddie Bernard, future director of the Pacific Marine Environmental Laboratory (PMEL), came to Novosibirsk in 1975 to test Soviet data on his numerical tsunami model. The six-week trip to which Bernard brought his young wife gave him surveillance adventures and restricted access to coastal charts but was productive, and in 2020 he said they "still have lifelong friends from that experience."[455] The two Soviet, now Russian, stations and a data center at the geophysical observatory in Khabarovsk integrated into the international Pacific tsunami warning system through this project continue to contribute to the system. In fact, scientists still consider the U.S.-Soviet cooperation productive for future projects: "Data from one Russian and three US DART buoys provided an accurate forecast of the 2011 Japanese tsunami for US coastlines. This

[454] Sergey L. Soloviev, "Zashchita protiv Tsunami" [Protection against tsunami], *Priroda* 5 (789) (May 1981): 54-67.
[455] Eddie Bernard, interview by Molly Graham, February 12, 2020, Bellevue, Washington, Voices Oral History Archives, NOAA, accessed on May 21, 2021, https://voices.nmfs.noaa.gov/sites/default/files/2020-10/bernard_eddie_final.pdf.

example of unselfish sharing of vital data between Russia and the USA is a model for international cooperation."[456]

Earthquake prediction

In the three years leading to the signing of the CFEP agreement, the American scientific community and the wider public were deeply interested in and concerned about nature protection and the causes, effects, and prevention of pollution. In the same period, earthquake prediction barely ever made it to the news, Congress hearings, or scientific periodicals.[457] The CFEP agreement was designed to draw positive publicity to environmental concerns already in the public domain and thus to demonstrate a shared desire to take responsibility for them and develop ways of their control. CFEP projects focused specifically on anthropogenic pollution and industrial activity harmful to live organisms including humans, on widely discussed factors of natural diversity depletion and human health hazards. Earthquake prediction was not commonly associated with any of this. How did a branch of seismological research, a study whose feasibility was regularly questioned connect to environmental protection or threats to human health? Who and why added it to the list of pollution-oriented information exchanges?

The man who had answers to these questions would be Gordon J.F. MacDonald, a geophysicist, a member of the CEQ, and a defense environmental scientist. It was he who

[456] Eddie Bernard and Vasily Titov, "Evolution of Tsunami Warning Systems and Products," *Philosophical Transactions: Mathematical, Physical and Engineering Sciences* 373, no. 2053 (28 October 2015): 7.
[457] Between January 1, 1969, and December 31, 1972, thirteen articles in the *New York Times* and fifteen articles in *Science* discussed earthquake prediction. In contrast, air pollution was discussed in over six hundred and over four hundred articles, respectively.

advocated for including earthquake prediction in the CFEP agreement programs.[458] Seismology, obscure and barely present on the American academic scene three decades earlier, was rapidly gaining momentum in the scientific world. In addition, in the Cold War context the study of earthquakes held potential for military applications up to a possibility of weaponizing seismic activity, in which a defense scientist like MacDonald would be invested.[459]

Soviet seismology had been on the radar of the American scientific community years before the 1972 agreement, and not simply because of the general Cold War strategy to keep a finger on the pulse of the adversary's advancements in physics and the development of atomic weapons. Previously, the most meaningful encounters between American and Soviet geophysicists happened during and around "perhaps the most ambitious and at the same time the most successful cooperative enterprise ever undertaken by man," the International Geophysical Year (IGY, July 1957 – December 1958).[460] However, that was all they were—encounters. Follow-up engagements such as exchanging seismological instruments brought successes in science diplomacy. One facet of the IGY aftershocks was open geophysical data exchanges through the World Data Centers, but "open" did not mean free flowing or uncensored.[461] The value of the IGY was not as much in opening a door to active collaboration as it was in a new "division of labor" in geophysical research among participating countries. Data sharing and

[458] N.W., "Earthquake Accord and the Test Ban," *Science* 178, no. 4056 (1972): 38.
[459] Jacob D. Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism* (New York: Oxford University Press, 2013), 160.
[460] Lloyd Berkner, foreword to *IGY: The Year of the New Moons,* by J. Tuzo Wilson (New York: Knopf), vii.
[461] Jacobsen, Fedorova, and Lajus, "The Seismograph as a Diplomatic Object," *Centaurus* 63 (2021): 277–295; Elena Aronova, "Geophysical Datascapes of the Cold War: Politics and Practices of the World Data Centers in the 1950s and 1960s," *Osiris* 32 (2017): 314-316.

opportunities to join multinational programs lifted the strain for every leading IGY nation with geophysical aspirations of doing all research on all fronts. Among other things, the IGY was a reorganizing effort aimed at bringing fragmented national research efforts into a global system of observations, data circulation, instrumentation, and field research for decades to come.[462]

The IGY may not have generated much further collaboration in field research, but it certainly encouraged developments in seismological instrumentation, giving more hope for successful prediction than there had been before. In fact, the hope was so strong that in the late 1960s the American seismological community pivoted in problem solving toward prediction. The federally approved and funded ($137 million) 10-year research program prompted by the "political and scientific aftershocks of the Good Friday earthquake in Alaska in 1964" was to focus on installing observation instruments in major seismic zones and accumulating enough digitized data to develop a prediction technique in collaboration with Japanese seismologists who had already launched their national 10-year program.[463] The man to lead the program, the MIT seismologist Frank Press, had paid several visits to Soviet geophysical research facilities in previous years. He was not impressed with Soviet seismology in the 1950s but gradually came to appreciate its theoretical side more in the 1960s and 1970s. In fact, Press's reports about the Soviet prediction research persuaded MacDonald, who was not a seismologist, to include earthquake studies for the CFEP agreement. Government officials who prepared

[462] Gennady A. Sobolev, "Uroki Mezhdunarodnogo Geofizicheskogo Goda" [Lessons of the International Geophysical Year], *Vestnik Rossiiskoy Akademii Nauk* 67, no. 11 (1997): 994-997.
[463] John Walsh, "Earthquake Prediction: OST Panel Recommends 10-Year Program," *Science* 150, no. 3694 (1965): 321-323.

the agreement did not know of the addition: "Within the United States bureaucracy, no particular attention was paid to the fact that seismic research was included in the environmental agreement. Most of the concerned agencies were not aware of it until the agreement was ready for signature."[464]

According to the historian Jacob Hamblin, following the failed twenty-third International Geological Congress in Prague that "seemed to foreshadow long-term damage to the coherence of the international scientific community, at least among geologists and geophysicists" in 1968, "the Soviets would play less and less of an important role in the development of geophysics." Looking into the 1960s history of geophysics in the U.S., Hamblin concluded:

> "What value were the Soviets, then, in international cooperation? Given the conceptual differences between East and West, it is not difficult to imagine why Western scientists put such little value in person-to-person contacts. <…> The only tangible commodity the Soviets could offer the West in the scientific exchange was data, which they collected at great length and expense, much to the disdain of scientists such as Deacon who preferred problem-oriented studies. Data from international programs kept Soviet scientists actively involved in international exchange and allowed them to publish without gaining approval from the government. Certainly it was for data alone that the Americans and British fostered the cooperative relationship with the Soviets; other alleged motivations—coordinating work, comparing techniques, or discussing new ideas—had little to recommend them by the late 1960s."[465]

Data was undoubtedly coveted in geophysics, seismology included. To this day earth sciences have been very data driven because the more systematized observation data. Tthe accuracy of identifying distribution, impact, and patterns in what is now understood as the global seismic process thus provided a better chance of developing, proving, or

[464] Press, interview by Doel; "Accord on Quakes May Yield a Bonus," September 27, 1972, *New York Times*, 15.
[465] Hamblin, *Arming Mother Nature*, 215.

disproving hypotheses about its nature. Western scientists needed Soviet regional data for expanding their understanding of global processes and for modeling them, so they maintained collaborative efforts with the Soviets to pursue data transfer. From a transactional viewpoint on how the international scientific community functioned Hamblin's assessment is nothing but accurate. The tit-for-tat principle of initial U.S.-Soviet exchanges promoted the same pragmatic approach to scientific dialogue in the 1960s. If Soviet scientists had only data to offer—and even that they offered reluctantly and when it served their pragmatic interests—earthquake prediction may have been nothing but a front for a data-mongering operation. This was not, however, the official rhetoric for the American interest in the Soviet earthquake prediction. It was sparked by an announcement of a breakthrough by Soviet seismologists.[466] This motivation behind including earthquake prediction in CFEP reveals itself in an article in the *New York Times* announcing the newly launched agreement:

> ***Washington, April 24—*** Japanese and Soviet scientists believe they are "well on the way" to developing methods of earthquake prediction, it was reported here today. <…>
>
> Dr. Karl Kisslinger of St. Louis University in Missouri, who reported on Japanese and Soviet research, said Soviet scientists were "very excited" about their prediction method. It seems to provide a warning months in advance of a major quake, at least in the region of Soviet Central Asia north of Afghanistan.
>
> In 1940, that region—the so-called Garm district—suffered
>
> In regions where major earthquakes occur there is usually a continuing series of small quakes. Most are too weak to be noticeable, but they can be used to monitor variations in the travel times of the two types of waves through the deep rock where the strain presumably accumulates before a quake.
>
> In this way it has been found that some weeks before the quake the ratio between shear wave and pressure wave begins to drop, it reaches a minimum, then climbs again. When it returns to its original level, the quake occurs.
>
> Furthermore, the rate of change seems to indicate the severity of the quake that is to come. Thus, the change in ration began three months before a relatively severe quake that shook Tashkent on April 25, 1966, whereas before lesser quakes the change came only a month in advance. "If this behavior is verified for future observations and for other seismic zones," said Dr. Kisslinger, "it is a powerful, if poorly understood forecasting tool."
>
> It was noted by the symposium participants that

[466] Allen L. Hammond, "Earthquake Predictions: Breakthrough in Theoretical Insight?", *Science* 180, no. 4088 (1973): 851-853.

> a severe quake whose aftermath was an avalanche and landslide that buried a town and its 20,000 inhabitants under 40 feet of debris. Consequently, the area has been one of the two primary targets of Soviet earthquake research, the other being Kamchatka on the Pacific Coast.
>
> the crustal movements responsible for quakes are basically different in various parts of the world and a prediction method that works in one may not be applicable elsewhere. Nevertheless, it was agreed that a great many specialists would examine old records to see if the Soviet method is valid for California, Japan or other regions."[467]

Judging by the intentions of the organizers and the participants and preliminary results from 1975, Area IX could have been an exception from the "data alone" focus of American interest in Soviet science.[468] Moreover, this and similar announcements in 1972-1973 certainly sound as if American scientists did not possess this new technique of predicting earthquakes and wanted to acquire it through collaborative programs with the U.S.S.R. and Japan.

It is reasonable, however, to ask whether this was not a typical Cold War pronouncement to disguise an ulterior motive—to use CFEP seismological research as a tool in the nuclear diplomacy debate. The research sites specified in the memoranda were conspicuously close to nuclear test sites in both countries. The mastermind behind the agreement Henry Kissinger denied any knowledge about the use of seismic techniques in

[467] There is a typo in the article: the severe quake in the Garm district to which the author refers occurred in 1949 (the above-mentioned Khait event), not in 1940. Otherwise, what may seem a lengthy quote is indeed a compelling explanation of the geophysics behind the Soviet claim to success in earthquake prediction and the reasons for American interest in it. Written by one of the creators of the modern genre of science journalism Walter Sullivan, this article is a clear, succinct, and accessible account of the problem for non-seismologists. Walter Sullivan, "Scientists Envision Quake Prediction and Prevention," April 25, 1972, *New York Times*, 85.
[468] Memorandum of the fourth meeting of the U.S.-U.S.S.R. joint committee on cooperation in the field of environmental protection, October 28-31, 1975, folder "IR: US-USSR Cooperation: Environmental Protection, 1975," 31-34, NAS.

nuclear test detection.[469] Ending the drawn-out twenty-year "yield wars" between the U.S. and the U.S.S.R. over exceeding the allowed thresholds for sizes of nuclear test and conducting concealed tests was still an unattainable dream.[470] An offshoot of Area IX later became instrumental in resolving this diplomatic-scientific conflict. In fact, under the CFEP umbrella a group of scientists and representatives of non-governmental organizations with governmental blessing introduced scientific methods of peaceful conflict resolution. Using seismic instruments near nuclear test sites in a hybrid sci-tech experiment to measure seismic response to human-made explosions, they proved the verifiability of Soviet tests by American equipment and vice versa. This history has been well documented and researched in-depth. The key takeaway point from its intersection with our story is that CFEP laid the foundation for the verification project. It drew together researchers who had the professional knowledge to conduct this experiment in what already was not a hostile environment. Soviet scientists were more at ease with the experiment and glad to offer their expertise in something they knew well. With contacts from previous joint work and good understanding of the Soviet academic system, the

[469] "Accord on Quakes May Yield a Bonus," *New York Times, 15.*
[470] For example, Lynn R. Sykes, *Silencing the Bomb: One Scientist's Quest to Halt Nuclear Testing* (New York: Columbia University Press, 2017), 91-142.

