Hiding in Plain Sight: **Uncovering Nuclear Histories**

Robert Anderson, editor

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1. Introduction to Hiding in Plain Sight: Uncovering Nuclear Histories

Robert Anderson

This is a trans-disciplinary conversation among scholars involved in a variety of nuclear studies and is particularly focused on their encounters with both vast archives and scarce archives.

We are aware of scholars in Canada and elsewhere who are interested in areas as diverse as the history of nuclear diplomacy; technical aspects of nuclear weapons; treaties for nuclear disarmament and arms control; international and/or comparative studies of nuclear energy; storage of nuclear waste; studies of extractive and/or Indigenous "nuclear communities"; sociology of nuclear and expert relations; comparisons of nuclear and alternate forms of energy; and how the media have dealt with nuclear risk. Despite the importance of these specific topics in the contemporary world, we feel that the broader idea of nuclear studies and the possible synergies between these different areas of work is curiously neglected in Canada. This is our chief motivation: to present a group of essays devoted to the discussion of this broad subject mostly in relation to its secretive origins and the absence of records.

Themes and Issues

Official secrets and sensitive evidence have been kept in closed files for generations and have also been opened gradually. In Canada, the waiting period has usually been thirty years after their use. But nuclear affairs were seldom included in that general rule of opening the records. Since the mid-1980s, however, some sensitive Canadian documents have been opened

on request for study, following passage of the Access to Information Act in 1983. Researchers gained access to sets of closed documents from the 1940s onward. Soon many of these nuclear files were, after review, declared open. Other files from the same period, however, remained closed. Thus, Canada's long history of nuclear development, international negotiation and involvement in bilateral global agreements has resulted in a vast and valuable archive that is, though greatly more open each year, still largely untapped and undervalued.

In the recent depiction of Canada's history for the country's 150th anniversary in 2017, there was no reference in the media to Canada's important nuclear history. In textbooks for grade twelve students, there is almost no mention of Canada's role in nuclear developments, whether in the uranium trade or reactor design, or in the special public-private collaboration embedded in the entire Canadian nuclear system. Even Canada's efforts in nuclear arms control and disarmament went largely unrecognized during that anniversary. Although Canada passed an anniversary of one hundred fifty years as a national state, recognition of our complex nuclear past was limited to passing references to nuclear facilities like Chalk River and organizations like Atomic Energy of Canada Limited, Canadian Nuclear Laboratories, and the Canadian Nuclear Safety Commission. While recognition of these entities is appropriate, their very limited reference reminds a relatively uninformed public that this particular history is not important in "a free and democratic society." On the contrary, I'd say that if Canadians are confused by or conflicted over this history then they need to understand it better. It is one of our deeper links with the rest of world in the twentieth century. And for that understanding we need to open the archives sooner and steadily, and let people know about them.

Nuclear scholars tend to gather from time to time as a form of renewal of energies. The SSHRC-funded April 2012 Workshop at the University of Toronto was coordinated by Laurel MacDowell as described in her Chapter 2 here. The workshop addressed "The Nuclear Industry in the 21st Century: How We Got Here," showed that emerging young researchers were keenly interested in understanding not just the familiar geopolitical nuclear chess game at the heart of the nuclear world since the 1940s Cold War, but also the social history, business history, environmental history, labour history, Indigenous history of different nuclear communities and the whole nuclear industry from the 1940s onward. Following that Toronto Workshop in 2012, a new network called the Nuclear International Research Group (NIRG) was founded. Then, in 2018 and 2019, workshops[1] which the authors of this publication attended were an extension and enlargement of that question: How did we get here?

Not all of these essays are about Canada alone; some connect Canada and India, some are about Japan, Ukraine, and/or India, a number are about United States – even referring to the deep connections between Canadian and American nuclear affairs. They reflect the fact that the records of nuclear studies are a uniquely twentieth century archive. In these essays, we are recognizing that special history, having gathered together some of the evidence that will give the next generation a better sense of what happened, how it happened and why it happened. From many public points of view, Canada's nuclear histories should all become slightly less mysterious. Our title, *Hiding in Plain Sight*, is lifted posthumously from archivist and historian Greg Donaghy's abstract for the paper he could not write, as explained in Chapter 3. I toyed with a title *Hidden in Plain Sight* but realized that "hidden" implied human agency in

every case, as if hidden *by* someone. It also suggests an activity in the past. But that is not true for all our cases in this collective work; some of this hiding is occurring today and will be done tomorrow; some of it a result of agency, some not.

Now that the NIRG had become the "Nuclear Humanities and Social Sciences" and is profiled on the website of the CNRS of France where it is known as "Nuclear_hss," it has an truly global reach. To extend and deepen that reach, we dedicate these short essays with pleasure.

Robert Anderson, Editor,
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[1] I am most grateful to Social Science & Humanities Research Council of Canada for their support to Simon Fraser University which enabled us to stage these workshops at the National Library and Archive of Canada in Ottawa in June 2018 and at the 2019 Congress of Humanities and Social Sciences at the University of British Columbia. Equally important, the School of Communication managed the accounting of these workshops with me. I am also indebted to MV Ramana, Director of the Liu Institute of Global Issues and to the President of Green College – both at UBC – for enabling us to stage the 2019 Workshop there. The original 2018 Workshop could not have been held in Ottawa but for the kind assistance of the Librarian and Archivist of Canada, Guy Berthiaume, and the profound knowledge and networks of Paulette Dozois, senior archivist at the *Bibliothèque et Archives du Canada*. My research assistant/editor Helena Krobath boldly started this project with me in 2020, and Warren Bowen skilfully completed it as research assistant/editor; cover designer-organizer Stephan Struve at Carleton University was a great help, right down to the final day. They have been wonderful to work with. I am lucky that our editor Kate Shuttleworth, Digital Publishing Librarian, Simon Fraser University Library has been so encouraging throughout this complex project.

2. NIRG and Nuclearism in the Era of Climate Change

Laurel MacDowell

Laurel MacDowell is professor emerita of the Department of History, University of Toronto and founder of the Nuclear International Research Group (NIRG). She has published three books, many articles and has edited or been a contributor to other books. Most recently she was the editor of the recent *Nuclear Portraits*, University of Toronto Press, 2017, and contributed a chapter on nuclear power to Ruth Sandwell ed. *Powering Up: The History of Power, Fuel, and Energy from 1600,* McGill-Queen's University Press, 2016.

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The Nuclear International Research Group (NIRG) began as I was thinking about the relationship between nuclear energy and the environment. I was also reading a great deal about climate change. One day I saw a huge billboard that boasted about what a green source of energy nuclear power was. Because I had just finished an article on uranium mining in northern Ontario, which resulted in a health disaster and became the situation that led directly to the passage of an Occupational Health and Safety Act in Ontario Canada, I found the billboard opportunistic.

There needed to be more information about the nuclear industry in the public sphere. I knew Anna Stanley who worked in the nuclear field as a geographer. She had mentioned how isolated nuclear scholars sometimes felt. So, the two things came together – my annoyance about the billboard and Anna's comment about the lack of community in the nuclear research area. The two of us decided to try to organize a group of nuclear scholars. With the Internet and Listservs how difficult could it be?

In August 2008, an invitation went out to faculty and graduate students across Canada inviting them to join the Nuclear Research Group. The purpose of the group was to develop a small community which could discuss its interdisciplinary work and get feedback. A secondary purpose was to explore the possibility of getting funding for a workshop that critically considered aspects of production in Canada and the United States (e.g. nuclear and energy policy, health and environmental effects of radioactivity, social/environmental justice issues, historical and contemporary geographies of nuclear development, labour and occupational issues, etc.). Several people responded to our outreach.

Then Anna left for a job in Ireland. In May 2009, there was a founding meeting of the Group at the University of Ottawa. About ten people showed up. They suggested that "international" be added to the name so we became NIRG, and after our deliberations, we had a plan. We would introduce the group with a symposium, then have a larger research seminar, and then there should be a book focusing on the impact of the nuclear industry on local communities. And I should implement all of this as Coordinator.

In November 2009, the first small symposium took place in the Department of History at the University of Toronto. We had three speakers and participants, including graduate students, First Nations activists, environmentalists, Ontario Power Generation employees and some curious people from the nuclear industry. Among the speakers was Allison Macfarlane, former chairman of the Nuclear Regulatory Commission, whom President Barack Obama had named to the Blue Ribbon Commission on America's Nuclear Future. She is married to Hugh Gusterson, who had joined NIRG early, and he had suggested her.[1] As a result of the symposium, several

more people became members of NIRG, so we had twenty-eight active researchers in different fields in North America working on various aspects of the nuclear industry, including history, geography, public policy, international relations, health, environment and waste management.

The next project was funded by the SSHRC Aid to Conferences and Workshops grant. The two-day symposium, "The Nuclear Industry in the 21st Century Environment," was held at the University of Toronto in 2015. Lisa Rumiel, then at McMaster University, helped organize this event, and a larger group attended, including Robert Anderson, the editor of this book. Excellent papers presented on a range of subjects were followed by lively discussions. The two-day workshop aimed to continue the conversation about how nuclear technology has transformed the politics, cultures, economies, ways of living, public health and landscapes in nations around the world. The papers featured research by a group of scholars and graduate students from a variety of university departments and institutes around the world. The topics examined aspects of nuclear history in Canada, the United States, the Soviet Union, the European Union, the Marshall Islands, Italy, India and the continent of Africa throughout the twentieth century. The purpose of the workshop was to provide presenters with an opportunity to present their papers and discuss them with each other and with a larger audience of participants studying nuclear history. NIRG was developing a community; we gained more members, including quite a few from Europe, so we were indeed becoming more international.

With a growing email list, I tried to send out fairly regular communiques. When the Fukushima disaster struck, a great many messages were exchanged among NIRG members. This

facilitated an ongoing connection among members so that today, members are regularly communicating about conferences, papers and ideas.

The founding meeting led to a book, *Nuclear Portraits: Communities, the Environment, and Public Policy*, which was published in 2017 by University of Toronto Press. Some of the chapters came out of the symposium. The one on Chernobyl, for example, was the result of Suzanne Bauer and Karena Kalmbach, who had given separate papers at the symposium, collaborating with Tatiana Kaspersi to write a broader paper on the subject for the book. Other essays were from new people, including Paul Jobin, who wrote about workers at Fukushima, and David and Marissa Bell, who wrote about ongoing conflicts in Port Hope, Canada.

As I was approaching retirement, I wanted to see NIRG continue to expand. I asked Karena Kalmbach to take over as Coordinator. She was an active scholar, young and dynamic, and fortunately, as the time was right for her, she agreed. I was delighted that NIRG had expanded beyond North America to include Europe. Karena has further developed the email list, and NIRG has been renamed and is now part of another website, so it is going in new directions. It is now “Nuclear_Hss” and staged on the website of the CNRS of France. I would like to see the organization become even more international. Today, we face the shifting situation in the Korean Peninsula, and the future of the Iran deal concerns the nuclear industry, the world and nuclear scholars. With the Iranian and North Korean nuclear programs in the news, it would be useful to attract scholars who are knowledgeable about those countries and other nuclear nations, such as India, Pakistan, Russia and Israel. Some of them are represented here.

What NIRG has become today and what new directions it takes in the future will depend on those members, like Robert Anderson, who decide to sponsor events which facilitate discussion and result in new contacts and new scholarship. From the beginning, there was always a relationship in my mind between the nuclear file and the environment, with a concern about the proliferation of nuclear production with possible military dimensions. But climate change must also be a subject of concern to nuclear researchers. I presume that fewer nuclear nations and nuclear plants are desirable to prevent nuclear war, but also that environmental disasters in nuclearized regions can arise from serious climate events as well as natural disasters.

It is sometimes suggested by grim environmental pundits that if climate change doesn't get us then nuclear destruction will. Concerned pessimists about the effect of nuclear power on humanity have been vocal from the beginning, since the dropping of atom bombs on Japan in 1945. But it remains an interesting question what the effect of climate change on the nuclear industry will be. When the Fukushima disaster occurred, fear about its environmental effects was immediate. A release of radioactive materials in the atmosphere and in the ocean followed the 2011 Japanese tsunami, which damaged the nuclear plant, resulting in serious hydrogen gas explosions and partial meltdowns. The large-scale release of radioactivity resulted in the evacuation of about 100,000 people from a twenty kilometre exclusion zone set up around the power plant, similar to the thirty kilometre radius Chernobyl Exclusion Zone still in effect. Today, radioactivity levels have lowered enough to have a limited impact on wildlife. Radionuclide concentrations are stable in the marine environment near the nuclear plant;

traces are visible in the air. Since the accident, radionuclide measurement results of foodstuffs produced in Japan have lowered. In Japan, in July 2016, Fukushima Prefecture announced that the number of evacuees had fallen below 90,000, partly as some municipalities lifted evacuation orders, but interestingly about 33,000 people have chosen not to return to their homes out of fear and distrust. Even these data were very difficult to obtain, as Claude-Yves Charron shows in Chapter 8.

Politicians are not dealing adequately with climate change today. The Paris Agreement was an achievement, but even in the US President Trump was an effective climate change denier until he was replaced. In Canada we clearly are not going to meet our targets for carbon reduction which we committed to. Climate change is more evident already to everyone, with daily environmental disasters occurring – including floods, droughts, fires, wind storms, etc.

What precautions are being taken to ensure that nuclear plants remain safe and do not explode in this disruptive era? How do the facts of climate change affect the nuclear industry in nuclear nations? Are nuclear scholars sensitive to this environment as they research and write? Are archivists reflecting on how this new environment may result in new issues that scholars will want to study with their assistance?

Both nuclear issues and climate change are serious challenges that we cannot neglect. In this era of climate change, it is important for politicians and the public to keep informed about nuclear energy as they explore alternative energy sources. What role nuclear energy will play in that scenario is an interesting and controversial question. But more needs to be done now in the academic field, and hopefully research will expand on nuclear subjects, and on the

relationship between climate change and nuclear issues. NIRG remains a useful tool to encourage the expansion of such critical research, but what new directions it takes in the future will probably depend on the relationship between nuclear energy and climate change.

Which climate and political forces are influencing the nuclear nations? How will climate change stimulate future scholarship? Are nuclear scholars examining this new situation? Scholarly work and archives on all aspects of nuclearism hopefully will expand, be well publicized and grow the field and public awareness of it.

NIRG began with thoughts about the relationship between nuclear energy and climate change. What it has become today and what new directions it takes in the future probably will depend on that same relationship.

Figure 1. Point Lepreau CANDU Six 705 megawatt reactor in New Brunswick Canada in 2020, then running above 90% capacity. It was commissioned in 1983 and refurbished in 2012. Although renovation was supposed to begin in 2008 the whole process was itself delayed by operating problems so that renovation actually began in 2011 and took a year. Cost over-runs and insurance problems delayed its re-start. Apart from well-known environmental sustainability questions, Point Lepreau is a text book-case on the difficulty of successfully operating a reactor of this size, triggering both planning and financial issues. The high cost of insurance for the renovated reactor was confidential, adding to the cost of a unit of electricity from Point Lepreau. As the cost was difficult to measure, it is thus difficult to compare it with other reactors, particularly with respect to its contribution to climate change. The original Point Lepreau reactor was built long after the early CANDU reactors were installed in Ontario, India, Pakistan, Korea and Argentina. (NB Power, *Point Lepreau nuclear generating station*, photograph published Jan 28, 2021 by CBC news, https://www.cbc.ca/news/canada/new-brunswick/lepreau-nbpower-nuclear-plant-1.5890989. Image used with permission. Rights belong with NB Power.)

[1] Professor Allison Macfarlane is now [2022] Director of the School of Public Policy and Global Affairs at the University of British Columbia, Vancouver.

3. Hidden in Plain View: Canadian Nuclear Diplomacy since 1945

Greg Donaghy

I am not a nuclear historian, but nuclear questions so permeate world affairs after 1945 that I am constantly forced to wrestle with them in studying Canadian foreign policy. The implications of reflecting on my experience are disheartening.

Paradoxically, the very ubiquity of the nuclear question has perhaps obscured it from view as one of the central preoccupations of postwar Canadian diplomacy. Certainly, several generations of diplomats and politicians have made it their business to work at securing as strong a voice as possible in the socioeconomic and political nuclear landscapes emerging after 1945. Nuclear anxieties lurk in the background of Canada's long history of "five eyes" intelligence sharing, in the lengthy but unsatisfying struggles for a voice in US strategic deliberations, and in the almost endless search for nuclear disarmament. Indeed, that hallmark of postwar Canadian foreign policy – peacekeeping – often includes an unspoken nuclear dimension.

Parallel concerns over the shape of nuclear markets – for reactors and expertise and for uranium – helped define Canadian aid policy in India and Pakistan in the 1950s and are woven through my work on the history of the Department of External Affairs in the mid-1970s. Precise documentation is often elusive, but the dynamic of the larger story is not unknown, just uncomfortable: Canadians (and we are probably not alone) willingly ignored our historic nuclear landscapes because they illuminate a world irrevocably beyond our control.

A Note from the Editor

Greg Donaghy wrote this concept note before his retirement as Head of the Historical Section of Global Affairs Canada (known for a long time in his tenure as External Affairs); the note was intended as the nucleus of his contribution to this collection. He then began a career as research professor in the Department of History at Carleton University in Ottawa. His death at age 59 in July 2020 is a great loss: colleagues spoke of his long tradition of "understated collaboration," a tradition from which I too have benefitted. For personal detail on Greg Donaghy's life and work, see Robert Bothwell, John English, and Norman Hillmer, "Celebrating Greg Donaghy," *International Journal* (Toronto) December 2020, vol. 75 (4), 464-470.

4. Back to the Future: Nuclear Archives and the Working Diplomat

Paul Meyer

Paul Meyer is Adjunct Professor of International Studies and Fellow in International Security at Simon Fraser University. Prior to taking up his present appointments in 2011, Paul had a thirty-five-year career with Canada's Foreign Service with a focus on international security policy. His research interests include nuclear non-proliferation and disarmament, outer space and cyber security.