Americans had realistic expectations and could navigate the project to success.[471] And what being within the Soviet academic system actually mean for earth sciences?

Section 2. An excursion into Russian geophysics, mostly seismology

In seminal Western works on the history of earth sciences, Russian geophysics often occupies a marginal space if mentioned at all. [472] This happens largely due to limited access to credible sources for historians in the past as well as to adherence to the Cold War "Western superiority complex."[473] Unfortunately, that oversight is problematic as it overlooks non-Western histories of science and even international dialogue. In the first chapter we saw how this preconception could cloud American scientists' judgements prior to exposure to the Soviet academic system and how some of them changed their

[471] Several scientists whose stories are told in this chapter participated in the verification experiment as well. For some, like the seismologist Charles Archambeau, the project was the only interaction with Area IX, and not everyone necessarily knew that it was under the auspices of CFEP. They were invited by the Natural Resources Defense Council, a non-governmental U.S. environmental advocacy group, that acted as the organizer for the test verification project. For others, like David Simpson, Jon Berger, and Frank Vernon, it was a logical continuation of their involvement. Thoroughly researched historians' accounts of the nuclear verification project from the American perspective can be found in Kai-Henrik Barth, "Catalysts of Change: Scientists as Transnational Arms Control Advocates in the 1980s," *Osiris* 21 (2006): 182-206, and Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca: Cornell University Press, 1999), 279-288. A summary can be found in Anna Amramina, "Political Seismology or Seismological Politics: Natural Resources Defense Council–USSR Experiments in Underground Nuclear Test Verification," *Seismological Research Letters* 86, no. 2A (2015): 451–457, and a popular version with photographs of project participants bundled up to brave Kazakh winters and sporting nothing but towels around the waist in the Russian baths is available in Glenn Garelik, "The Grounds for a Test Ban Treaty," June 1987, *Discover*, 50-67.

[472] For example, Russian geology and geophysics did not occupy a significant place in the classics in history of earth sciences, David Oldroyd, *Thinking about the Earth: A History of Ideas in Geology* (Cambridge: Harvard University Press, 1996). Nor did they have a notable presence in a recent history of earthquake studies before WWII by Deborah R. Coen, *The Earthquake Observers: Disaster Science from Lisbon to Richter* (Chicago and London: University of Chicago Press, 2013).

[473] For a journalistic take on this from a Russian-born political scientist see Andrei P. Tsygankov, "Russia Has an Inferiority Complex, America Has a Superiority Complex," August 6, 2014, *Russia in Global Affairs*, https://eng.globalaffairs.ru/articles/russia-has-an-inferiority-complex-america-has-a-superiority-complex/.

position after communicating with Soviet colleagues and receiving first-hand knowledge about their work. As Mott Greene wrote in 1985, historians sometimes focus on understanding the earth sciences' contributions to national (and I would add, Cold War) history, not on understanding earth sciences. It is not wrong to do so, just missing the perspective of a group of actors, scientists. So, it is important to look at the history of Russian seismology as a discipline here outside of the "who beat whom" paradigm about geophysics and correct the record.[474] In addition, it will provide an important alternative perspective on the thirty years of interaction between American and Soviet seismologists.

Developing on the same timeline as Western Europe, the incipient "geographical" stage of academic interest to earthquakes in Russia is traditionally linked to the late nineteenth century.[475] It revolved around accumulating information about historical earthquakes, identifying the geography of seismic zones, analyzing geologyl of rocks, and observations and cataloguing of recent events. The latter were aplenty on the outskirts of the Russian empire, particularly in Central Asia. Until the 1970s seismology in Russia was a case in support of historians' argument about developments in this discipline reliant largely on occurrences of extraordinary natural phenomena they study.[476] A series of strong quakes in Kazakhstan between 1887 and 1902 offered numerous opportunities for developing and perfecting detection and measurement techniques to the two people known as the founding fathers of Russian seismology. The

[474] Mott T. Greene, "History of Geology," *Osiris* 1 (1985): 101.
[475] "…in 1901, it was clear that the United States was trailing far behind other countries in seismology." Coen, *The Earthquake Observers,* 208.
[476] Matthias Dörries argues this for volcanology in "In the Public Eye: Volcanology and Climate Change Studies in the 20th Century," *Historical Studies in the Physical and Biological Sciences* 37, no. 1 (2006): 87-125; Deborah Coen for seismology in *Earthquake Observers*, 6.

geologists Alexander P. Orlov (1840-1889) and Ivan V. Mushketov (1850-1902) promoted seismic zoning and meticulous cataloguing of seismic events, a method of data collection that contributed both to data accumulation and hazard assessment.[477] Boris B. Golitsyn (1862-1916), whose name is the only reference to the history of Russian seismology given consistently in Western literature, brought physics to the geology of earthquake studies. He was instrumental in setting up a national network of seismic stations and best known for designing an electro-dynamic seismometer for long-period seismic wave detection. The 1902 Golitsyn seismometer was used for remotely recording data from seismic events globally during the "instrumental" stage of earthquake studies until it was modified to radically increase the instrument's sensitivity in the 1950s and later to introduce digital data recording.[478]

Golitsyn's death followed by the time of upheaval during WWI, revolution, and the civil war left the discipline lagging with no resources for a decade. Soon after the establishment of Soviet seismological research was resumed largely for pragmatic reasons. The transition to and survival in the Soviet system meant becoming useful. In an early socialist state effort to control and eradicate harmful effects of hazards such as infectious diseases and natural disasters the discipline was reinstated and reshaped to

[477] T.B. Yanovskaya, "K Istorii Rossiiskoy Seismologii" [On the history of Russian seismology], *Voprosy Geofiziki* 47 (2014): 32-41

[478] In anglophone literature his last name is often spelled "Galitsin" or "Galitzin". V.I. Onoprienko, *Boris Borisovich Golitsyn (1862-1916)* (Moscow: Nauka, 2002), 105-113, 153-164; Johannes Schweitzer, "The Birth of Modern Seismology in the Nineteenth and Twentieth Centuries," *Earth Sciences History* 26, no. 2 (2007): 270; David Oldroyd, *Thinking about the Earth*, 233; Deborah Jean Warner, "Maurice Ewing, Frank Press, and Long-Period Seismographs at Lamont and Caltech," *Earth Sciences History* 33, no. 2 (2014): 336.

respond to the needs of the state.[479] Multidisciplinary discussions of the Crimea earthquake of 1927 included theoretical investigation into the nature of earthquakes as geophysical phenomena, field research and analysis of catalogued historical events, and strong arguments for earthquake resistant construction in seismic regions—all the major lines of cutting-edge seismology of the time.[480] Besides, in the late 1920s Soviet state nature was assigned cultural features of an enemy to conquer and a treasure trove to pry open for the benefit of the people. Pragmatic aspects of this approach to the environment went hand in hand with romanticizing professions that promoted it—the epidemiologist fighting a deadly outbreak, the prospecting geologist looking for minerals, or the lab scientist peering into a seismogram to penetrate the Earth's interior.[481]

It took another decade to develop an institutional support structure for earthquake science. From a single seismological institute at the Academy and an array of seismic stations the investigation developed a network of research institutions in all major fields of geophysics. After WWII, two devastating earthquakes on Soviet soil changed the course of seismology in the country. The Ashgabat event on October 6, 1948, took the

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[479] Nigel Raab, *All Shook Up: The Shifting Soviet Response to Catastrophes, 1917-1991* (Montreal and Kingston: McGill-Queen's University Press, 2017), 208-209. It takes a little background knowledge of Soviet history to comprehend the reasons for the strategic status of Crimea in the 1920s and 1930s as the country's *здравница* (health resort or sanatorium), but it is a fascinating example of cultural construction of ecology and public health. For more on this see Johanna Conterio, "Curative Nature: Medical Foundations of Soviet Nature Protection, 1917-1941," *Slavic Review* 78, no. 1 (2019): 23-49.

[480] P.I. Gollandsky, "Seismostoikoye Stroitelstvo dlya Kryma" [Earthquake resistant construction for Crimea], in *Chernomorskiye Zemletryaseniya 1927 goda i Sudby Kryma*, a collection of papers edited at the Crimea Scientific Research Institute (Simferopol: Krymskoye Gosudarstvennoye zdatelstvo, 1928), 99-112.

[481] Alla Bolotova, "Colonization of Nature in the Soviet Union. State Ideology, Public Discourse, and the Experience of Geologists," *Historical Social Research* 29, no. 3 (2004): 104-123; Susan D. Jones and Anna A. Amramina, "Entangled histories of plague ecology in Russia and the USSR," *History and Philosophy of the Life Sciences* 40 (2018), DOI https://doi-org.ezp2.lib.umn.edu/10.1007/s40656-018-0220-3.

lives of tens of thousands of people and destroyed the city.[482] The damage could have been less and casualties fewer had there been better communication between academic experts, authorities, and regional Turkmen infrastructure; more research on regional seismic situation; and more detailed assessments of the event that would ensure prompt rescue dispatch and disaster relief.[483] The Ashgabat earthquake was followed only ten months later, on July 10, 1949, by a 7.4 magnitude and 10-degree intensity event in Tajikistan known as the Khait earthquake. It happened in the foothills of the Pamir-Alay mountain system, in a highly seismic area where weak earthquakes happen routinely and stronger ones regularly. The tremor and the ensuing landslides and mudflows crushed and buried the village of Khait and thirty other settlements around, killing over twenty-eight thousand local people by some estimates.[484]

The Academy's response to these disasters was to reorganize and reequip the national network of seismic stations with more sensitive and stable instruments and to launch an earthquake prediction research. This comprehensive campaign included creating in proximity of the Khait earthquake site a permanent seismological observatory better known in the geophysical community as the Garm Complex Seismological

[482] Raab, *All Shook Up*, 51-52; A.A. Nikonov, "Ashkhabadskaya Katastrofa: Izvestnaya i Neizvestnaya," *Priroda* 998 (1998): 11-20 [Ashgabat catastrophe, known and unknown]. The exact number of casualties was never made publicly known. Nikonov doubts it was recorded in the wake of the disaster and gives his own estimate at sixty thousand people.
[483] Raab, *All Shook Up*, 54-61; Yanovskaya, "K Istorii Rossiiskoy Seismologii," 40.
[484] Here the magnitude scale is popularly known as the Richter scale that measures the strength of an earthquake that roughly reflects the energy it releases. Intensity is its ground shaking and detectable destructive impact on the Medvedev-Sponheuer-Karnik scale (MSK). A.Ya. Sidorin, "K 70-letiyu Khaitskogo Zemletryaseniya 1949 goda v Tadjikistane" [Seventy years since the Khait earthquake of 1949 in Tajikistan], *Voprosy Inzhenernoy Seismologii* 46, no. 3 (2019): 163-174.

Expedition.[485] With the status of a remote laboratory of the Institute of Physics of the Earth in Moscow, Garm combined several roles. It replaced annual seasonal expeditions to the area conducted since 1945 with uninterrupted observations for which it had a seismic station and an instrumental base on the premises for recording data. Above all, Garm quickly grew into a research and training hub of experimental and theoretical seismology in the middle of nowhere that would make the most of its location and provide a rigorous intellectual environment and a safe and enjoyable life for its staff and visitors alike.[486] In addition, by the time the CFEP agreement was signed, Garm had accumulated twenty years' worth of continuous records in a highly seismic region.

There was a belief in the West in the 1950s and 1960s (not without precedent in genetics and cybernetics) that any Soviet scientific discipline domineered by those at the top of the state hierarchy—communist party leaders and their science minions, the academic elite—could be arrested in its development.[487] Some historians still share this position, especially around the plate tectonics controversy in Soviet earth sciences. After the West had reached consensus on plate tectonics, heated debates continued in the Soviet geophysical and geological communities between the "fixists" (whose view was that tectonic plates were immobile, their position "fixed" with only vertical movements possible) and the "mobilists" who shared the plate tectonics concept in the 1960s and

[485] In may sound strange that Garm was officially called an expedition when it was, in fact, a permanent facility. This is an instance when internal logics differ. For the IPE Garm began as a seasonal field station and continued to exist as a destination for annual expeditions from Moscow. It remained an expedition setting in a remote location to Moscow scientists, and its name reflected the status of Garm as a site of continuous field research.
[486]M.A. Sadovsky, *Izbrannye Trudy. Geofizika i Fizika Vzryva* [Selected works. Geophysics and physics of explosion] (Moscow: Nauka, 2004), 280-284; V.N. Strakhov, ed., *Igor Leonovich Nersesov (1919-1995)* (Moscow: OIFZ RAN 2000).
[487] Whitesides, *Science and American Foreign Relations since World War II*, 61.