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My engagement with documentation relating to the Non-Proliferation Treaty (NPT), and Canadian policies relating to it, commenced with a personal transition in 2011 from being a career Canadian diplomat to a scholar affiliated with both a university and several NGOs. It brought home to me how the would-be student of NPT-related diplomacy was frequently faced with major blockages in seeking information on official policy.

For much of my professional career as a Foreign Service Officer, a reference to "the archives" would have seemed an overly rarefied and remote term. We might occasionally have need to access "the files," which would mean a somewhat time-consuming request via the Department's registry when at HQ or, if at post, an amble down the corridor to extract the desired dossier from the secure registry. All this provided, of course, that we could identify the file in question and cite its designator number and provided that the file clerk in charge was not in a particularly grumpy mood.

If these processes were too cumbersome, there was always the fallback of the so-called working files, those informal collections of materials that many an officer would maintain

themselves, although with rather suspect authorization for so doing. The specifics of the information we would be accessing would vary depending on the subject and the location of our work and whether we were engaged in one of the two principal modes of diplomacy – bilateral or multilateral – but most often our search would take one of the following forms. I have termed these forms *Precedent* and *Proposal.*

1. *Precedent.* By *Precedent,* I mean clarifying what had been done in the past, relevant to the current task at hand. Precedents are particularly valued in diplomacy, a rather conservative pursuit, and it was helpful if one could cite a precedent for an action or an existing piece of text. No matter how dated or obscure this language might be, the skilled diplomat, especially in a multilateral context, could leverage a precedent to great effect in negotiations.

The innate inertia that characterized many such developments of text via committee meant that it was often easier to extract agreement on previously accepted language than to try and obtain approval of a new formulation, regardless of its inherent merits. Since many exercises relating to resolutions or communiqués are repeated on an annual basis, one would always be eager to review from the files what had been agreed last time around as a starting point for one's negotiation. Of course, some variants of past texts would be more aligned with one's aims than those of one's negotiating partners, so the prior research could pay major dividends when it came to presenting a re-discovered fragment of sacred text, rather than have to accept text not well aligned with one's position.

I recall this arising frequently in the context of resolutions being considered at sessions of the UN Human Rights Council, especially with respect to the sensitive issues of women's

sexual and reproductive health, and sexual orientation. Canada and the "like-minded" Western states would seek to insert phrases from selected outcomes of earlier UN forums that embodied these concepts, while other states, often from the Organization of the Islamic Conference, would object and offer up other less favourable formulas from other UN outcome documents. Being able to cite chapter and verse for suggested language and to embellish its pedigree in such a manner as to impress other delegates as to its superior virtue for inclusion in the text under negotiation was a regular requirement of multilateral diplomacy. A review of the files could also be invaluable in avoiding certain terms that were neuralgic for some delegations. In the arms control and disarmament field for example, the United States had a strong allergy to the term "secretariat" in discussions of what roles international organizations might play. On more than one occasion we would substitute "implementation support unit" for an entity that would essentially perform the function of a secretariat but dare not say that name.

2. *Proposal.* Another main motivation for reviewing the past as documented in the files was in the preparation of a new proposal for deployment in either a bilateral or multilateral context. Due diligence in the preparation of such a proposal, which would carry the Canadian label, demanded that earlier suggestions on the same topic be reviewed and taken into account in the preparation of the proposal. One had to anticipate possible objections of the this-has-been-tried-before variety, whether real or merely tactical, and ensure the originality of one's own proposal. Careful consideration of the record was also vital in determining where the likely sources of support and opposition for the proposal in question would be. The accompanying

talking points would be crafted as to anticipate possible objections and to link the proposal with similar ideas or positions associated with other partners.

What I have outlined above was the basic homework expected of diplomats in carrying out their professional duties. Most of this work during my career was carried out on the basis of hard copies contained in departmental files or archives maintained by the UN or other international organizations. With the switch to electronic record keeping around the year 2000, this access became more difficult. The means of record management and information retrieval became problematic in my experience. While copies of correspondence were dutifully marked for the electronic registry, subsequent efforts to retrieve said material were often frustratingly difficult. Items seemed to disappear into a virtual black hole, never to emerge again.

Not surprisingly, the poor experience with information retrieval in the new electronic context prompted many officers, including myself, to revert to reliance on their own working files, to at least ensure that they could access their own correspondence or material on which they were copied. This was far from an ideal solution, but at the time it seemed the lesser of two evils given the frustrating experience with the e-system. Now, improvements may have been made since my departure from the Department, although I suspect the process is still far from satisfactory. My sense is that it may be having a detrimental impact on the quality of our diplomacy as officers are unable or constrained in carrying out the homework with the files I have described.

There was, and I expect still is, the problem represented by the over-classification of nuclear-related or any foreign policy documentation. It struck me at the time that while the

originator of a document was enjoined to decide on the appropriate level of classification (e.g. Secret or Confidential) with a box already provided on the letterhead or memo template for that purpose, there was no provision for declassification after a certain period of time. Given that much classification occurred not as a result of the substance of the document per se, but because of time sensitivity, this seemed an unnecessary impediment to future access. A recurring example of this situation involved the text of statements or communiqués to be issued after some official gathering. These draft documents were normally classified, as a premature leak could be damaging to Canada's foreign relations, especially if other states were party to these outcomes. Once the event had occurred and the document issued, there was no longer a reason for classification, but the classified status of the draft material would remain in the absence of any systematic declassification process.

The declassification process was a low priority and poorly resourced task, usually conducted by retired officers under personal service contracts. A considerable backlog was always present, and I suspect it has only grown in the intervening years.

I think the introduction of a set period for declassification, and a pre-printed box on official forms for designating this, would be a simple but beneficial means of rendering more archival material readily accessible to researchers.

Finally, I am concerned with the pattern of diminishing transparency in Government of Canada information relating to nuclear affairs that is available to the public. During my time at the Department of Foreign Affairs, material related to nuclear non-proliferation and disarmament issues was regularly posted to the Departmental website. Position papers and

official statements were readily available to the interested public. Regrettably, these practices have deteriorated significantly in so far as Global Affairs Canada is concerned. If one ventures to the relevant pages of the GAC website, the material available is in the main three years out of date and includes little if any official statements from the various nuclear-related multilateral forums in which Canada has participated.

To add insult to injury, this neglect of the GAC website corresponds with a decision to grant $175,000 to the US Nuclear Threat Initiative and State Department in order to upgrade the website for the US-led International Partnership on Nuclear Disarmament Verification. It is useful that this international project benefits from an enhanced website, but as the saying goes, "charity begins at home." It is unconscionable that the concerned Canadian public is not able to access on a timely and comprehensive basis authoritative information on the actions being taken by officials in their name. We should all appreciate that a failing commitment to transparency of information now can only detract from the access to it in future.

The Nuclear Non-proliferation Treaty (NPT): Transparency and Opaqueness

The current policies of Library and Archives Canada put the bulk of archival material related to the NPT beyond ready access, designating it as restricted documentation. To gain access, the researcher is required to engage in a variant of the children's game pin-the tail-on-the-donkey, whereby one tries to guess as to what documentation might exist in the archives and hope that the Access to Information procedures will actually produce something of use.

Fortunately, due to my previous association with the Foreign Ministry, I was able to obtain assistance from the historical section of what is now Global Affairs Canada. This enabled me to benefit from blanket access to files originated by the then-Department of External Affairs (but not to files generated by other parts of the Canadian Government, such as the Department of National Defence or Privy Council Office, that could be relevant to my research interests). This access also required the renewal of a "secret" security clearance, again a requirement that the average citizen is unlikely to possess, which was fortunately facilitated by the historical section. As noted earlier, little in the material I managed to access would still warrant any classification level today but given the absence of a systematic de-classification process, the vast bulk of documentation remained off-limits to ready access. Thanks to the privileged access I was granted to the closed files originating with the Department of External Affairs, I gained some insight into official policies, while also bearing witness to the dramatic falloff of documentation associated with the Department's transition from hard copies to electronic files around the turn of the millennium, the latter category being something of a no-go zone.

It was also disconcerting to realize that my access was limited to the official files generated by External Affairs and not extending to other sources, notably to personal papers. These are often subject to particular terms and conditions that can render access problematic. Even when the papers concerned are designated to be open (by a given year), they can remain closed in practice for many years thereafter. An example of this occurred when I tried to access some of Ivan Head's personal papers, which were described as being related to "disarmament." Although one volume was marked as being open in 2010 and another in 2014, I discovered to

my chagrin that in 2016 they remained closed. The explanation provided to me was that the archivist had yet to review this material to allow it to be released. There was also no timeline as to when such a review would be undertaken. The views of the long-time and influential foreign policy advisor to Prime Minister Pierre Trudeau remained inaccessible, despite the embargo date having long expired.