1970s (i.e., relative horizontal movement of tectonic plates). One of the leaders and international representatives of Soviet earth sciences Vladimir V. Belousov was an adamant denier of Wegener's theory and its staunch critic to his life's end in 1990. Given Belousov's influence and his position of power in the Academy, it was assumed that he turned into geophysics' new Lysenko who would stop at nothing to block plate tectonics.[488]

Soviet scientific debates over plate tectonics were quite similar to the American academic controversy in the 1930s and 1940s over the rejection of the foundation of plate tectonics, the continental drift theory by geologists in the U.S. The reason for the debates was also the same. Some of the prominent Soviet academics were against it "not because there was no evidence to support it (there was ample), nor because the scientists who supported it were cranks (they were not), but because the theory, as widely interpreted, violated deeply held methodological beliefs and valued forms of scientific practice."[489] Contrary to the Lysenko affair, the Soviet plate tectonics debate was scientific, not propagandistic, an epistemological, not an ideological issue. Even in the West, several eminent academics held anti-plate tectonics views. Besides supporters at home, Belousov was in good company of the British physicist Sir Harold Jeffreys and the American geophysicists Maurice Ewing and J. Lamar Worzel. In the 1970s and 1980s persistent adherence to his views did Belousov no favors: he found himself in a nonsensical position of having tremendous clout and respect on the international academic arena and

[488] Hamblin, *Oceanographers and the Cold War*, 215.
[489] Naomi Oreskes, *The Rejection of the Continental Drift: Theory and Method in American Earth Sciences* (New York and Oxford: Oxford University Press, 1999), 6; V.E. Khain, "Bolshie Zabluzhdeniya Bolshih Uchenyh" [Big misconceptions of big scientists], *Istoriya Nauk o Zemle*, no. 1 (2009): 6-10.

being resented for his adamant stance. [490] Whether he and his group "blocked new ideas" is an interesting question. There is no doubt they fought the theory relentlessly. Their opponents (and there were many, which makes one wonder about the accuracy of the assumption that different views were strangled) did not care to fight at every corner, however. Some things were a matter of creating the right time in the right space instead of head-on collisions.

The geophysicist Charles Drake recalled in an interview that during the Oceanographic Congress in Moscow in 1966 a group of Soviet geologists approached him with a request to participate in a seminar at the Moscow Geological Institute, which was run by Belousov and where his supporter, academician Yuri M. Pushcharovsky, held a leading position:

> "And the meeting opened with Pushcharovsky getting up and saying how they worked at the institute which was according to the principles of the late academician Schatsky. And then we got up and said our thing about Alaska and the Aleutians and they got up and they talked about Kurils and Kamchatka in a curiously uninspired way. And then after the formal part was over, we gathered around the maps and started talking, and when we did that, it was very different. We were actually talking one on one and so forth. Very different from how it was when they gave their talks. So we did for a while. Then we had to go, and they said, "Hey, can we do this again?" And we said "Sure, when?" "How about tomorrow morning?" "Fine. What time?" "How about six-thirty?" Why so early? Pushcharovsky doesn't come in until nine." [491]

Drake did not agree to this insanely early meeting. They held it at seven.

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[490] Richard A. Kerr, "Skepticism Persists as Plate Tectonic Answers Come Harder," *Science* 199, no. 4326 (1978): 283; Constance Holden, "Two Who Never Joined the Revolution," *Science* 246, no. 4930 (1989): 575; L.I. Ioganson and Ye.A. Rogozhin, "V.V. Belousov i Geofizika (k 110-letiyu so dnya rozhdeniya)" [V.V. Belousov and geophysics (on the 100th anniversary of his birthday)], *Fizika Zemli* 4 (2018): 3-18; Charles Drake, interview by Ronald Doel, May 20, 1997, AIP, www.aip.org/history-programs/niels-bohr-library/oral-histories/22583-3.

[491] Drake, interview by Doel.

Other American geophysicists wondered about Belousov's power over the Soviet scientifical community. On a month-long tour of Soviet research facilities, the oceanographer Robert S. Dietz conducted an experiment: "I tried to judge the degree of control exerted by leading academicians in establishing a school of thought. As a test, I asked several young geologists about V.V. Beloussov's concept of geotectonism controlled by the rising and falling of a mosaic of Earth blocks. Most of them were quick to disagree and eager to display independent thought and opinion."[492] In the same year, the Soviet Academy published a paper in its flagship journal by the geologist Murat Kamaletdinov, who outlined his own thrust-nappe mobilistic theory based on contemporary geological research in the Ural Mountains and previous studies in the West. The ensuing debates about his theory continued intermittently for the next twenty years and may be additional evidence of more plurality of opinions and opportunities to share them in post-Stalinist Soviet science than outside skeptics suggest.[493]

In a manner of speaking, the group to resist plate tectonics the longest was not the Soviet scientific community but the government of the United States. Refusing to acknowledge seismologists' confirmations of discrimination between earthquakes and underground nuclear explosions and accusing the Soviet Union of cheating on the Threshold Test Ban, government officials thus implicitly rejected the theory on which scientists' findings were based. Plate tectonics helped to account for differences in efficiency of seismic wave propagation in rock formations in the Soviet Union and on

[492] Robert S. Dietz, "Soviet Research in Oceanography," *Geotimes* 145, no. 4 (1965): 11-12.
[493] Iskhak M. Farkhutdinov, Rustem A. Ismagilov, Anvar M. Farkhutdinov, Leyla M. Farkhutdinova, "Murat Kamaletdinov and the Struggle for Acceptance of the Thrust-Nappe Theory," *Earth Sciences History* 36, no. 1 (2017): 101–115.

sites in the U.S. or Africa. It clarified how higher than allowed nuclear explosion yields of Soviet tests were miscalculated, when these differences were not taken into account. Nonetheless, neither the scientific consensus on this, nor plate tectonics seemed to convince the U.S. Department of Defense until the Area IX bilateral test verification project concluded.[494]

By the 1970s, earth sciences were prospering in the U.S.S.R. The funding was good, but they could hardly compete with the attention given to nuclear physics. This was not necessarily bad news for a discipline in the Soviet system as it meant also escaping the pressure of state expectations in the arms race. Geophysics had many benefits that physicists received in the academic system (space, equipment, career prospects, funding for large-scale and long-term projects, access to technology, social benefits) without certain disadvantages. There was no shortage of young engineers and university graduates with degrees in physics, geology, geophysics, and mathematics who were interested in specializing in one of the earth sciences. Oceanographers could access a fleet of research vessels, numerous expeditions were annually held in geology and geography, meteorological and climatological research was supported by the vast resources of Gidromet, and the network of earth sciences institutions expanded through the Siberian and the Far East branches of the Academy.

Seismology was tightly bound to the Soviet atomic project. Instruments that telemetrically recorded earth tremors could detect nuclear explosions. The Institute of Physics of the Earth had an extra division whose work was kept rather quiet. The IPE

[494] Sykes, *Silencing the Bomb*, 69-70.

Special Force worked closely with army seismologists from the Special Monitoring Service of the Ministry of Defense.[495] However, accessibility of foreign travel including internships and participation in international projects, considerable freedom in selecting research topics and locations, and a creative atmosphere in institutions—all pointed to what the anthropologist Alexey Yurchak so perceptively argued for Soviet theoretical scientists. In general, being a scientist could offer a form of escaping the mundane world of everyday life, but this alone did not make for a happy existence or a successful professional career in the Soviet society. A culture of "living vnye"—"a form of relating to the system's discourse, being simultaneously internal and external to it," as Yurchak defines it—formed among theoretical and field geophysicists. The earth sciences milieu combined the features of Yurchak's archaeological circle and theoretical physicists: the romantic ideas about traveling to expeditions, an intense intellectual life, independent thinking, cultural pursuits outside the discipline, possessing knowledge not accessible to other, a collective of creative people, mutual support, shared vacations, and exotic Western hobbies.[496]

A few examples of tight connections between professional freedoms and cultural interests in this milieu may help to recreate some of its atmosphere. Work life could influence, enrich, or transform one's life outside the profession. Many songs by one of the best known and much-loved Soviet amateur chansonniers Alexander Gorodnitsky tell

[495] A.P. Vasiliev, "Sistema Dalnego Obnaruzheniya Yadernyh Vzryvov i Sovetskiy Atomny Proekt" [The system of remote detection of nuclear explosions and the Soviet atomic project] in *Istoriya Sovetskogo Atomnogo Proekta: Documenty, Vospominaniya, Issledovaniya*, ed. V.P. Vizgin (Saint-Peterburg: Izdatelstvo Russkogo Hristianskogo Gumanitarnogo Instituta, 2002), 237-278.

[496] Alexei Yurchak, *Everything Was Forever, Until It Was No More: The Last Soviet Generation* (Princeton and Oxford: Princeton University Press, 2006), 137-141. "Vnye" translates as "outside [socialist system]."

stories about exotic travels, strong persevering people, being homesick on long journeys, love and separation, and enduring values. For most of his metaphors, Gorodnitsky drew on a life-long academic career at the Institute of Oceanology and his own expedition travel around the world on Soviet research vessels.[497] A researcher at IPE, Mikhail B. Gokhberg, is not of the same caliber as a singer-songwriter, but in the early 1970s he brought to the U.S.S.R. an athletic hobby he took up abroad in addition to hang-gliding. Previously unknown in the Soviet Union, wake surfing received a lot of interest from young people. It was somehow spared the fate of golf or baseball deemed by propaganda to be capitalist sporting activities and inaccessible during the Cold War. Vice versa, cultural background could give unexpected assistance in one's professional activities. [498] At the beginning of his career another IPE researcher, Alexander Ponomarev, was involved in a series of geological expeditions to the Nether-Polar Urals. Menial work—digging and hauling—in that area was often done by transient seasonal workers who led a half-legal and rough existence and had little respect for orderly conduct or work ethics. By the end of a long workday, scientists and workers would gather around a fire. To prevent bickering and scuffles almost inevitable among tired bored men with less expedition discipline, Ponomarev found a way to maintain discipline and distract the

[497] On the amateur chansonniers in Soviet poetry and song culture grouped under the term "bards", their escapism, and significance for the intelligentsia see Christian Noack, "Songs from the Wood, Love from the Fields: The Soviet Tourist Song Movement," in *The Socialist Sixties: Crossing Borders in the Second World,* ed. Anne E. Gorsuch and Diane P. Koenker (Bloomington: Indiana University Press, 2013), 167-192; more on Gorodnitsky's life journey, career, and poetry in his memoir Alexander M. Gorodnitsky, *Atlanty Derzhat Nebo: Vospominaniya Starogo Ostrovityanina,* [Atlantes hold the sky: memories of an old islander] (Moscow: Eksmo, 2011).
[498] N. Popov, "Serfing – Akrobatika na Vode," *Tehnika Molodezhi* [Surfing, or water acrobatics], November 1974, 44-48; Natalia Lebina, *Passazhiry Kolbasnogo Poezda: Etudy k Kartine Byta Rossiiskogo Goroda* [Passengers of the sausage train: sketches to the picture of everyday life in a Russian city, 1917-1991], (Moscow: Novoye Literaturnoye Obozrenie, 2019), 21-38.

group in the evening. An avid reader since early years, he told them, with an element of reenactment, segments from favorite childhood adventure books in "to be continued" daily installments. He knew the Russian translation of Rafael Sabatini's *Captain Blood* almost verbatim, which the workers appreciated as entertainment, and knowledge of stories gained the young scientist a degree of authority.[499] It was this odd and rich culture, which "outside of the Soviet state project, <this milieu> would have made no sense and would have failed to thrive," American seismologists and geologists faced when they began traveling to the U.S.S.R. under CFEP. Culture shock was inevitable, but there were ways to mitigate it, perhaps.[500]

Section 3. Seismology projects

Earthquakes and induced seismicity: there's no place like Garm

In *A Fragile Power* Chandra Mukerji asked: "…scientists prepare themselves in so many technical, social, and psychological ways for work at sea, but is there any evidence that it serves the state?"[501] The same can be asked about seismological field and lab work in Area IX, and the answer will be the same as Mukerji's—yes. State powers fulfilled their science diplomacy obligations to the CFEP agreement through this work. They showed Détente benevolence toward each other and came closer to a comprehensive nuclear test ban treaty. The U.S. government learned with the help of scientists that earthquake prediction was not a good investment and redirected research funding to other topics. The U.S. military received more precise techniques for underground explosion

[499] Correspondence and conversations with Alexander Ponomarev and his family.
[500] Yurchak, *Everything Was Forever*, 141.
[501] Mukerji, *A Fragile Power*, 73.

detection and, broadly speaking, data from a global seismic network. The Soviets gained access to American research in seismology. To explore the community of core-level scientists, we will invert and enlarge the question. Is there any evidence that this government-designed initiative served the scientists? What were their interests and motivations for joining the program and did they benefit from it? In addition to science, we will explore the benefits and detriments of exposure to another culture, new social skills, emotional experiences, and expanded knowledge brought to these scientists.