In contrast to the archival opaqueness in Ottawa, I must acknowledge with appreciation the increased transparency now available via the respective websites of the UN's Office for Disarmament Affairs and the NGO called Reaching Critical Will (an arm of the Women's League for Peace and Freedom), regarding NPT documentation, including working papers and national statements. Such primary sources are invaluable to the diplomatic historian and one can only hope that Library and Archives Canada and Global Affairs Canada will in future arrange to have more material freely available for those researchers (or simple citizens) wishing to know the content of Canadian policy regarding the NPT and the global nuclear non-proliferation and disarmament regime of which it is the cornerstone.

5. Nuclear Secrets and Interpretations of the Diefenbaker Government's Demise, 1962-63

Michael Stevenson

Michael D. Stevenson is Associate Professor of History at Lakehead University specializing in military and diplomatic history. He is the author of *Canada's Greatest Wartime Muddle: National Selective Service and the Mobilization of Human Resources during World War II* (MQUP, 2001), and he has edited three volumes of the *Documents on Canadian External Relations* series focusing on the John Diefenbaker government. He is currently writing a book on Canadian-American relations during the Eisenhower administration, and a biography (with Eric Bergbusch) of Howard Charles Green, Canada's foreign minister from 1959 to 1963.

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The collapse of John Diefenbaker's Progressive Conservative government in February 1963 capped three months of turbulent negotiations with the United States over the acquisition of nuclear weapons for Canadian forces. Despite the importance of this event in post-1945 Canadian political history, the closure of government files in Canada and the United States relating to nuclear weapons for nearly fifty years prevented a thorough and complete analysis of the circumstances relating to the near breach in Canadian-American relations in 1963 and the resulting fall of the Diefenbaker government. Historians instead relied heavily on memoirs and recollections of key Cabinet ministers involved in the situation to attempt to explain Diefenbaker's demise. The recent opening, however, of these formerly classified government files and the use of previously ignored private papers has allowed a full picture of the 1962 to 1963 nuclear weapons negotiations to be determined and demonstrates the critical utility of open archives in understanding Canada's nuclear history.

The broad outlines of the closing months of the Diefenbaker government and the bilateral dispute concerning nuclear weapons can be quickly provided. The Canadian Cabinet had split over the question of nuclear arms, with a pro-acquisition faction led by Defence Minister Douglas Harkness and an anti-acquisition faction led by Secretary of State for External Affairs Howard Green failing to convince prime minister Diefenbaker to make a final determination. But the debacle of the Cuban Missile Crisis finally convinced Diefenbaker to launch serious and sustained negotiations with the Kennedy administration. In November and December 1962, Canadian and American representatives met in Ottawa to hammer out an agreement that eventually centred on a "missing part" formula. This would see US nuclear warheads stationed on Canadian soil for use in CF-101 interceptors and Bomarc missile squadrons minus one critical component that would be flown from the United States to Canadian bases once a specified NORAD alert level had been reached. These negotiations did not result in a breakthrough, however, and the Kennedy administration determined to avoid resuming them in the hope that a possible election would remove Diefenbaker from the political scene.

Early in 1963, retiring NATO commander Lauris Norstad's public declaration that Canada was shirking its NATO obligations by not accepting nuclear missile tips, Lester Pearson's decision to commit the Liberal Party to nuclear weapons acquisition, and the arrival in Ottawa of a tough-minded diplomatic brawler, Walton Butterworth, as the new US ambassador, pushed Diefenbaker to strike a four-member Cabinet committee to arrive at an official policy on nuclear weapons, a policy document Diefenbaker immediately rejected. The prime minister

then made the mistake of revealing the existence of the top-secret nuclear negotiations with the United States in a speech to the House of Commons on January 25, 1963, causing an unprecedented rebuke from Washington in the form of a State Department press release on January 30. Unable to remain in Cabinet without a firm commitment from Diefenbaker, Defence Minister Harkness resigned, and the Diefenbaker government fell over a non-confidence motion on February 5, 1963.

The broad, non-specific outlines of this chronology have been well known to historians. For decades, scholars relied primarily on the personal recollections and published memoirs of the Canadian Cabinet ministers involved in the nuclear weapons debate of 1962 and 1963, most notably those of Donald Fleming and Douglas Harkness. Harkness's interpretation has served as the major primary source in the traditional approach explaining the final months of the Diefenbaker government. Traveling across the Atlantic by boat in August 1963, Harkness composed a seventy-four page memorandum titled "The Nuclear Arms Question and the Political Crisis Which Arose from It in January and February 1963" that provided his viewpoint of the nuclear weapons crisis.[1] It cannot be contested that this document is a valuable source, but it is obviously presenting Harkness' side of the debate alone, and the memorandum also avoids many of the technical details of the bilateral negotiations between Ottawa and Washington that took place in November and December 1962. Nonetheless, many biographical and policy accounts of the period use Harkness as an unimpeachable and unbiased source. In his excellent biography of Diefenbaker, for example, Denis Smith relies on Harkness' 1963 memorandum more heavily than any other single source. Most of these personal accounts tend

to endorse the pro-nuclear weapons acquisition faction within the Progressive Conservative government and present a somewhat unbalanced account of the remarkably complex array of factors at play in the final months of the Diefenbaker regime.

Three critical archival sources relating to the 1962 to 1963 nuclear crisis, however, have been opened or utilized recently, providing a much more nuanced picture that undermines the existing negative interpretation of Diefenbaker's management of the nuclear weapons file. First, Department of External Affairs records related to the crisis have been recently published in Volume 29 of the *Documents on Canadian External Relations* series that provide the intricacies of the nuclear negotiations between Canadian and American officials.[2] Second, the comprehensive documentation housed in the John F Kennedy Presidential Library dealing with Kennedy's relationship with Diefenbaker has been declassified, and it focuses on the decisions taken in January 1963 leading up to the release of the State Department press release on January 30. Finally, the detailed private correspondence of Howard Green has become known after being largely ignored by a generation of Canadian historians. Using these sources, a case study examining nuclear diplomacy in 1962 and 1963 that at least partially rehabilitates Diefenbaker's political reputation demonstrates the importance of open archives and shines new light on the history of Canada's nuclear weapons experience.

The *Documents on Canadian External Relations* volumes published by the Department of Foreign Affairs and International Trade over a period of many decades have proved invaluable in documenting Canada's nuclear history. Successive editors of *DCER* volumes select critical documents relating to nuclear arms and subject them to the declassification process,

resulting in their publication and availability to scholars for the first time. Volume 29 in the *DCER* series was published in 2013 and allowed the full details of the negotiations to arm Canadian forces with nuclear weapons to be ascertained for the first time. The initial round of negotiations occurred in Ottawa on November 21 and 23, 1962. For interceptors and Bomarc missiles in Canada, a variety of options were discussed, including the storage of the warheads on transport aircraft at US bases on permanent standby to be flown to Canada when a specific alert status was reached or the tactical ferrying of CF-101 interceptor aircraft to US bases during an emergency to allow the MB-1 air-to-air rocket to be installed. Both options were not realistic in terms of the cost and time involved, and the missing part idea was initially discussed. A second round of negotiations took place on December 4 and 5, and it was determined that for Bomarc missiles, an arming plug for the warhead could be flown in to have Bomarc batteries operational in less than three hours. For the MB-1 rocket for CF-101 interceptors, two potential missing parts in the form of an umbilical power cable and an ejector rack were identified, with arming times ranging from one to four hours. Although Canadian negotiators believed that a workable agreement could be reached, senior officials in Washington determined these plans were not workable and too “contrived” to be considered realistic from a defence perspective. The two documents published in the *DCER* for the first time provide this rich detail. The first document has not been previously available at all to historians, while the second document was present in the LAC personal collections of Howard Green and AE Ritchie but not widely referenced.

Recently declassified sources from the United States, particularly those housed in the Kennedy Library, further illuminate the contentious issue of arming Canadian forces with nuclear weapons. Some of these previously restricted documents concern the Ottawa negotiations over the arming of Canadian Bomarcs and CF-101 aircraft and confirm the details provided in the *DCER* collection, with an obvious slant regarding the artificiality of the proposals concerning the missing part instead of Canada simply accepting the complete warheads and housing them on Canadian soil. The most detailed and informative documents from the Kennedy Library concern the development, forcefully advocated by Walton Butterworth, of a well-defined plan to destabilize the Diefenbaker government as the Canadian prime minister's difficulties mounted in January 1963. These plans were undertaken with the knowledge of the White House, as evidenced by a declassified document from Lawrence Legere to President Kennedy on January 21, 1963 recommending that no concessions be granted to Diefenbaker. "On balance," Legere noted, "it seems best to stand fast. This course is easy to justify militarily… and it could materially enhance Diefenbaker's difficulties as the election approaches."[3] This policy was clearly made more punitive after Diefenbaker's gaffe in Parliament revealing the existence of the bilateral nuclear negotiations that led to the State Department press release.

Finally, the necessity of open archives in the accurate analysis of Canada's nuclear history is evident in the remarkable personal papers of Howard Green contained in the City of Vancouver Archives. This collection has been accessible for decades, but nuclear policy historians have largely ignored it. The most valuable historical material in the Green papers

comes from his personal correspondence. Over the course of his political career, he penned thousands of letters to his family providing a detailed analysis of events in Ottawa. His observations are not more or less valuable than widely cited memoirs or accounts written by people such as Douglas Harkness, but it is important to include Green's previously ignored letters because they add balance to the debate about the downfall of the Diefenbaker government.

Green has frequently been portrayed as a naïve, inexperienced practitioner of foreign policy, but he genuinely believed that his campaign for international disarmament and the acceptance of nuclear weapons on Canadian soil were incompatible policy goals. His correspondence adds colour to the events of 1962 and 1963 in many areas. He offered a strong commentary, for example, on Lester Pearson's decision to commit the Liberal Party to accepting nuclear warheads: "I think it takes us off several hooks and I can't understand why he didn't sit tight and let us stew! Strange fellow – intrinsically a weak sister, I think. He should have stayed with diplomacy!"[4] Similarly, Green recalled January 30 as "the day the State Department did us dirt… I saw the US press release first when handed it by a Canadian reporter! How on earth the US government expects to hold friends is beyond me – but they may not care. I think this is the time that Canada must stand up to them if she is not to become a satellite."[5]

In conclusion, therefore, this micro-study of the 1962 to 1963 nuclear weapons crisis demonstrates the vital importance of open archives to provide a more thorough understanding of the nature of Canadian-American relations during the Cold War. Scholars examining the

bilateral association are divided into two general factions. One group led by John Herd Thompson and Stephen J. Randall contends that a general ambivalence marked dealings between Ottawa and Washington after 1945, particularly from the American side.[6] The opposing group led by Robert Bothwell argues that the bilateral connection reflected a special bond or unique partnership between the two countries.[7] The tumultuous events in the closing months of the Diefenbaker government conclusively demonstrate that Canada was anything but "invisible and inaudible" in Washington.[8] Diefenbaker's attempt to adopt autonomous policies threatening to unravel increasingly integrated bilateral defense connections clearly alarmed the Kennedy Administration. In response, Washington launched an unprecedented diplomatic campaign to destabilize the Conservative government and either force Ottawa to accede to American demands or, preferably, to topple Diefenbaker and allow a Liberal government to re-establish the special relationship between the two countries that had prevailed since the Second World War.[9]

Figure 2. President John F. Kennedy Meets with Prime Minister John G. Diefenbaker of Canada and Others. White House Photographs. Canadian Prime Minister John Diefenbaker and Secretary of State for External Affairs Howard Green visited Washington to meet with United States President John F. Kennedy on February 20, 1961. In office only a month at this point, Kennedy pressed his counterpart on Canada's willingness to acquire American nuclear warheads for weapon systems Canada had acquired to fulfil its NORAD and NATO obligations. Diefenbaker, conscious of strong opposition within segments of the Canadian electorate to nuclear weapons, and Green, a strident champion of international disarmament, played key roles in the Progressive Conservative government's ultimate refusal to station nuclear weapons in Canada, and the Diefenbaker government collapsed over the issue in February 1963. In the photograph, seated (left to right) are Kennedy, Diefenbaker, and Green. Standing behind them (left to right) are US Secretary of State Dean Rusk, Canadian Ambassador to the United States Arnold Heeney, and American Ambassador to Canada Livingston Merchant. (Photograph by Abbie Rowe. AR6363-A, John F. Kennedy Presidential Library and Museum, Boston. https://www.jfklibrary.org/asset-viewer/archives/JFKWHP/1961/Month%2002/Day%2020/JFKWHP-1961-02-20-C?image_identifier=JFKWHP-AR6363-A. Photograph is in the Public Domain.)

[1] "The Nuclear Arms Question and the Political Crisis Which Arose from It in January and February 1963," Douglas Harkness Papers, MG 32 B19, Volume 57, Library and Archives Canada.

[2] Janice Cavell, ed., *Documents on Canadian External Relations, 1962-1963*, Volume 29 (Department of Foreign Affairs, Trade and Development Canada, 2013).

[3] Legere to Kennedy, January 21, 1963, National Security Files, Box 225, File NATO, Weapons, Cables, Canada, 12/61-11/63, part 1, John F. Kennedy Presidential Library.

[4] Green to F. Green, January 13, 1963, Howard C. Green Papers, Series 593-E-6, File 6, City of Vancouver Archives.

[5] Green to F. Green, February 3, 1963, Howard C. Green Papers, Series 593-E-6, File 7, City of Vancouver Archives.

[6] John Herd Thompson and Stephen J. Randall, *Canada and the United States: Ambivalent Allies*, 4th ed. (University of Georgia Press, 2008).

[7] Robert Bothwell, *Canada and the United States: The Politics of Partnership* (Twayne, 1992).

[8] Edelgard Mahant and Graeme S. Mount, *Invisible and Inaudible in Washington: American Policies towards Canada during the Cold War* (UBC Press, 1999).

[9] "'Tossing a Match into Dry Hay': Nuclear Weapons and the 1962-63 Crisis in Canadian-American Relations," *Journal of Cold War Studies* 16 (4) (2014): 5-34.

6. Use of Archives in Nuclear Arms Control and Disarmament Research

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In exploring Canada's activity in promoting nuclear arms control, non-proliferation and disarmament, my research involved consulting academic, think tank/foundation, media and government sources. Among the government sources consulted were online archived documents – reports and analyses on Canada's historic role in this area of foreign policy. As this research moves forward, in order to make comparisons with Canada's current activity with that of the past, further archival consultation will be required. These documents reveal the context within which Canada found itself active in promoting arms control, non-proliferation and disarmament (such as during the Pierre Elliot Trudeau government and the post-Cold War 1990s when nuclear weapons played less of a role in states' national security strategies). Archival material, including standing committee reports, provides a view of the role of specific actors within such contexts, such as key players in Foreign/External Affairs Canada.

The context revealed in these archival documents demonstrate the interplay of actors and other variables within the domestic and international environment. This interplay is unique

and circumstantial, shaped by the important issues and events of the time, the agendas of the key actors in promoting (or stepping back from) active arms control and disarmament, in addition to other influences such as public opinion. Essentially, these materials capture a snapshot of where the issues and actors stood at that point in time, providing a comparison for the unfolding of events and subsequent shifts in behaviours. These snapshots show a step in the process in which the current state of play emerged; thus, such archival documents provide value to path-dependence and process-tracing methodologies.

Figure 3. Women on steps holding signs “No Nuclear Arms for Canada - Pas d'armes nucléaires pour le Canada,” September 25, 1961. Canada has a long tradition of promoting nuclear arms control and disarmament. (Duncan Cameron. Library and Archives Canada, Reference No. MIKAN 3592131, Ottawa Ontario Canada. https://www.flickr.com/photos/lac-bac/7797421452. Used under CC-BY-NC-ND license.)

The availability of online archival government documents facilitates data collection and encourages further consultation of such reference materials. This is particularly important to scholars located far from the National Capital Region – it saves time from traveling to access hard copy archival documents or sending requests through Access to Information, a convoluted and costly process through the postal system. These online collections are not complete, and thus much valuable information is only available through application requests. It is hoped that with increasing digitization of such documents, the process will be streamlined and researchers may reduce the time required to access the materials.

7. Nuclear Archives and Photography

John O'Brian

John O'Brian is an art historian, writer and curator. Until 2017, he was Professor of Art History at the University of British Columbia. His publications on nuclear photography include *Strangelove's Weegee*, *Camera Atomica*, *Through Post-Atomic Eyes*, *The Bomb in the Wilderness*, and *Atomic Postcards: Radioactive Messages from the Cold War*.

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You cannot talk about archives without also talking about research and inventories and the ghosts that haunt them. Since beginning research on my first book, I have depended on archival resources, a dependency that troubles me. By inscribing my hopes and fears onto archives and what they have to offer, I have also inscribed them onto organizations that have collecting biases. Yet, I could not have written my books and essays without them, nor could I have prepared exhibitions on nuclear photography or written their accompanying catalogues.

Few aspects of the nuclear environment have escaped the camera's gaze. The camera possesses the power of deferred sight, the uncanny ability to make visible what cannot always be seen at the time of an event. Of the millions of photographs taken each day, few stick in the eye. But those that do stick in the eye lodge there for a long time. They mark vividly the destruction of Hiroshima and Nagasaki and other nuclear events. Photography is one of the primary ways, if not the primary way, that nuclear episodes and activities are represented and remembered.

I have worked in nuclear archival collections in Britain, Canada, France, Israel, Japan and the United States. Some years ago, I discovered a photograph in the Imperial War Museum, London, called “Atomic Wreck Peril.” It alerted me to an event I knew nothing about. On August 25, 1984, the French cargo ship *Mont Louis* collided with the German ferry *Olau Britannia* in the English Channel and sank off the coast of Belgium. A grainy photograph, taken at a distance with a telephoto lens, shows the *Mont Louis* listing sharply to starboard before going down. Without that shot, there would no public visual record and reduced public discussion of the accident. With a deadweight capacity of 5,000 tonnes, the *Mont Louis* was transporting 350 tonnes of uranium hexafluoride from Canada to the Soviet Union, where the gas was to undergo enrichment before being sent on to France for use in light-water reactors.