To boldly go… where? The first elementary school teachers often leave an impression in our memory. American scientists who chose to take Russian classes in preparation for Soviet adventures remember their instructors fondly. These women stood out as the first point of contact with Russian culture that made a direct impact. Some took classes at the Tolstoy foundation in Valley Cottage, New York, including a dainty aristocratic woman with the last nameVolkonskaya, seemingly straight out of a Tolstoy novel. Some studied Russian at language schools in New York City. These options were available to young research scientists at what is now known as the Lamont-Doherty Earth Observatory. A good number of American participants came from there. Lamont had contacts with the Russians since the 1960s through multinational oceanographic programs and was actively involved in Area VIII. So did the Scripps Institution of Oceanography, and both Lamont and Scripps had strong seismology departments. It was not unexpected that they were to lend their expertise and people to CFEP's Area IX. The United States Geological Survey (USGS) had an official appointment by the EPA to act as the coordinating authority of Area IX. The USGS geophysicist Rob Wesson, also bound for Tajikistan, and his wife Cornelia took classes from a wonderful older Russian woman in Menlo Park, California

(USGS headquarters). The main destination for these research groups in the Soviet Union would be the Complex Seismological Expedition of the Institute of Physics of the Earth in Garm. [502]

Officially, none of the American participants who joined the program in 1973-1980, were required to have any fluency in Russian. It could come in handy on the practical level if one traveled to the U.S.S.R. for longer periods rather than short visits. For the graduate student Bill Leith and the researcher Peter Molnar it was a lucky coincidence that they had had taken Russian classes as undergraduates. In any event, Peter always felt there were more important things to learn than the language—over the years he picked up enough to get around, ask for food and directions, get a job done, and make himself understood. It is easy to be misled by his indifferent attitude to the language. Between 1973 and 1977, he spent at least three months annually at Garm. For over thirty years Peter has kept his ties with the "Garmites" scattered around the world and has contributed articles and photos to memory projects.[503]

College students in the 1960s and 1970s chose to study Russian language for a variety of reasons: the language was exotic with a Cyrillic alphabet; the Cold War confrontations kept stirring interest to the Russian culture, and Russian literature got special attention; and in the case of earth sciences majors it could offer a chance to read

[502] Records of the Institute of Oceanology of the Academy of Sciences of the U.S.S.R., 1960-1974, 1-1956, ARAN; Russell W. Raitt papers, "Institute of Oceanography of the National Academy of Sciences of the USSR – *Vityaz* visit 1958 December," box 17, folder 23, collection 0035, Special Collections and Archives, University of California San Diego; Robert L. Wesson, interview by author, June 2019.

[503] "Garmites" is not a term I created, it is the anglicized version used alongside the Russian "гармчане", i.e., inhabitants of Garm meaning all those who lived and worked there in Soviet time. The community is alive through a regularly updated website and email exchanges, http://garm.msk.ru/.

Russian geology books and journals in the library. Not everyone on the program was ready language-wise. The Scripps researcher Frank Vernon was recruited so quickly, he did not have the time to take classes. His group found themselves in Kazakhstan without much Russian and needed to rely on interpreters. The Lamont research assistant Michael Hamburger was convinced he was invited to join the Garm project mostly to translate because he had the luckiest combination of skills: he graduated from Wesleyan University with a double B.A. in environmental science and Russian language and literature.[504]

Their Soviet counterparts' experiences with getting ready to communicate with Americans could be more stressful. The seismologist Tatiana Rautian was working with her husband Vitaly Khalturin at the Garm Complex Seismological Expedition in Tajikistan since the beginning of the 1950s. Nothing could really prepare a stranger for a first visit to this field observatory, which its "natives" described like the best of times under the worst conditions. It was a wonderfully pristine seismologists' paradise between the bare snow-capped Pamir and the green Tianshan, where seismic activity is so high that weak earthquakes can be recorded every day. On the other hand, at first there was "no running water, electricity, washing machines, traffic jams, theaters, libraries, or professors—but there were earthquakes!"[505] Moscow was six days of travel away. When, for the first time ever, a group of a hundred Americans was expected at Garm in 1971 on

[504] Michael W. Hamburger, interview by author, September 2018, Frank L. Vernon, interview by author, March 2019.
[505] Elena Kudriavtseva, "Zemletryaseniye Znaet o Sebe Vsyo": Seismolog Tatiana Rautian – o tom pochemu Slozhno Predskazyvat Stihiynye Bedstviya" ["The earthquake knows everything about itself": Seismologist Tatiana Rautian on why it is difficult to predict disasters], November 13, 2017, *Ogonek* 45 (5491), 28.

a field trip with after an IUGG assembly in Moscow, Rautian was told to brush up her English to report to Frank Press. There was nothing to brush up, she never studied English. In the two weeks remaining before the guests' arrival, she combed through a scientific paper using it as a template for speech patterns and terminology.[506]

The selection process for the exchanges was not too complicated. The Canadian David Simpson had finished his PhD in Canberra, Australia, and was just situated in a postdoctoral position at Lamont. His academic supervisor, the anti-nuclear warrior seismologist Lynn Sykes came up to him and asked whether David wanted to do some work in Tajikistan. "Sure," said David, "where is it?" and thus became the project leader. The efficacy and creativity of Area IX were, among other things, in its relaxed hierarchy. Everyone had responsibilities, but no one was the boss. There were obviously reports to be submitted to the Department of the Interior's U.S. Geological Survey, to the NSF that funded the projects, and to the EPA. Finally, these works were sanctioned by U.S. Congress and reports on progress were expected there as well. The reports, however, were not the product of the work. On site, the tasks were concrete: deliver the instruments to a chosen location, install, check, and calibrate, process and discuss recordings, look through archival records, compare, and so forth. Besides the prediction project with the hub in Garm, the Dushanbe seismic station hosted Simpson for the induced seismicity investigations. In fact, in preparation for his first visit the supervising body, the Tajik Seismoresistant Construction and Seismology Institute under the leadership of Sobit

[506] Kudriavtseva, "Zemletryaseniye Znaet o Sebe Vsyo."

Negmatullaev, built a snow-white house at the station for David and his family. He brought with him his wife Paddy and two young sons.[507]

Between 1973 and 1989, Garm, Dushanbe, Talgar (seismic station and research site in Kazakhstan), Toktogul (station in Kirgizia), Borovoye (another seismic station in Kazakhstan near Lake Borovoye and the Semipalatinsk nuclear test site), and the mountains in between became destinations for American and joint teams. In retrospect, participants called it more of a cultural than a scientific experience, others ascribed equal value to research and learning about the Soviet culture on their visits.[508] Many agreed that it was a wonderful, albeit tumultuous time in their life and career: from communicating with scientists, drivers, and even shepherds during field work to parties (with, expectedly, too much vodka), soccer in Garm, and an insane mushroom hunting expedition led by an inebriated local helicopter pilot. For the Soviet scientists, it was an excellent opportunity to work and learn directly from Western colleagues, to discuss approaches, teach them colloquial Russian, and get occasionally frustrated at the Americans' naivete about the ways the Soviet infrastructures worked.[509]

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[507] Anonymous, "Earthquake Prediction," "Progress of the Nurek Seismic Program," *Eos* 57, no. 3 (1976): 122-124; David W. Simpson, "Induced Seismicity Studies in Soviet Central Asia," *Earthquake Information Bulletin* 10, no. 6 (1978): 208-213.
Paddy remembers the children, Tim and Scott, ages five and two-and-a-half, adapting to the new environment and picking up Russian much faster than the adults. Cooking in the kitchen, she could soon hear them fighting over toys: "Давай! Давай!" ("Come on! Give it to me!").
[508] Cornelia V.K. Wesson and Robert L. Wesson, "Odyssey to Tadzhik: An American Family Joins a Soviet Seismological Expedition," *Earthquake Information Bulletin* 7, no. 1 (1975): 8-15.
[509] This is a condensed discussion of a much richer set of cultural and scientific stories. Among the sources are J. *Berger, J.N. Brune, et al., "*A New U.S.-U.S.S.R. Seismological Program," *Eos* 68, no. 8 (1987): 105, 110-111; correspondence with Georgy Popandopulo, September 2018, and Yuri Kopnichev, May 2021. Conversation with Bill Leith, January 2018. Although the entire enterprise sounds solidly absurd, it was, in fact, not. Summer white cap mushrooms in Kazakhstan are so big and conspicuous that spotting them from a low flying helicopter may be easier than walking in the tall grass on the ground. The insane part was piloting a helicopter under the influence, but this is a different discussion.

Garm inspired at least two works of fiction. Better known to English-speaking readers would be Tom Clancy's spy thriller *The Cardinal of the Kremlin* (1988). The story revolved around secret national defense systems at the time of the American Star Wars initiative. Clancy imagined a Soviet response to it. A clandestine site on a hill in the "westernmost extension of the Himalayan Range" near Dushanbe hosted "engineers and academicians, people with enough skills that the State wanted to look after them." They all lived in a building, "the view from which must have been fantastic, though it was a prototypical Russian apartment building, as stylish and attractive as a cinderblock" and serviced an anti-ballistic missile system hidden in the Tajik mountains. "Food was trucked up the new mountain road—or, in bad weather, flown in. Another of the buildings was a theater. A third was a hospital. Television programming came via satellite earth-station next to a building that contained a few shops."[510]

Not a military installation but a research complex, the real Garm was a far cry from Clancy's espionage fantasy. A short novel was published in the U.S.S.R. in 1986, penned by a journalist who witnessed life in Garm and knew its campus and team personally. The descriptions of the locale in the book are numerous and colorful—dirt roads, small white houses, occasional food and water shortages, delayed flights in and out, and above all an eventful life of a collection of complex characters. In addition, the narrative strikes one as almost uncomfortably candid. A knowledgeable reader can easily identify the real people behind thinly veiled characters, and the author's judgements of their personalities were not always flattering. However, even with the embellishments and subjectivity that poetic

[510] Tom Clancy, *The Cardinal of the Kremlin* (New York: Berkley, 2013), 43-44. There is, of course, a disclaimer at the beginning of the book that "any resemblance to actual … locales is entirely coincidental."

license grants, Garm and Garmites come alive in the book rendering the simplicity of dwelling and the complexity of residents' and visitors' intellectual and emotional life.[511]

Earthquake prediction has now become an unwelcome research topic in American geophysics. In the 1970s it was prioritized in funding, and for scientists, as Peter Molnar formulated, it was an intellectually stimulating problem.[512] Indeed it was, and several approaches were created and tested to find reliable precursors to detect imminent earthquakes and issue warnings. As failures at accurate predictions by research groups around the world accumulated, far outweighing their successes, hopes faded. Seismologists in the U.S. shifted gears to focus on understanding the mechanics and the physics of quakes rather than predicting them. As USGS's Susan Hough points out in a history of earthquake prediction, currently this remains a futile exercise is for amateurs and quacks—earthquakes cannot be scientifically predicted. In the case of Area IX, she writes, two visits to Garm (Peter Molnar in 1973 and Rob Wesson in 1974) revealed that in their famed claim at an efficient prediction method the Soviets "had not been consciously dishonest in their interpretations. They had, however, set up the rules of the game such that it was all too easy to fool themselves."[513]

[511] Alexander Gangnus, *Polygon* [Test site] (Moscow: Sovetsky Pisatel, 1986).
[512] Peter Molnar, interview by author, August 2018.
[513] Susan Hough, *Predicting the Unpredictable*: *The Tumultuous Science of Earthquake Prediction* (Princeton: Princeton University Press, 2010), 68.

The atmosphere around earthquake prediction has often been tense, and opinions differed tremendously in the scientific community even in the 1970s when it was popular.[514] It may have been Area IX's timing that its heyday coincided with a period of scientists' enthusiasm about prediction. The work on it continued up to the end of the 1980s.[515]

At the onset the 1990s, the story took a turn for the tragic. The Garm seismological observatory was obliterated in the Tajik civil war. The staff fled, and the forty years of good relations with the local people were severed. Even in the 1980s there were rumors of a coming conflict and resentment toward the Soviet regime. An anecdotal story circulated among seismologists: A Tajik worker who had been with the Garm expedition for a long time came up to seismologist Vitaly Khalturin. He had an admiration and a deep respect for Khalturin, so he said: "You are a wonderful man. When the massacre begins, we'll kill you painlessly." Everyone took it for a joke, but the reality of it set in too quickly.[516] After receiving an alarming fax from Rautian in early January 1992,

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[514] As discussed in Hough, *Predicting the Unpredictable,* 166-167, and Helene Joffe, Tiziana Rossetto, Caroline Bradley, and Cliodhna O'Connor, "Stigma in Science: The Case of Earthquake Prediction," *Disasters* 42, no. 1 (2018): 81−100. In his Henry Fielding Reid medal acceptance speech in 1976, the pioneer of seismology Charles Richter famously compared earthquake prediction to the obsession with a cancer cure, meaning both were futile and a waste of time unless done with full scientific rigor and an understanding of the complexity of the task. Excerpts from the speech were transformed into snappy quotes attributed to Richter, i.e., "earthquake prediction is for fools, charlatans, and liars." Interestingly, the 2010 recipient of the Reid medal, the highest award of the Seismological Society of America, was Tatiana Rautian ("Henry Fielding Reid Citation for Tatyana Glebovna Rautian," *Seismological Research Letters* 82, no. 5 (2011): 700-702. On the SSA website she is described as "often called "The Charles Richter of the former Soviet Union" and "generator of ideas" (https://www.seismosoc.org/award-recipient/tatyana-g-rautian/).