The uranium hexafluoride on board the *Mont Louis* came from ore mined and refined in Canada, but according to a press report “no one knew anything” about its cargo before the sinking. Asked about the risk caused by the collision, the nuclear scientist Yves Lenoir stated that if “the gas came into contact with sea water, radioactivity would be released into the atmosphere.” Beaches in Belgium and France were cleared of people, while the *Olau Britannia*, with 935 passengers on board, continued to its destination of Sheerness, Kent. The ferry experienced only minor damage, it was reported, and none of those on board suffered from radiation exposure. That was the official story, at any rate; it was not reported whether all the lost containers of uranium hexafluoride were recovered following the accident.

A duplicate copy of the photograph “Atomic Wreck Peril” purchased from the Imperial War Museum is now in my personal atomic archive, assembled over the past two decades. The

archive consists of military photographs, press images, snapshots, nuclear postcards, protest pamphlets, record album covers, works of art, exhibition catalogues, civil defence pamphlets, atomic kitsch, and corporate brochures. It contains of over a thousand items that I draw on heavily for my research. Nuclear representation is not only about the past. It is also about the present and uncertain futures.

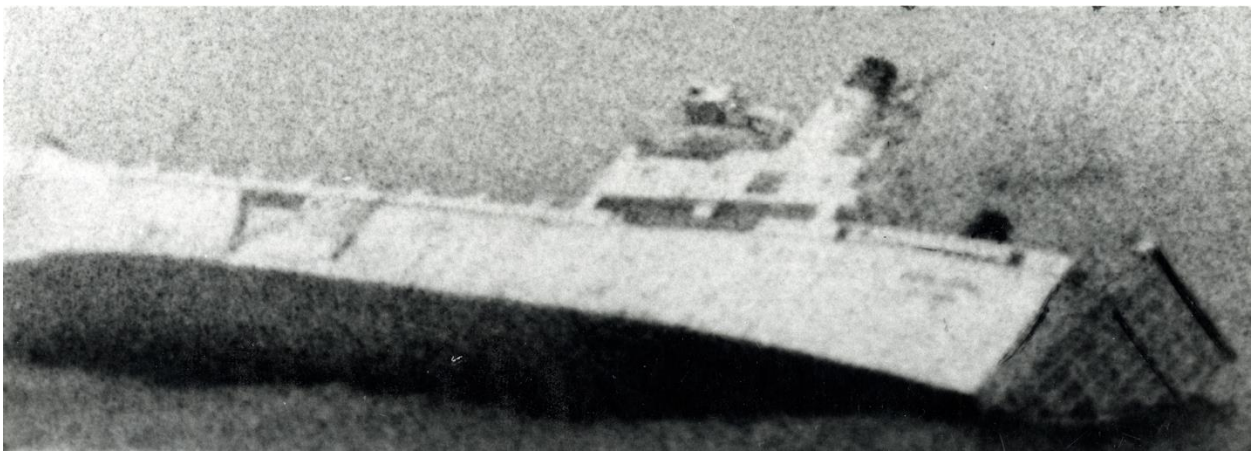

Figure 4. Atomic Wreck Peril, August 25, 1984. Gelatin silver photograph. Collection of the author. (Anonymous. Image purchased for non-commercial use from the Imperial War Museum.)

8. The Rashomon Effect in Risk Communication during and after Fukushima's Daiichi Nuclear Accident: From Lessons Learned to Areas of Future Research

Claude-Yves Charron

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The accident at the Fukushima nuclear complex in 2011 created an unstable decision-making environment in which incomplete information and irreconcilable perspectives converged and confronted each other. By starting with the different stakeholders involved, deploying their different "orders of discourse," as Foucault described,[1] and different narratives, or "intrigues" constructed by each of these perspectives, in Veyne's terms,[2] the stakeholders were sometimes in negotiation and sometimes in conflict. The National Diet's Fukushima Nuclear Accident Independent Investigation Commission (NAIIC)[3] elicited different perspectives and mistakes in communication and in the chain of command, from the Prime Minister's Office (PMO), to the regulators, to the Nuclear and Industry Safety Agency (NISA), and from the electricity producer TEPCO headquarters to the operators on the ground.

The National Diet's NAIIC diagram of the Emergency Communication Protocol offers us a useful frame of reference to understand the risk communication challenges, and the different perspectives involved:

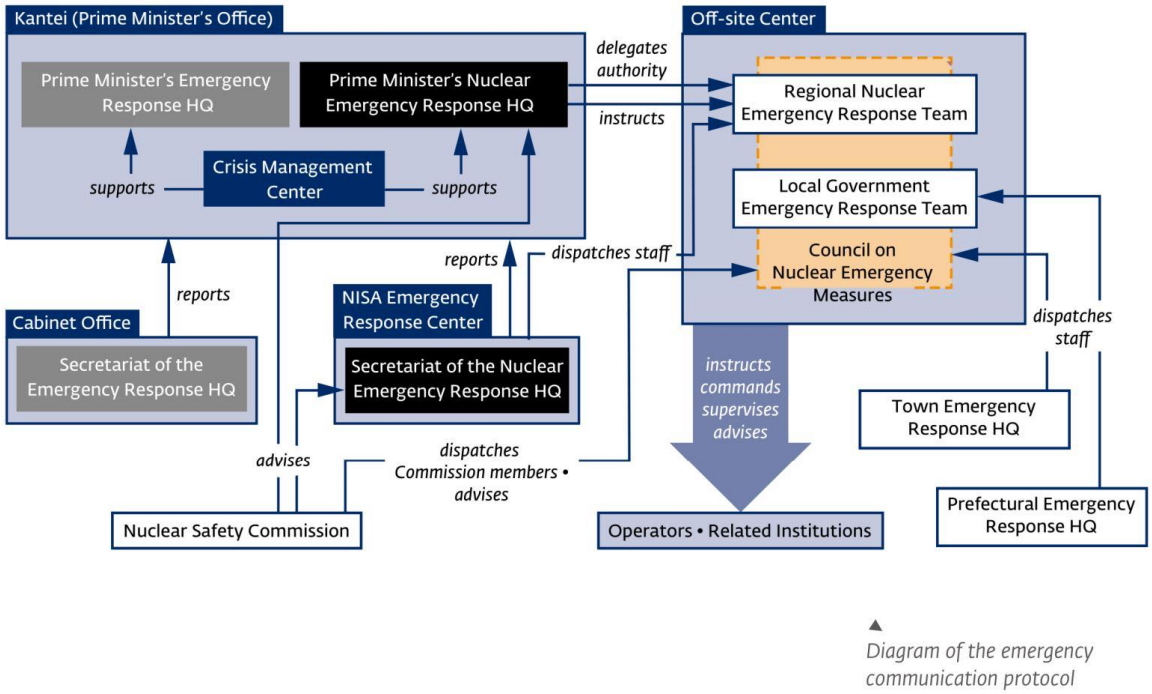

Figure 5. The National Diet of Japan: The Fukushima Nuclear Accident Independent Investigation Commission (NAIIC). (2012). Outline of the organizational framework concerning the nuclear emergency preparedness. (https://www.nirs.org/wp-content/uploads/fukushima/naiic_report.pdf. Used with permission. Rights belong with The National Diet of Japan.)[4]

This emergency communication protocol might be seen as a version of the Rashomon Effect (as Anderson has defined it in 2016),[5] showing how bewildering it was to the various parties but firing up their networks at the same time. And the intense pressure for closure, so essential to the Rashomon Effect, involved very high stakes within Japan's information political

economy. You will see that I shall propose a different kind of risk communication after I have reviewed the post-2011 archives here.

The different archives, from the National Diet Library Great East Japan Earthquake HINAGIKU[6] to TEPCO's "Prompt Report Archives"[7] to the Fukushima Prefecture's Archive[8] and to the Japan's 2011 Disasters Digital Archive[9] and others, and to the different follow up reports of the International Atomic Energy Agency, offer a very interesting framework for future research on this tragedy, and on the on-going efforts on decommissioning the plant. Each archive was implicitly framed in terms of a legitimation process of its own perspective. Some records are open, some are closed. Japan is also following the standard of 30 years set by the guideline of International Council on Archives.

Allow me to mention that this short essay is a work in progress, not yet completed, being conducted with the utmost respect for the different perspectives and the different stakeholders involved. I must understand their different "orders of discourse," and the "intrigues" constructed by and through their different perspectives in this crisis situation. These notes are also submitted with great respect to my friends living there, and for the evacuees who still face considerable challenges. Less than two weeks after the nuclear accident, I had the honor of being named as representative of the Quebec government and posted in its diplomatic offices in Tokyo. I could follow the information flows, with all the uncertainties associated with the many pieces of the puzzle moving around in the media, with unique perspectives in negotiation and in conflict.