[515] "Memorandum, Area IX. Earthquake prediction," David Simpson's home archive.

[516] Relayed based on Viktor N. Fridman, *Moya Divergentsyia* (Moscow: ArsisBooks, 2019), 149 [My divergence]. I also heard this grim story from informal oral sources. Khalturin knew the local culture and traditions, spoke Tajik, and loved the mountains.

American colleagues quickly mobilized resources for a Garm rescue campaign. It was not only the Tajik facility that needed help to survive. By 1992, there were several other joint projects, the most active being the expansion of the Global Seismic Network and between American and Russian geoscientists that involved data collection centers in what was now the former Soviet Union. The effort to preserve data from the Borovoye and Talgar stations in Kazakhstan was more successful, but the archive of seismograms at Garm perished with the campus. The Garm rescue mission pivoted toward inviting Khalturin and Rautian to come to the U.S. They came to Lamont in 1993 and worked in the U.S. until Khalturin's death in 2005.[517]

Engineering seismology

On the previously mentioned "too much vodka" issue, over his annual visits in 1975-1980 Chris Rojahn learned to enjoy the people and the food in Tajikistan and theater performances on stopovers in Moscow. He also mastered great aptitude at throwing a shot of vodka over his shoulder when no one was looking at a party in Dushanbe. Parties were held between trips with the engineer Peter Mork, either by a four-wheel drive vehicle or a Yak-40 Soviet plane to sites in Tajikistan to install seismic instruments. Even with the blatant bravado tone of the article praising Chris's second visit to Tajikistan and other Area IX progress in the popular magazine *Soviet Life,* the candid photographs showed people at work. Seven out of eight images are scenes of conversations, formal

[517] Fax from Rautian (IPE) to Simpson (Lamont), January 2, 1992, IRIS Memorandum, Simpson to friend of Garm, January 7, 1992, and subsequent correspondence between twenty-three American geoscientists and Russian and Tajik institutions (Russian Academy of Sciences, IPE, Tajik Institute of Seismoresistant Construction and Seismology, Tajik Academy of Sciences), January-December 1992, Simpson home archive.

and informal, between American and Soviet participants.[518] As for the formal accomplishments of the project, they were succinctly described at a Congressional hearing: "Dr. C. Rojahn and P. Mork of the US Geological Survey, working with Dr. S. Negmatullayev and others of the ISSCS, installed a network of 18 strong motion accelerographs in various parts of the Tadzhik SSR. These instruments will provide material of significance to both US and Soviet structural engineers and engineering seismologists of ground motions during strong earthquakes. Plans were also completed for experimental work on the seismic resistance of typical California and Tadzhik dwellings to be carried out jointly in California and Tadzhikistan."[519]

[518] Christopher Rojahn, interview by author, November 2019; Lyudmila Yenyutina, "Hand in Hand to Curb Earthquakes," April 1976, *Soviet Life*, 56-59.
[519] U.S.-U.S.S.R. Cooperative Agreements in Science and Technology: Hearings before the Subcommittee on Domestic and International Scientific Planning and Analysis of the Committee on Science and Technology, U.S. House of Representatives, Ninety-fourth Congress, first session, November 18, 19, 20 (Washington. D.C.: U.S. Government Printing Office, 1975), 177.

Figure 6. Article in *Soviet Life*, 1976.

HAND IN HAND TO OUR EARTHQUAKES

Soviet and American research on earthquakes holds out the promise that we may be able not only to predict but to defuse that most destructive of natural forces.

By Lyudmila Yenyutina
Photographs by Georgi Zelma

EARTHQUAKES are among the natural disasters that threaten huge segments of the world's population. Without warning they can wipe out whole cities. Is it possible to tame these monsters?

Hundreds of geophysicists and geologists believe it is. They are on the threshold of discoveries that will enable us to predict the moment, the place and even the magnitude of earthquakes. Some of the studies are part of the USA-USSR Agreement on Cooperation in the Field of Environmental Protection. In the opinion of such authorities as Guyford Stever, Director of the National Science Foundation and President Ford's Science Adviser, this is one of the most successful areas of cooperation between the scientists of the two countries.

In Central Asia joint Soviet-American studies have been conducted for two years on the Garm-

At the Laur experimental field Soviet and American researchers see how a building is affected by artificial earthquakes. Climbing the ladder are Peter Mork and Christopher Rojahn. Below: At the Dushanbe Institute, analyzing seismic recordings from the Nurek Hydroelectric Power Station. From Left: Kamil Mirzoyev, assistant director of the institute, Theodor Koszynski and David Simpson of Columbia University's Lamont Laboratory.

Scattered through Soviet Central Asia are 250 high-precision automatic magnetometers linked with seismic stations. Theodor Koszynski (right) and Anatoli Prokhorov check the automatic devices near the Langar station. Above center: Seismic forecasts are based on magnetic data, sharp fluctuations in the Earth's magnetic field. At the Dushanbe Institute: Sabit Nigmatullayev with Peter Mork and Christopher Rojahn. Left: Brian Tucker and Valeri Kunakov at the Chusal seismic station.

Dushanbe proving ground, in the mountains of Tajikistan. The Complex Seismological Expedition was organized by the Institute of Physics of the Earth and is headed by Igor Nersesov, the institute's deputy director.

"Earthquake studies have a long history in our country," Igor Nersesov said. "Soviet scientists have proposed a great many interesting ideas, theories and hypotheses. Now that we are collaborating with U.S. specialists, we can check our hypotheses, using a large number of observation points.

"Our American colleagues came to the Garm proving ground for the first time in 1974. This was, so to speak, the first trial of strength, and by 1975 our joint investigations were well under way.

"From the very beginning we had good businesslike relations. We reached quick and constructive agreement on plans for joint research and the main lines of investigation and worked out the programs for studying seismological data on computers.

"Most of the Americans with whom we are cooperating both in Moscow and on our proving grounds in Tajikistan are young. However, we already knew many of them from papers they had published. They are well trained and very knowledgeable.

"It is a pleasure to work with such people as David Simpson from the Lamont Laboratory of Columbia University in New York; Christopher Rojahn from the U.S. Geological Survey, a very sociable and energetic man, and Robert Wesson, from the same organization, who impressed us all with the breadth of his scientific interests.

"Peter Molnar of the Massachusetts Institute of Technology has been doing very fine work in our country. He wrote a joint paper with Tatyana Rautian and Vitali Khalturin, senior research associates of our institute working on the Garm proving ground, that is presently being prepared for publication. It deals with the physics of the seismic focus. These scientists have elucidated the signs preceding a strong earthquake.

"I remember with pleasure my work with Brian Tucker of the University of California at San Diego. He is a good mixer, interested in literature and art. We had some very fine talks. It's rare for anyone as versatile as Dr. Tucker, with so many interests and hobbies, to be so expert in his own specialty.

Americans have a reputation for being businesslike and punctual. Did your expedition find that to be true?

"These qualities are a must in our work," Nersesov replied. "The collection of seismological data is a continuous and painstaking job. We have to make observations on all kinds of days, including holidays, on days when it is raining and on days when it is scorching hot. We all did our share. I would like to make another point: Joint research on the Garm proving ground and our everyday contact on the job and after helped us understand each other better. I think this human aspect of our cooperation is very important."

How close are we today to predicting earthquakes accurately?

"Soviet scientists have been able to forecast a number of earthquakes in the area of Tashkent, the capital of Uzbekistan, on Kamchatka and in Tajikistan," Nersesov told me. "The problem, however, is very complicated and delicate. More than scientific competence is involved. We must be certain that our forecasts are absolutely exact, completely reliable, repeatedly confirmed in practice. The danger of panic is always present.

"We are working on a universal scale of seismic danger and on principles for spotting earthquake-prone areas. A map of the Soviet Union's seismic zones is now being compiled.

"Our colleagues from Dushanbe, the capital of Tajikistan, are working on designs for quake-proof buildings. Incidentally, Americans Christopher Rojahn and Peter Mork have worked at this institute.

"Comprehensive studies of earthquakes enable us to chart seismic danger, not only for an entire geographical zone but also for an individual construction site. It goes without saying that this is very important for the national economy.

"As for combating seismic danger, interesting proposals have been made by American scientists. It is possible, for instance, to drill wells in the focal area of a future earthquake and pump in water under a pressure of 1,000 atmospheres, thereby forcing a weak seismic tremor. This is a way of defusing a really dangerous tremor. We shall tackle this problem, but later. The present goal is to predict the time, place and strength of an earthquake. Cooperation between Soviet and American scientists should provide interesting results in the near future."

Robert Wesson has probably spent more time on our proving grounds than any other American. What are his impressions?

When they returned to the United States in the autumn of 1974, he and his wife Cornelia published an article, "Odyssey to Tadzhik," in the journal *Earthquake Information Bulletin*. This is how they described their arrival in Garm:

As we nervously prepared our words of greeting in Russian, Igor Leonovich Nersesov, Chief of the Complex Seismological Expedition, stepped up and warmly greeted us in both English and Russian. Tall, handsome Boris Volin, the base administrator, reached up his tattooed arms for our 21/2-year-old son, Alex, thus beginning a warm friendship between them.

With great surprise and delight we found a commodious five-room house, including a well-equipped kitchen and bathroom. I breathed a sigh of relief. This was not to be the Spartan field experience I had imagined.

In the same article the Wessons recalled their visit to the mountainous Tajik settlement of Khait:

of Khait. . . . It was the end of summer. . . . The men were off working, but many women were at home taking care of children. Everyone we met invited us in for tea. After accepting the invitation of a young woman and her sister-in-law, we settled ourselves on striped cushions on the floor, and the women brought green tea and cucumbers and placed them in the center of the floor. I spoke no Tajik, they spoke no English. . . . In spite of the language barrier we were able to express our pleasure and delight in being together.

Dr. Wesson told me: "When I first heard that there would be joint work with the Institute of Physics of the Earth, I was very much interested and excited about the possibility of coming to your country and finding out about life in the Soviet Union. Of course, many of the names of the people I met since coming to the Soviet Union I knew before. I had read about the work of Sadovsky and Nersesov. And I was interested in finding out what Soviet seismologists have been doing in the way of earthquake prediction. And, finally, what scientist doesn't dream of finding himself in the kind of special situation you have in an expedition like the one in Garm? I thought it would be an exciting and thrilling adventure. It turned out to be very much the way I anticipated it.

"During these two years I have been impressed by the work of the Soviet scientists. I found them very interesting people to get to know. I think we have reached the point where we understand each other well enough to work together in a fairly complicated situation."

Dr. Tucker also took part in the expedition to Garm. I talked to him on the eve of his departure from this country.

"When I came to your country six months ago, everything seemed different, not at all like home," he told me. "I felt lonely and homesick. You would think that after six months the feeling of strangeness would increase and you would long to go home, but for me it has been the opposite. Now I feel very, very comfortable, extremely happy. I am completely at ease. It's a personal thing that has changed. And it was revolutionary on a personal level. These six months helped me to understand things much better.

"What discoveries did you make while you were here?

"One thing I discovered," Dr. Tucker said, "is that Russians in general know much more about and have a greater interest in the United States than Americans have about Russian life. The Soviet people I've met seemed more intellectually alive and questioning than typical Americans. There was a tremendous change in my opinion of Russians. People I met were extremely well read, extremely interested in other philosophies and ideologies and politics.

"There is another thing that I liked—my Soviet friends are very relaxed about their future. They are sure there is not going to be a depression; they are sure of having a job and, when they are old, a pension."

You said "friends." Do you really have many Soviet friends?

"I truly feel that some of my best friends are now in Garm," Dr. Tucker replied. "I honestly did not expect to find such close friendship in so short a period of time. And they are really very close friends. It was just great, it was rich and deep. I met some people from whom I learned quite a lot and whom I respect very much as scientists. I didn't actually work with some of the others, but we had developed such a close relationship that we cried when I left."

What do you think about everyday life in Garm?

"I found people in Garm much more social. They seemed to be very relaxed, not dependent on TV. Maybe it's the tempo of Middle Asia. I noticed that in Moscow things are very fast and different. People in Garm know how to appreciate spontaneous things. Every man I know could sing and probably play a guitar, recite verses. I found that many more people know poetry than in America. We rely on TV very much and just don't train ourselves to know these things.