All the relevant archives which I am describing were established after the tragedy, during the different investigations, and are maintained and active today, with strong associations with other organizations. A visit to the website of the Diet National Archive will give you an impressive introduction to the complexity and the diversity of the different sources involved, making it a potentially "unified" archive for researchers in the future.[10]

On March 7, 2013, the National Diet Library (NDL) started the full-scale operation of the NDL Great East Japan Earthquake Archive, HINAGIKU.[11] According to its Librarian, Rie Nagasaki: "HINAGIKU is the Searching Portal that enables integrated search and utilization of sound and videos, pictures, websites, etc. about the Great East Japan Earthquake. Its aim is to hand down all records and lessons to future generations and to utilize them for the restoration and reconstruction of the affected areas and for disaster prevention measures." This nickname came from the initial letters of "Hybrid Infrastructure for National Archive of the Great East Japan Earthquake and Innovative Knowledge Utilization."[12] HINAGIKU offers partial access in nine languages. The language of flowers of *hinagiku* (daisy) is "future," "hope" or "compathy." "This nickname reminds us of the purpose of the project for reconstruction support" said the Diet's Librarian, Rie Nagasaki.

The assumption of my essay is that risk communication is at the core of any initiative of risk prevention. And to understand risks for the future we need and the Japanese people need to have a very good historic grasp of what really happened at Fukushima in 2011. Most importantly a good historic grasp requires reliable information in a reliable, stable, open archive. With 23,000 deaths, with many others on the path of slow radiation disease, and

150,000 displaced people, and with the decommissioning of the nuclear stations which still seems to require more and more time, it will be many years before we understand the full consequences of this disaster.

When I arrived in Tokyo in the spring of 2011, I found that many investigations about the nuclear accident were all taking place at once: at the national level, by a Japanese government focusing on TEPCO, by a National Diet investigation parliamentary Commission (NAIIC), and by a private Rebuild Japan Initiative Foundation. Investigations were also being conducted by the International Atomic Energy Agency (IAEA), the American Nuclear Regulatory Commission (NRC), and the Nuclear Energy Agency (NEA) of the OECD. It became a competitive environment, each party trying to capture a different a piece of this fast-evolving cloud of information. Of course, each party was speaking to different audiences and interest groups. Some of the information was just not shared among the parties. This is another meaning of the term *risk communication*.

From the perspective of the IAEA, its focus was on the importance of the lessons learned. As the (late) Director General Yukiya Amano said in 2015: “Some of the factors leading to the Fukushima accident are not unique to Japan… In fact a key reference for the IAEA 2015 Action Plan… is that ‘effective international cooperation is vital.’”[13] From the perspective of the United Nations Office for Disasters Risk Reduction (UNDRR),[14] which staged the Third UN World Conference on Disaster Risk Reduction at Sendai City, Miyagi Prefecture, Japan, they wanted to reduce the chance of reoccurrence of this kind of accident. The Sendai Framework (2015-2030) was adopted by UN Member States on March 18, 2015 at the Conference on Disaster Risk

Reduction.[15] It is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and all stakeholders. Here again, risk communication is at the core of risk reduction, not only for Japan, but for the different UN member states.

Perspective of the National Diet's Nuclear Accident Independent Investigation Commission: Lessons Learned during and after the Nuclear Accident

The most impressive source of information went beyond the technical dimensions of the accidents, and did not remain confidential. That was the Japanese National Diet's "Fukushima Nuclear Accident Independent Investigation Commission" (NAIIC),[16] chaired by Dr. Kiyoshi Kurokawa, a medical doctor, and former president of the National Science Council of Japan. Indicating how very seriously the Japanese political system viewed this accident, this was the first Independent Commission created in the history of Japan's constitutional government.

Kurokawa's Commission held 900 hours of hearings involving 1,167 people and conducted nine site visits. To gain a global perspective, the Commission dispatched three teams overseas, and included interviews and hearings with experts from the US, France, Russia, Ukraine and Belarus. To assure a maximum degree of information disclosure, all of their nineteen Commission meetings (except the first one) were open to public observation, and were broadcasted on the internet, simultaneously in Japanese and English, to a total of 800,000 viewers in both national and international audiences.

Having just arrived in Tokyo, I followed some of these meetings on the internet. The Commission was very impressive to an outside observer like me. The Commission also used social media – Facebook and Twitter – and received 170,000 comments. And to better comprehend the viewpoints of the evacuees, three town meetings were held near Fukushima in order to hear first-hand opinions of more than 400 attendees. They also visited twelve municipalities in the evacuated areas. The web site of the Commission is now closed, but all the information has been transferred to the digital archive of the National Diet HINAGIKU. And both the executive summary and the complete report are still both completely accessible online.[17]

The key criticism in terms of risk communication came from the Diet's Independent Commission, framing the issue as a "man-made disaster" involving the main stakeholders:

> The TEPCO Fukushima Nuclear Plant Accident was the result of a collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly "man-made." We believe that the root causes were the organizational and regulatory systems that supported faulty rationales for decisions and actions, rather than issues relating to the competency of any specific individual… Since 2006, the regulators and TEPCO were aware of the risk that a total outage of electricity at the F Daiichi plant might occur if a tsunami were to reach the level of the site. They were also aware of the risk of reactor core damage from the loss of seawater pumps in the case of a tsunami.[18]

My Perspectives on the Roles of Open and Closed Information

It is popularly imagined outside Japan that important or sensitive information is more tightly held in confidence there than elsewhere in the world. But this accident was unlike anything else which has occurred in Japan since August 1945. A completely new generation with no experience of something on this scale is in charge, in power, and in competition. There

were also completely new audiences or interest groups paying heightened attention. Professional newcomers were responsible to a public which did not know them. So even inside Japan observers soon noticed and commented on a pattern of withholding or avoiding or covering up which is not uncommon in other countries, including Canada.

But with so many lives at risk of radiation exposure, the normal slow pace of administrative interaction would not be acceptable; the pressure for closure mounted hour by hour. As the days slipped by, one could see the mistrust slowly building up from the bottom, just the radiation was leaking from the bottom of the reactors. I was in a unique situation of being an outsider, a diplomatic guest and a scholar. This is why I found the slow appearance of open archives, formed out of sensitive and confidential raw material in closed files, so very interesting. Business as usual in Japan was being turned upside down during this crisis, and the following seasons with all the different private, government and parliamentary investigation commissions.

The complementarity between access to archives and local knowledge, and interviews with stakeholders involved in the field is crucial, because of the multiplicity of the different orders of discourse involved, and their different ways they are framed in Goffman's sense. A leader of the TEPCO headquarters in Tokyo, under intense pressure to make decisions, did not always have the same frame as his key officer on the site.

The Independent Commission, the first of its kind in Japan's history, had access to classified documents, and their different interlocutors during the Commission's work understood that they knew about dissociated perceptions. Most individual external scholars

don't have access to these different frames, but the whole of the Diet's National Archive (HINAGIKU) is dedicated to the accident and provides a frame of reference that is informed by both the open and the closed information.

An enigma remains as to how the Ministry of Foreign Affairs handled its information flow with the American Embassy and all foreign Embassies based in Tokyo, from the "Worst Case Scenario" issue to other sensitive information like the global dispersion of radiated material released from the reactor. This was part of the closed information in the diplomatic order of discourse, but what was conveyed to key parties beyond the open information on the MOFA website?

The pressure of the international media coverage of the accident might have provided for a more important degree of open information than usual. But perhaps due to the scale of the event, the processes it set in motion, the confusion and uncertainty, the coverage was limited to what the key parties were prepared to reveal. For instance, the 400 pages of the 2011 Yoshida Testimony from the key TEPCO manager on the site, was first classified and closed. But after numerous disclosure requests from the media, the government released it in 2014. The Japanese version can now be found in the HINAGIKU Archives, and a French version in Guarnieri and Travadel 2018.[19]

The constant follow-up and collaboration of the International Atomic Energy Agency (IAEA) must have been a plus value here, in terms of the balance between open and closed information at the international level: the Diet's Independent Commission sent teams to

interview nuclear experts in seven countries to get access to broader information and better interpretation of the nuclear forces at stake.

The delicate balance between open and closed information might remain in Japan, just as it does in every country. But to transform the lessons learned here for other countries, a new balance between the open and the closed worlds is required. As the Director General of the IAEA said in Vienna, this risk situation is not limited to Japan alone, neither with respect to its communications problems, nor to the interface between the regulators and the operators.