"There in Garm we would stay till dawn, dancing, singing, talking, reciting poems. I enjoyed the poems by Pushkin and Yesenin. My friends would write them down for me, and I tried hard to learn them. It was great and inspiring."

And what did it give you as a scientist?

"It was extremely fruitful and useful," Dr. Tucker told me. "In my opinion, we American scientists are getting quite a lot from this cooperation, maybe even more than our Soviet colleagues. But forgetting the scientific side, on a personal level it was very beneficial and memorable for me to come to Garm. I'll never forget it."

Brian Tucker of the University of California, Chusal station chief Victor Filippov and engineer Victor Kunakov arguing a point. Research observations have demonstrated the connection between magnetic variations and movements of the Earth's crust.

Base administrator Boris Volin (in apron) gives his American colleagues a sample of combined Russian and Tajik hospitality. Below: Soviet-American soccer game.

Geophysicist Robert Wesson of the U.S. Geological Survey explains some of his findings to Soviet participants in the Complex Seismological Expedition.

Laboratory and theoretical investigation of physics of the earthquake source

Hartmut Spetzler and his wife, who joined him on a trip to the Soviet town of Troitsk near Moscow, were slightly disappointed. The hospitality and mutual support among Soviet colleagues were tremendous like in Germany after the war, but the approach to work discipline was peculiar. In 1974, at a conference on high pressure physics in Kyoto Hartmut met the Soviet academician Leonid F. Vereshchagin, who was running the High-Pressure Physics Institute in Troitsk. They discussed a possibility of conducting a joint experiment on the famous fifty-thousand-ton press, colloquially known as the Big Press, that the institute owned. Several months later, a group of Soviets came to visit the University of Colorado in Boulder where Spetzler worked. Among them was a researcher from IPE Gennady Sobolev, who invited Spetzler to join a different project, the laboratory experiments section of Area IX. It all came together in 1976 when Hartmut came to the Soviet Union, and he and Sobolev began their project. The idea was to reconstruct the conditions of stress that rock media undergo before an earthquake occurs to create mechanisms for more accurate predictions. Predictions could made based on precursors (physical phenomena that precede earthquakes), but observations showed inconsistencies in their behavior. Building a model of an earthquake source from rocks, reconstructing the geological structure of the source, connecting hundreds of sensors to the model, and simulating the stress in the Big Press could tell the team what happens in the source before and during an earthquake. The advantage of the Big Press was that being the largest press of this kind in the world, it could crush two-by-one-meter samples. This would give a more accurate picture than the typical size of samples of three to four

centimeters.[520] The only trouble was that employees of a laboratory at an academic institute would come to work late, have several breaks, and leave at three in the afternoon, giving the team had limited access to the press.[521]

For better or worse, the Russians had no respect for work discipline in both directions. When the experiment got off the ground, and the work became interesting, they would work non-stop and would not stop until eleven at night. Spetzler was not the only Area IX participant who noticed the lack of discipline. There were other differences in the ways the Soviets thought, worked, and saw the world. Some complained and others appreciated how good the Soviets were at theory and mathematics. Enthusiastic analysts, they paid less heed to developing technical apparatus for processing and could get carried away with an idea, but the ideas were grounded in observations.[522] Their ways of working on joint papers could be peculiar. After the experiments Sobolev invited Spetzler to come to Russia to analyze data and write a paper together. For a writing retreat he chose a

[520] Hartmut A. Spetzler, interview by author, August 2018; G.A. Sobolev and A.A. Semerchan, "Zemletryaseniye v Laboratorii" [An earthquake in the laboratory], *Nauka v SSSR* 4 (1984): 55-57, 66.

[521] The Big Press was used by several experimental teams in turns. "Machine time" was distributed between them with time slots allocated to each team. If one came in late, only remaining time until the next team's slot was available. Missing a scheduled slot meant losing a day of experimental work.

[522] Hamburger, interview: "…one of the strengths of the Soviet approach was keeping things constant for very long periods of time. They would develop a network of seismographs and run the same instruments the same way decade after decade. Americans are the opposite, always jumping onto the next new technology. There was much less continuity in the American observational system, so when we worked in Garm, for example, we had the advantage of some high-precision American seismic instruments, but also forty years of history of the Soviet recording history."

village house in a town north of Moscow, where they slept in a barn and worked in the "icon corner" of the house.[523]

Figure 7. Photograph of Spetzler in the village house, 1976.

Numerical modeling of earthquake faulting

In 1976, an Indian-born MIT graduate student Shamita Das was the first woman to receive a PhD in geophysics there. Her thesis "A numerical study of rupture propagation and earthquake source mechanism" drew, in part, on papers by the Soviet author Boris Kostrov published in the *Journal of Applied Mathematics and Mechanics* between 1964

[523] This must have been one of the dozen papers Sobolev and Spetzler coauthored, e.g., Hartmut A. Spetzler, Gennady A. Sobolev, Carl H. Sondergeld, et al., "Surface deformation, crack formation, and acoustic velocity changes in pyrophyllite under polyaxial loading," *Journal of Geophysical Research: Solid Earth* 86, no. B2 (1981): 1070-1080; Guennadi Sobolev, Ivan C. Getting, and Hartmut Spetzler, "Laboratory study of the strain field and acoustic emissions during the failure of a barrier," *Journal of Geophysical Research: Solid Earth* 92, no. B9 (1987): 9311-9318.

and 1966.[524] Kostrov's findings could be further developed with more access to digital technology, which Das used in her work. This was the first in a chain of events that led to Das's decade-long work in Area IX on seismic wave propagation and earthquake source modeling.

A job at Gulf Oil Corporation in Pittsburg convinced Das that industry research was of little interest to her. On a recommendation of her professor, with whom she had already published a paper, the U.S.G.S. geologist John Filson, Das decided to return to academic geophysics and applied for a fellowship at the Lamont Doherty Earth Observatory. In August of 1977, coming back to the U.S. from a trip to India to visit her parents Das made a detour to Durham, UK, to attend an assembly of the International Association of Seismology and Physics of the Earth Interior (IASPEI) held every four years at locations around the globe. At the conference she met Kostrov who, as it turned out, had read her thesis. He told her that she should come and work with him in Moscow, especially given that there was a bilateral agreement between the U.S. and the Soviet Union that sanctioned exactly this kind of work.

Back at Lamont Das took some time to think. Another coincidence prompted her to accept the plan: Kostrov's colleague Lev Vinnik who worked at the same Institute of Physics of the Earth in Moscow had visited Lamont a few months later. Das gave him a letter for Kostrov, in which she communicated her consent to join the numerical modeling group of Area IX. After realizing that she did not even know the letters of the Russian alphabet, Das signed up for a course of Russian. She also applied for an NSF

[524] Shamita Das, in discussion with author, June 2021; B.V. Kostrov, "Selfsimilar Problems of Propagation of Shear Cracks," *Journal of Applied Mathematics and Mechanics* 28, no. 5 (1964): 1077-1087 and other papers.

grant for her trip, and the application was approved. All that was left to do was to get a visa and a plane ticket.

Das's smooth preparation for the Moscow project in 1979 met just one challenge. The end of Détente under the pretext of the Soviet invasion of Afghanistan threatened to topple the diplomatic relationships between the countries, let alone scientific collaboration. Das remembers that when visits by scientists with higher visibility were halted, program organizers turned to the "lowest-level people", early- and mid-career geophysicists who had not yet made a name for themselves in the hierarchy. As we saw in the previous chapter, WG VIII organizers found a way to sneak their people into the Soviet Union even during the Moscow Olympics. Das fit the bill—a research scientist at Lamont was a notch above a graduate student. She had NSF funding. However, when visa rules tightened, authorizations were to be approved by the top executives. Das received her visa clearance addressed to her personally in a telex signed by the U.S. Secretary of State George P. Shultz.

Between 1980 and 1990 Das made fourteen trips to the U.S.S.R. She learned to speak Russian fluently. Her command of Russian became, in fact, so good that she had no trouble having long chats with Kostrov over the phone. Who was this Boris Kostrov for work with whom a promising (and soon prominent) U.S. researcher was willing to leave Lamont and her life for up to four months a year for a decade?

Everyone who talks about Boris Viktorovich Kostrov (1933-1998) opens with a statement of his brilliance despite hardships life dealt him. Kostrov was the son of a

physics professor in Tomsk, who was executed during Stalin's purges in 1937.[525] After the father's death, the mother took two small children to Crimea where she had grown up. They survived the WWII Nazi occupation of the region. After finishing grade school, Kostrov applied to the physics departments at the Moscow and Kiev universities but was rejected as the son of an "enemy of the people". He was finally accepted to the undergraduate program in physics at the local teachers' institute with the help of his father's friend. After graduating and serving in the army, he was hired as a lab assistant at the Yalta geophysical station of the Institute of Physics of the Earth (IPE), whose headquarters were in Moscow. In two years, he rose in rank to lead the station. According to oral sources, two prominent geophysicists, Frank Press (U.S.) and Evgeny Savarensky (U.S.S.R.), impressed with Kostrov's talent while visiting the station, convinced him to pursue a graduate degree at IPE in Moscow.[526] From then on, his professional life as a theoretical seismologist was tied to IPE.[527] His early works published in Soviet academic periodicals and translated into English in the 1960s made an important contribution to understanding rupture mechanics in the earthquake source.[528] Once at a seminar the Soviet mathematician Gennady Cherepanov challenged the "painfully ambitious and passionate" Kostrov to solving an problem in the dynamic theory of elasticity. It took

[525] Shamita Das recalls Kostrov's family history as follows. Besides teaching at the Tomsk University, his father worked at a laboratory on developing new weapons. A gun test went wrong, and after the incident a picture of Stalin that would typically hang on a wall at every facility was found in the debris with bullet holes in it from gunshots. This was taken for an intentional act of treason, and Kostrov's father was arrested, tried, and executed. Das, in discussion with author.
[526] I cannot confirm this information yet. In an oral history interview, however, Press mentioned a professional visit to research facilities in Crimea a few years after the IGY (Press, interview by Doel).
[527] G.S. Kushnir and V.I. Osaulenko, "Vklad Borisa Viktorovicha Kostrova v Seismologiyu: K 75-letiyu so Dnya Rozhdeniya" [Contribution of Boris Viktorovich Kostrov to seismology: on the 75th anniversary of his birth], *Istoriya Nauk o Zemle* 1, no. 3 (2008): 37-50.
[528] According to SemanticScholar, Kostrov's h-index is seventeen, which is high for an author of fifty-nine publications.

four years of thinking, but Kostrov found an "absolutely brilliant solution that left far behind all Western authorities even including the greatest authority in the field, the American Fruend."[529]

A quiet workaholic, Kostrov had a charisma and a sense of humor that contributed to the climate of creativity in his department. A gathering there would often begin with his coffee-making ritual (he was known to make the best Turkish coffee at the institute) comparable with a tea ceremony.[530] One may argue that everyday routines, meals, shopping—what the Russian language describes with the succinct term "*быт*"—have little to do with scientific work. If can, however, contribute to accepting or rejecting new people, places, concepts, and in the end to mutual understanding.

Those who partook of tea breaks at Soviet academic institutions, each with their own traditions, know what it meant. To this day, in one of the IPE labs there is never a teabag in a bring-your-own mug at teatime. Brought together by expeditions to Central Asia and the Caucasus, researchers in this lab adopted some of the regional ways of tea drinking fused with hospitality traditions of their own. There is an element of rituality to it. Tea is brewed in a pot and drunk from bowls while time stands still for an hour, a reminder for the core group of their past travels and an exotic and warming experience for visitors.[531] Kostrov's coffee magic was of the same kind.

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[529] This story and the quote from Gennady Cherepanov's memoir are translated from Fridman, *Moya Divergentsyia*, 143-145, where "Freund" is Lambert Ben Freund, an expert in engineering mechanics applied to a variety fields including seismology.
[530] Communication with David Simpson, June 2021.
[531] This comes from the author's own experiences as an undergraduate student in the 1990s, as an IPE employee and visitor at other Academy of Sciences institutions in Russia in the 1990s-2010s.

Earthquake mechanics and modeling became the focus of Kostrov's joint work with Das. To her, an invaluable advantage of working with him was, as she described, the pleasure of learning, creating knowledge.[532] The atmosphere of intellectual stimulation, concentration on problem solving, and friendly challenges in Kostrov's group (he was leading the wave field department, one of four IPE's focus areas) was a thought generator. While the Soviets could not access the same technology as Westerners, they channeled their intellectual energy into theoretical and mathematical thinking. A computer could be useful for the project nonetheless, Das thought. Kostrov was a gifted programmer as well as a theorist. If they had a strong machine with free access, they could input the new information each time they worked together and run models. Then Das could simply take current results back to Lamont and continue to work there until the next visit without the disruption of incompatibility issues or having to re-enter anything.

Das's trips were funded by the NSF (1979-1987) and later the U.S.G.S. (1986-1988), the budget included equipment, and there was nothing to stop this purchase except, once again, politics.[533] With the U.S. embargo on technology transfer to the Soviet Union, Das held little hope for this transaction but filed the purchase forms for a Japanese computer. Much to her surprise, one day in Moscow she received a notification that the machine was ready for pick-up at the airport. She had long given up on it, especially after a group of scandalized congressmen made a public scene on the steps of the Capitol. Protesting

[532] Das, in discussion with author.
[533] Shamita Das's CV at the Oxford University's Department of Earth Sciences, http://www.earth.ox.ac.uk/~das/cv_2018.pdf.

Japan's release of soft- and hardware to the Soviet Union, they smashed a Japanese-manufactured radio with a sledgehammer in front of rolling cameras.[534]

The miraculous arrival of a Japanese computer was never contested. The machine was installed at IPE and used for the project and other research purposes. A decade of joint work resulted in the publication of fourteen coauthored articles and a monograph.[535] James H. Dieterich, a distinguished U.S.G.S. seismologist who supervised some of the CFEP activities, an authority on earthquake prediction, and later a member of the NAS, told Das once that her project was the best that came out of WG IX. While this may have been a compliment, it was also a word of appreciation.[536]

Statistical and theoretical modeling for earthquake prediction

Throughout this dissertation, the terms "mid-level" and "core-level" scientists or practitioners are used to denote early- and mid-career professionals. This is not so much a vertical hierarchical division as it is a delineation of prioritized types of scientific work (creation of scientific data and knowledge versus administration and political actions) plus the degree of involvement in Area IX activities. By no means does it say anything about levels of professional expertise—these were professionals at different stages of career but highly competent in their fields. The distinction is between the upper-level science administrators such as the Soviet academicians Mikhail A. Sadovsky (IPE director) and Evgeny P. Velikhov (vice-president of the Soviet Academy) and the

[534] Michael Schaller, *Altered States: The United States and Japan since the Occupation* (New York and Oxford: Oxford University Press, 1997), 254.
[535] Boris Kostrov and Shamita Das, *Principles of Earthquake Source Mechanics* (Cambridge and New York: Cambridge University Press, 1988). The book has been continuously cited in other scientific publications to this day.
[536] Das, in discussion with author.

American Frank Press (National Academy president and science advisor to U.S. presidents) and the core-level Bill Leith, Tatiana Rautian, or Rob Wesson. The former group includes mostly people who held top positions in science administration, had a degree of political clout, and were actively involved in the diplomacy of facilitating joint projects at governmental and academic management levels.[537] The latter group contributed primarily scientific work to Area IX. Their names are mentioned in historical narratives, but their histories have not been explored with regard to their roles in collaborative projects.

One may wonder whether the line between the groups gets blurred in the statistical modeling project. Its two official co-directors were at the same time the only people on the workforce. Vladimir I. Keilis-Borok (1921-2013) and Leon Knopoff (1925-2011) had known each other personally since the IUGG assembly in Toronto in 1957. As Knopoff put it, "there was sort of an instant affection for one another. I think we were thinking parallel science and we had very strong background that was similar."[538] As with other Area IX projects, recruitment was fast and simple: "At the 1971 IUGG I think it was, Frank and I were taken aside by one of the Soviet scientists — I have forgotten who, maybe Keilis-Borok, maybe somebody else — and he said, "Would you like to go on a

[537] Their contributions to arms control and involvement in promoting scientific expertise as a track-two diplomatic tool has been discussed in historians' works, for example, Evangelista, *Unarmed Forces*, and Kai-Henrik Barth, "Detecting the Cold War: Seismology and Nuclear Weapons Testing, 1945-1970" (PhD diss., University of Minnesota, 2000).
[538] M.A. Sadovsky to S.G. Korneev, January 27, 1975, folder "Programma sovmestnyh rabot i perepiska s nauchnymi uchrezhdeniyami i uchenymi kapitalisticheskih i razvivayushchihsya stran o seismologicheskih, gravimetricheskih i planetarnyh issledovaniyah, ohrane okruzhyushchey sredy, prognoze zemletrayseniy," 448-1-1564, ARAN; V.F. Pisarenko to A.V. Sidorenko and A.A. Kulakov, July 13, 1978, folder "Programmy, otchety, spravki o poseshchenii instituta, perepiska o vozmozhnosti ih priema, zapisi besed (po kap. stranam)," 688-1-1564, ARAN; Leon Knopoff, interview by Ronald Doel, April 27, 1990, AIP, www.aip.org/history-programs/niels-bohr-library/oral-histories/31364.

field trip to Garm in Tajikistan? And you'll see wonderful scenery."[539] It made perfect sense for two old friends to embark on a project together if they had already been working on similar issues in computational geophysics together and separately. Besides, they had so much in common, from parallel careers to interest in mountaineering and Jewish heritage. Keilis-Borok once helped Knopoff reconnect with a long-lost family member in Leningrad. He traveled from Moscow to Leningrad, knocked on the door of an apartment, whose address Knopoff copied from a letter his uncle had written to Knopoff's father, and found out the uncle's new address.[540]

In 1964, Keilis-Borok (with support of his friends Press and Knopoff) founded an international working group on geophysical theory and computers to bring together geophysicists and mathematicians in an interdisciplinary search for theoretical approaches to solving geophysical problems. This group has since evolved into the IUGG Commission on Mathematical Geophysics, whose biannual meetings have been held in Europe, America, and Asia over the years, with the latest in the Russian city of Nizhny Novgorod in 2018.[541]

Charismatic, fiercely intellectual, and shrewd, Keilis-Borok would have been a brilliant academic administrator if he were not so engrossed in his scientific ideas, especially prediction. His methods, on which he continued to work with colleagues at the University of California in Los Angeles after he moved to the U.S., are among the closest seismologists have come so far to accurate long-term prediction. The statistical modeling

[539] Knopoff, interview by Doel.
[540] Knopoff, interview by Doel.
[541] Commission on Mathematical Geophysics website, http://www.cmg2020.org/index.php/about-cmg/.

project was an application of Knopoff's and Keilis-Borok's interests at the time: "studies in Moscow and California of the application of pattern recognition techniques to earthquake prediction; use of seismicity patterns (foreshocks, aftershocks, earthquake swarms) in earthquake prediction; development of algorithms for prediction and risk estimates."[542] David Simpson remembers his impression of these two friends collaborating: "I spent a fascinating flight from Moscow to Dushanbe in an old Ilyushin airplane, sitting in the middle seat between Knopoff and Keilis-Borok. They were editing a lengthy manuscript for one of their publications. For the entire flight, the document kept flying back and forth between them, along with a constant stream of intense arguments and dissection of details. By the time we landed, there was red ink everywhere on the document, and little seemed to remain of the original text."[543] This is perhaps another example of Area IX participants finding a common language. Knopoff's parents were immigrants from the crumbling Russian empire, but his childhood language before English was Yiddish, not Russian. Keilis-Borok never hesitated to speak English, which, as a friend of his discretely defined in a collection of tributes to his memory as "an accent that took getting used to."[544]

Stories of long-term professional ties between research groups and life-long personal connections between American and Soviet scientists like Knopoff and Keilis-Borok

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[542] Hough, *Predicting the Unpredictable*; Henry Spall and David W. Simpson, ed., *The Soviet-American Exchange in Earthquake Prediction*, (U.S. Geological Survey, Open-File Report 81-1150, 1981), vi.
[543] Correspondence with David Simpson, July 2021. The manuscript must have been one of their joint papers, this one being one of the seminal: I.M. Gelfand, Sh.A. Guberman, V.I. Keilis-Borok, L. Knopoff, F. Press, et al., "Pattern Recognition Applied to Earthquake Epicenters in California," *Physics of the Earth and Planetary Interiors* 11 (1976): 227-283.
[544] "From recollections by Linda Pauling Kamb," in Anna Kashina, ed. Vladimir Keilis-Borok: A Biography (Ori Books, 2014), 98.

challenge the conventional narratives of Soviet academic isolation. The science journalist Richard Kerr wrote in 1994:

> "For 70 years, Soviet earth scientists were walled off from Western practitioners to a greater extent than their colleagues in almost every other discipline aside from classified military research. The Communist authorities may have allowed a few favored biologists and physicists to collaborate with their counterparts in the West, but they certainly drew the line at teams of Western earth scientists crawling over the Soviet interior."[545]

Most experiences of the Area IX participants seem to question this statement. By the time Kerr's article came out in *Science,* teams of American geophysicists may not have crawled all over the Soviet territory, but their peregrinations to Garm and work in Moscow, Kazakhstan, and Kirgizia had been in place for twenty years. Undoubtedly, after the collapse of the U.S.S.R. what Kerr called a cultural revolution transformed the relationship of post-Soviet scientific community with the outside world. Many bureaucratic barriers dissolved. It became infinitely easier to make individual contacts and join a foreign or international research team. These lines were multiple, including doors to Western PhD programs, internships, postdoctoral fellowships, research contracts, and H-1 (highly qualified professional) emigration flung wide open for geoscientists. Sadly, the fall of the Soviet system meant largely one-way traffic and thus less beneficial changes for the community: academic budget crises, reorientation of state interest in science, the infamous brain drain, and as a result a break in continuity in training the next generations of researchers in Russia. With new opportunities, overwhelming Western influence, and current domestic challenges, will Russian earth

[545] Richard A. Kerr, "Contacts with the West Bring Cultural Revolution," *Science* 264, no. 5163 (1994): 1277-1279.

sciences retain what was valued in Soviet times—the originality of thought, strong theoretical backgrounds, creativity in engineering?

Let us return to the question that opened the section on earthquake prediction and induced seismicity. What did the exposure to another culture, acquired social skills, emotional experiences, and expanded knowledge give participating scientists, their discipline, and track-two diplomacy? As for peaceful coexistence, Area IX was a model science diplomacy project, far exceeding the expectations of the CFEP designers who quickly lost interest in it. Area IX did not transform the entire discipline, but it certainly helped to perfect the instruments, explore earthquake prediction, and determine problematic questions, which, in turn, led scientists to consensus on the inadequacy of current methods and the necessity of developing new approaches in the future. On the individual professional level, these experiences shaped or influenced, to varied degrees, many careers of involved American and Soviet geophysicists. Social skills helped with other bilateral projects as it became easier to understand people from other cultures and be more tolerant to their lifestyles and ways of thinking.

The word "friendship" has been used frequently in this chapter as a positive outcome of collaboration. What is so valuable about the fact that spending enough time together not entirely by choice makes people eventually choose to spend time together and send one another Christmas cards? The term has a deeper meaning in the context of CFEP connections by reflecting the idea of collaborative circles suggested by Michael Farrell: "a group of collaborating friends—a collaborative circle—can affect creative work. Numerous artists, writers, composers, scientists, social reformers, and other creative people report that a collaborative circle played an indispensable part in their

development."[546] Collaborative circles develop over time (spent together) among people who enjoy each other's company and often have similar professional interests. They can influence personal journeys (support from colleagues at home and abroad influenced Simpson's decision to continue to work with Russians; active interference of their American circle helped Khalturin and Rautian to move to the United States) and institutional histories (Keilis-Borok founded the working group on geophysical theory to create a circle within a larger circle of professionals whose opinions he trusted). For his collaborative circle theory, Farrell studied groups of poets, artists, writers, psychoanalysts, and social reformers. Applying it to scientists' circles to a greater depth than is done in this chapter may yield remarkable results.

Conclusion

Two decades ago, a breakthrough in history of science to which numerous brilliant scholars contributed uncovered the complex relationship between science and Cold War state. Historians continue to analyze the interconnections between military patronage, state funding priorities, and ideological pressure and scientific education, research choices, and ethics in the United States, Soviet Union, and the global community. This line of historical scholarship has become so powerful that most of us see the scientific world through its lens. The story of Area IX is nothing but one case study of interdependencies of human input and scientific output in a sea of similar bilateral and multinational scientific programs initiated during the Cold War that have not been researched in detail yet. As such, it suggests that in one instance not everything was

[546] Michael P. Farell, *Collaborative Circles: Friendship Dynamics and Creative Work* (Chicago: University of Chicago Press, 2001), 1.

contingent on political rivalry or ulterior motives. The "human factor" of such programs—social interaction, moral values, professional initiatives, personal inclinations, cultural diversity and occasion commonality—became important agents in this case of science for diplomacy and, indeed, for scientific outcomes as well.

Propaganda and political machinations were obviously on the bandwagon of this program, but they did not seem to drive it. The seismology program was largely shaped by academic scientists pursuing their interests. They made use of state patronage and were inspired by opportunities to advance professional knowledge.[547] At the same time, they were brought closer in understanding each other by field and lab research and such "extra-curriculars" as international amateur soccer matches in the Tajik mountains and mushroom hunting by helicopter, which facilitated communication and joint research on topics related to Cold War state interests and those prioritized by scientists themselves.

What is the significance of this local saga to the larger history of science? Besides being an eventful page in the history of seismology, this particular story underscores the roles and agency of mid-level scientists in the Cold War and beyond. This community as a social group gained sufficient political capital to pursue their professional interests and, in a feedback loop, provided geographic, intellectual, and emotional journeys that shaped their stories. This account argues in support of the argument against rigid hierarchies in science and scientific diplomacy as a front for propaganda. Rather, the results of this

[547] Here I join Kai-Henrik Barth in arguing against the "distortionist" view of seismology, which suggests that earth scientists were manipulated by the military and that political interests twisted the development of the discipline. Kai-Henrik Barth, "The Politics of Seismology: Nuclear Testing, Arms Control, and the Transformation of a Discipline," *Social Studies of Science* 33, no. 5 (2003): 743-781.

study and bring out the importance of shared goals and interests for successful international and even interdisciplinary communication in science.

Conclusion

This dissertation project began when my senior colleagues, geophysicists at the Institute of Physics of the Earth (IPE) in Moscow, told me a story from the institute's Cold War past. Back in the 1980s, they had a joint project with Americans. It should have been classified because they were verifying underground nuclear tests at heavily guarded national security test sites in Kazakhstan and Nevada. But the joint project was designed to defy the secrecy and make the results as public as possible. It was self-apparent to seismologists by then that the only kind of nuclear tests allowed by international bans, underground testing, was unambiguously verifiable by seismic methods. American governmental negotiators for test bans had refused to accept this scientific fact for decades. IPE seismologists, their colleagues from the United States, and state leaders' science advisers drove this point home by organizing the verification project and making it public. Their expert opinion was heard and contributed to the signing of the Comprehensive Test Ban Treaty.

To me, this story sounded fascinating, important, and somewhat out of character for Cold War time. Could Soviet and American scientists really have an open public dialogue that involved traveling abroad with access to national security sites and exchange of equipment? In the 1980s, nobody I knew personally in the Soviet Union was repeatedly traveling to the United States.[548] Soon I learned that this project was part of a much larger program that began in the 1970s, the bilateral cooperation in the field of environmental

[548] This is not quite true. I knew exactly one person who made several trips to the United States at the time when I was in high school. It was my friend's father. He brought a personal computer from a trip and allowed us to play video games on it when he was away in expedition. My friend's father was seismologist Alexander Ponomarev, a participant of Area IX, who many years later became my boss at IPE.

protection. Good friends of my colleagues, geologists from the Institute of Geography, participated in something they called WG VIII within the same program. This information made me wonder about the entire scope of the environmental protection collaboration and its place in the Cold War and in history of science.

Ostensibly, an earlier connection between American and Soviet scientists preceded the CFEP program. Could something have reedified the scientific communication broken at the onset of the Cold War? If American opera groups, singers, and pianists could perform in the Soviet Union, and the Bolshoi Theater went on tour in the United States in 1958, scientists may have been part of that effort to establish peace through citizen diplomacy. This seemed a justifiable starting point for research into American-Soviet scientific dialogue. As evidence shows, it evolved from almost no legalized communication in the 1940s, to a restricted program between two different and hardly compatible state science systems in the 1960s, to numerous disciplinary collaboration projects connecting small groups of scientists and individual researchers directly in the 1970s and 1980s for joint research, to a relatively free flow of joint projects in the post-Soviet era. What were the roles of scientists in these transformations? They could have been pawns in the diplomatic and ideological game, doing what they were commissioned by the state. Evidence suggested, however, that they had agency beyond simply executing state contract. Their strengths lay within institutional power and personal contacts between participants. Particularly active were mid-level researchers.

Early years: the power of personal involvement

The first post-WWII East-West scientific exchange program began in 1958 between the U.S. and the Soviet Union as part of the Lacy-Zaroubin agreement. Although

scientists did not directly initiate it, they built this program from ground up during the Cold War. With suspicions and uneasiness on both sides at the outset, the U.S. National Academy of Sciences and the Soviet Academy of Sciences entered the relationship armed with the diplomatic rulebook and a strategic directive. They were under close supervision of federal authorities that set the goal of this exchange to be scientific reconnaissance. The preceding gap in academic communication left both sides in the dark about each other's advancements. Gradually, the initiatives of participating experts from a variety of disciplines (physics, microbiology, astronomy, mathematics, earth sciences, and chemistry) allowed the program to transition from strictly abiding by the diplomatic reciprocity principle to engaging with the interests of scientists themselves.

A significant achievement of the exchange program was establishing a structural and organizational foundation for further dialogue. The NAS and the SAS provided stability that allowed for annual short-term exchanges between top-level experts. Even a small number of long-term internships for early-career researchers became available each year between two nations that were highly reluctant to grant entry visas to each other's citizens. Research facilities and individual scientists could make choices about whom to invite for an exchange visit based on their academic interests rather than on opportunities for collecting scientific intelligence or inculcating ideology.

The program was not without flaws or obstacles. Red tape and language barriers on both sides, disputes over behaviors and sanctions found unacceptable, and exacerbations of conflict between the United States and the Soviet Union (and subsequent budget cuts and pressure to curtail scientific contacts), to name a few, threatened the exchanges over the years. American experts nominated for participation could be denied entry to the

Soviet Union, at times without so much as an explanation. United States Congress would insinuate that Soviet scientists' only goal was appropriating American know-hows without sharing theirs and propose closing the program. The exchange operated against the range of public opinion in both countries ranging from positive calls for finding peace through person-to-person dialogue to rampant hostility and xenophobia.

Nonetheless, the inter-academy program seemed to endure and develop from a meagre twenty-person exchange on preapproved sanitized topics to a two-thousand-person annual operation by the 1970s. The mere fact that, in 1971, the program included Carl Sagan's somewhat controversial conference on communication with extraterrestrial intelligence at the Armenian Byurakan observatory (featuring the crème de la crème of Soviet astronomy) speaks to how far the censorship and budget limits of the program could be stretched by then on the initiative of individual scientists.[549]

The program as a group and individual scientists involved in it moved past the initial culture shock, fears, and resentment of operating within an alien system and communicating with strangers whose motives and logic could seem unintelligible or antagonistic, learning to understand and appreciate the communication. What truly helped to endure the adversity and continue the exchange despite interference and negative judgements was personal involvement of participating scientists. If obstacles to continuing the dialogue arose, they were consistently removed by scientists rather than government officials. Some Americans openly advocated for support for the exchange in the press and in administrative committees. Others invested time and effort in

[549] Carl Sagan, ed., *Communication with Extraterrestrial Intelligence CETI* (Cambridge: MIT Press, 1973) and folder "IR: Exchange programs: USSR, Symposia: Extraterrestrial Intelligence, 1971," NAS.

understanding the Soviet system and learning the language. Soviet scientists worked hard to maintain and develop long-term professional ties and personal friendships with American counterparts, helped them navigate the Soviet academic system, and accommodated their professional interests.

Détente: pragmatic motivations

In 1972, during a period of relaxation in diplomatic relations between the United States and the Soviet Union, the scientific interaction was expanded and promoted from exchanges to cooperation in intergovernmental accords. The trailblazing bilateral agreement on cooperation in the field of environmental protection is of specific significance to the dynamic of American-Soviet dialogue in earth sciences. Designed in part as a publicity move by American politicians, the agreement was to show the Soviet Union and the rest of the world that the United States was prepared to share their environmental expertise. However, scientists who were marginally involved in drafting the eleven CFEP areas of cooperation in America, had already been in contact with either individual Soviet colleagues and academic institutions in the U.S.S.R., or were deeply interested in the current Soviet research and data. They lobbied for disciplines such as seismology and paleoclimatic and atmospheric studies to be included. This was another of their active contributions to the development of cooperation.

Launching the extensive CFEP operation went more smoothly thanks to existing NAS-SAS contacts and protocols. Yet, the new set of environmental cooperation plans brought about a new set of challenges. Very different fates befell eleven CFEP programs. Some were merged, others competently fulfilled missions stated in the initial protocols and disbanded, a few succumbed to institutional disagreements, questionable viability of

the research proposals, funding cuts, and political controversies. Historians have determined that, for American politicians, the CFEP agreement was a public display of concern for the global environment and of benevolence toward Soviet environmental disciplines. For Soviet strategists, it was a show of compliance with international environmental policies and opening to the West. For American scientists, it was a vehicle for procuring regional Soviet data. For Soviet scientists, it was a chance to access advanced American technology. All concerned parties had pragmatic motivations and projected results. Having achieved the initial publicity goal, political actors gradually lost interest in the agreement. On the contrary, participating scientists in some CFEP projects showed increasingly more intellectual investment on their own terms. They were the ones determined to continue these collaborative projects in the long term.

End of détente: persisting with collegial friendships

Three science-intensive CFEP programs—nature conservation, environmental changes and climate, and earthquake prediction—thrived for many years, evolved, and made an impact beyond initial expectations. The subtle transfer of decision-making power from politicians and bureaucrats to scientists and the state of their disciplines at the time of cooperation helped two earth science programs (climate and earthquake prediction) to contribute to data sharing, knowledge co-production, nuclear non-proliferation, expanding relationships between professional groups, and integrating Soviet scientists into the international community. Participating scientists were instrumental in these actions.

In 1978-1979 diplomatic relations between the U.S. and the U.S.S.R. worsened. The U.S. State Department strongly recommended that scientists involved in collaboration

with the Soviets discontinue them. Budget cuts were introduced to phase out or curtail these programs. Some American scientists who had been considering participation in collaborative efforts bowed out of their engagements. Soviet scientists proceeded as planned with joint projects in the hope that this new political standoff would not ruin the now long-standing cooperation. They received the support of those American colleagues who believed in focusing on professional goals over political disputes. Earth science projects continued, overcoming this and subsequent challenges until the collapse of the Soviet Union and beyond. In many instances, the cooperation thrived on personal contacts, working relationships, and collegial friendships between American and Soviet scientists.

Finale: the Cold War counterculture

It has never been an intention for this dissertation to obscure the competitive elements of the Cold War related to science and technology. The arms race, the propaganda aspect of environmental policy debates, deliberate withholding of scientific information, or attempts to access such information through espionage were always in the background of CFEP collaborations. The rivalry continued to permeate top-tier policies, actions, decisions, and communications. In addition, as Audra Wolfe argues, science is rarely apolitical.[550] Scientists were involved in politics in numerous ways during the Cold War.[551] At the same time, scientific collaborative initiatives became a vibrant counterculture to the Cold War. In the cases explored here, the political objectives of

[550] Wolfe, *Freedom's Laboratory*, 2.
[551] For a discussion of political entanglement of the NAS-SAS inter-academy exchanges and in the cooperation under the CFEP agreement and scientists' awareness of that entanglement, see Linda Lubrano's insightful piece: Linda L. Lubrano, "The Political Web of Scientific Cooperation," in *Sectors of Mutual Benefits in U.S.-Soviet Relations*, ed. Nish Jamgotch Jr. (Durham: Duke University Press, 1985), 50-82.

state sanctioned collaborations did not unequivocally equal or overrule the motivations of participating scientists. In fact, separating the two categories proved to be more revealing than the top-down perspective. As Perrin Selcer noted, a "Cold War lens [that] distorts as much as it reveals."[552] My focus on mid-level scientists mitigated the effect of that lens and uncovered networks of mutual interests and professional and personal contacts among American and Soviet scientists. Intergovernmental agreements served as structural safety nets for facilitating international travel, funding, accountability, and institutional communication. Scientists initiated, conducted, and expanded collaborative projects. Long-lasting projects organized by scientists that included field research, laboratory experiments, and joint papers as results proved the most successful.

The importance of this history from below— of understanding agency of mid-level scientists who have too often been overlooked for their role in scientific practice and collaboration —is in its ability to transcend political and cultural differences. Exploring this history is a way to see a wide variety of cultural exchanges and human connections alongside scientific ones. The story of American-Soviet projects challenges narratives that emphasize competition and Realpolitik calculations behind international programs. These political agendas were part and parcel of Cold War cross-cultural initiatives; but reducing our understanding of cultural and scientific exchanges to the pursuit of political and economic benefits would be robbing this history of an important feature.

In environmental protection collaborations we see a range of degrees of connectedness, openness, and productivity between American and Soviet participants contingent on the degrees of overlap in interests and compatibility of expertise. Other

[552] Selcer, *Postwar Origins*, 213.

contributing factors were shared experiences beyond encounters, continuous research rather than one-time visitations, cultural and professional curiosity, and meaningful human connections. This dissertation with its focus on American and Soviet scientists' agency in a Cold War setting underscores their professionalism, dedication to their mission, ingenuity, spirit of adventure, perceptiveness, generosity, and sense of humor.

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