I was impressed by the publication of Kadota's *On the Brink : The Inside Story of Fukushima Daiichi* with interviews with key actors on the site of Fukushima Daiichi, those who were facing the crisis, the information flow problems, and who had to take decisions under the stress of intense pressure for closure.[20] It provides rich and precious local knowledge, coming from the local stakeholders, hearing their perspectives; it gives them the same importance as the other orders of discourse enabling us to understand the intrigues from their perspectives too. Also of special relevance is the 2017 publication of Jobin's "Nuclear Gypsies in Fukushima before and after 3/11," adding the perspectives and challenges of the on-site workers, during the accident, and the thousands of clean up workers, and his analysis the ongoing collective civil actions and law suits by the evacuees and others in 2020, bringing more perspectives in negotiation and in conflict.[21] I have also included other important academic and media perspectives in the endnotes, trying to illustrate the diversity of perspectives involved.[22]

From Lessons Learned to Areas of Future Research

The next research I would like to explore depends on my hope that some of the closed files would progressively be opened and thus reveal the evolution of the Rashomon Effect between the different perspectives and different orders of discourse involved:

a) An in-depth analysis of the Yoshida's Testimony, and of all the challenges he experimented in terms of risk communication with the different stakeholders involved.[23]
b) A comparative analysis of the conclusion and recommendations of the three official investigations, from the parliament, the government, and the private sector; my follow up would focus on the implementation of these recommendations.
c) A follow up to the conclusions of the 2016 UN University Fukushima Global Communication Program[24] on the risk communication challenges after the nuclear disaster; what has been implemented during this complex recovery process.
d) A follow up of the 2020 Disaster Prevention and Relief Division of the Ministry of Land, Infrastructure, Transportation, Tourism's "*Nankai* Trough Mega Earthquake Operation Plan."[25]
e) A follow up study to the four action-priorities of the UN Sendai Framework (2015-2030) with a special focus on the second one, namely "strengthening risk governance to manage disaster risks."[26]

f) And, even if it would take more time, I would do a follow up study on the communication risk management in each of the stakeholders elicited within the NAIIC's diagram of the communication emergency protocol (diagram presented in the opening of this essay). Have the parties adjusted to the new risk elicited around the forecast for the "Nankai Trough"? The government's Earthquake Research Committee, chaired by professor Naoshi Hirata of the University of Tokyo, announced on February 9, 2020 that the probability of a magnitude 8 or 9 earthquake occurring within the next thirty years in the Nankai Trough had risen slightly from last year from 70 to 80 percent.[27] That forecast creates a much more important risk in terms of earthquake, and consequent tsunamis and nuclear accidents than Fukushima.

In my future research I expect to find a lot of intrigues appearing in other Rashomon Effects with different perspectives in complex and unstable decision-making environments. But through this research we can build on the lessons learned from Fukushima regarding leadership, governance, disaster resilience, and crisis management; perhaps this will steer us away from another "man-made disaster."

The parties caught in the spotlight by the tsunami and reactor accident in 2011 had to mobilize all their resources and constantly calculate the risk to their reputations just to avoid being defeated in the coming contest over information. It was the perceived risk to their credibility and reputation, not simply their chance to score against the other parties, which guided most of them through that period of complete uncertainty. Thus, we might see their risk communication, and the archival record which they were carefully building and guarding, as

being at the heart of the Rashomon Effect in the Fukushima incident, especially in the context of the uncertainties of a next major earthquake and tsunami and other potential nuclear accidents much more important than in Fukushima, related to the "*Nankai* Trough."

Annex I

National Diet Library Great East Japan Earthquake Archive HINAGIKU. https://kn.ndl.go.jp/#/.

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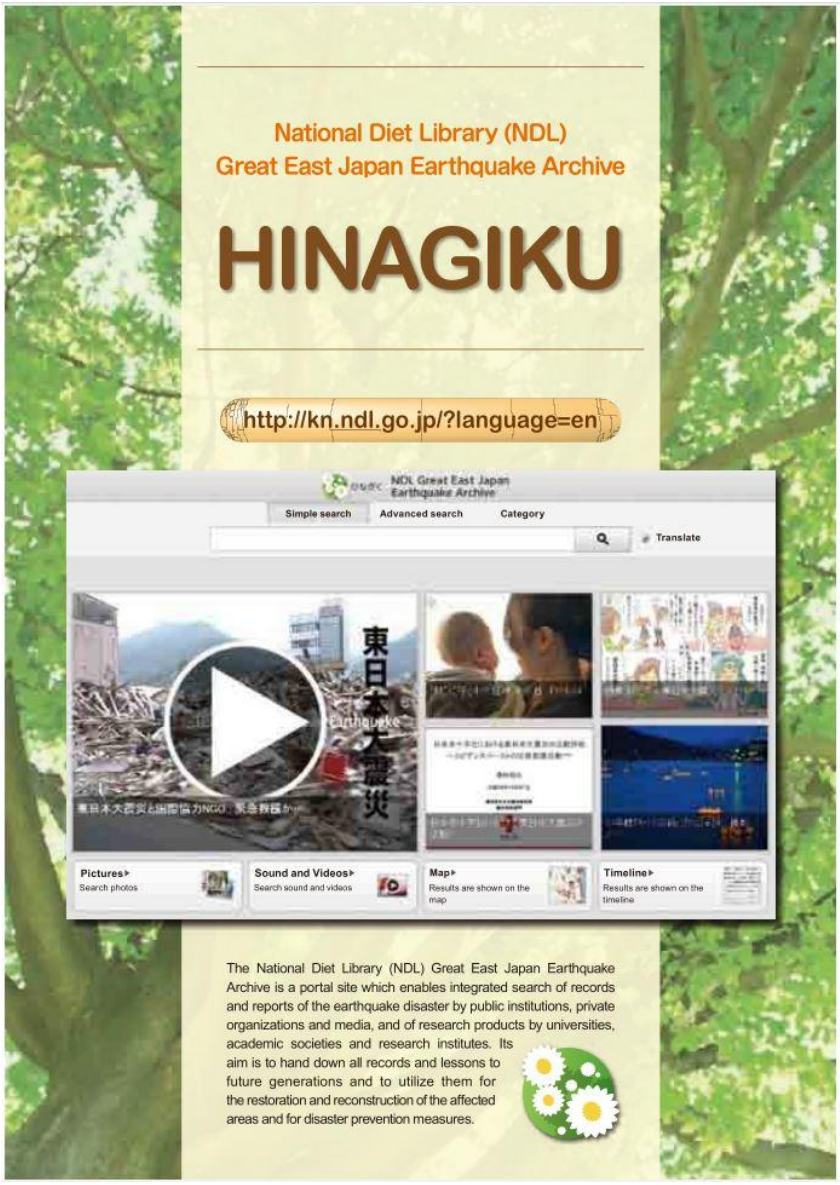
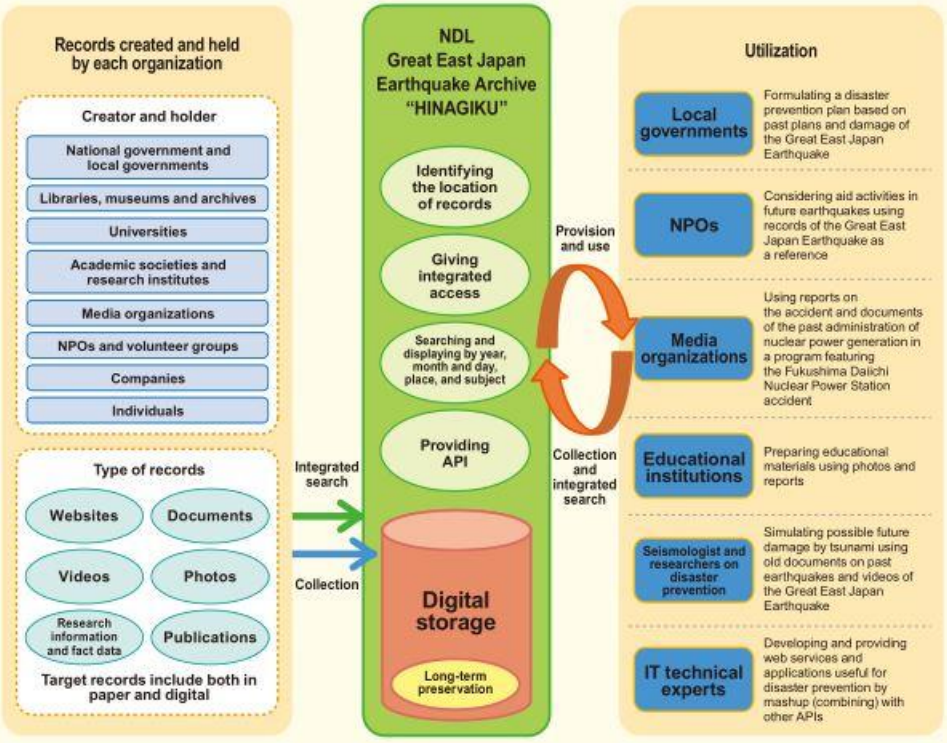


What is the NDL Great East Japan Earthquake Archive (HINAGIKU)?

The "Seven Principles for the Reconstruction Framework[1]" and the "Basic Guidelines for Reconstruction in response to the Great East Japan Earthquake[2]" formulated by the Japanese government emphasized the need to develop a system for collecting, preserving and providing records and lessons of the disaster caused by the earthquake and subsequent tsunami and nuclear accident, and to construct a mechanism for utilizing them in an integrated manner, accessible to everyone around the world.

In accordance with the above national policy, the NDL constructs the "NDL Great East Japan Earthquake Archive" in cooperation with various organizations inside and outside Japan to collect and preserve records of the earthquake for Japan as a whole and to provide them to people all over the world.

Whole image of the NDL Great East Japan Earthquake Archive



*1 Formulated at the fourth session of the Reconstruction Design Council in Response to the Great East Japan Earthquake (May 10, 2011)
*2 Reconstruction Headquarters in response to the Great East Japan Earthquake (The 5th) (formulated on July 29, 2011, revised on August 11, 2011)
You can see the documents above on the "HINAGIKU".

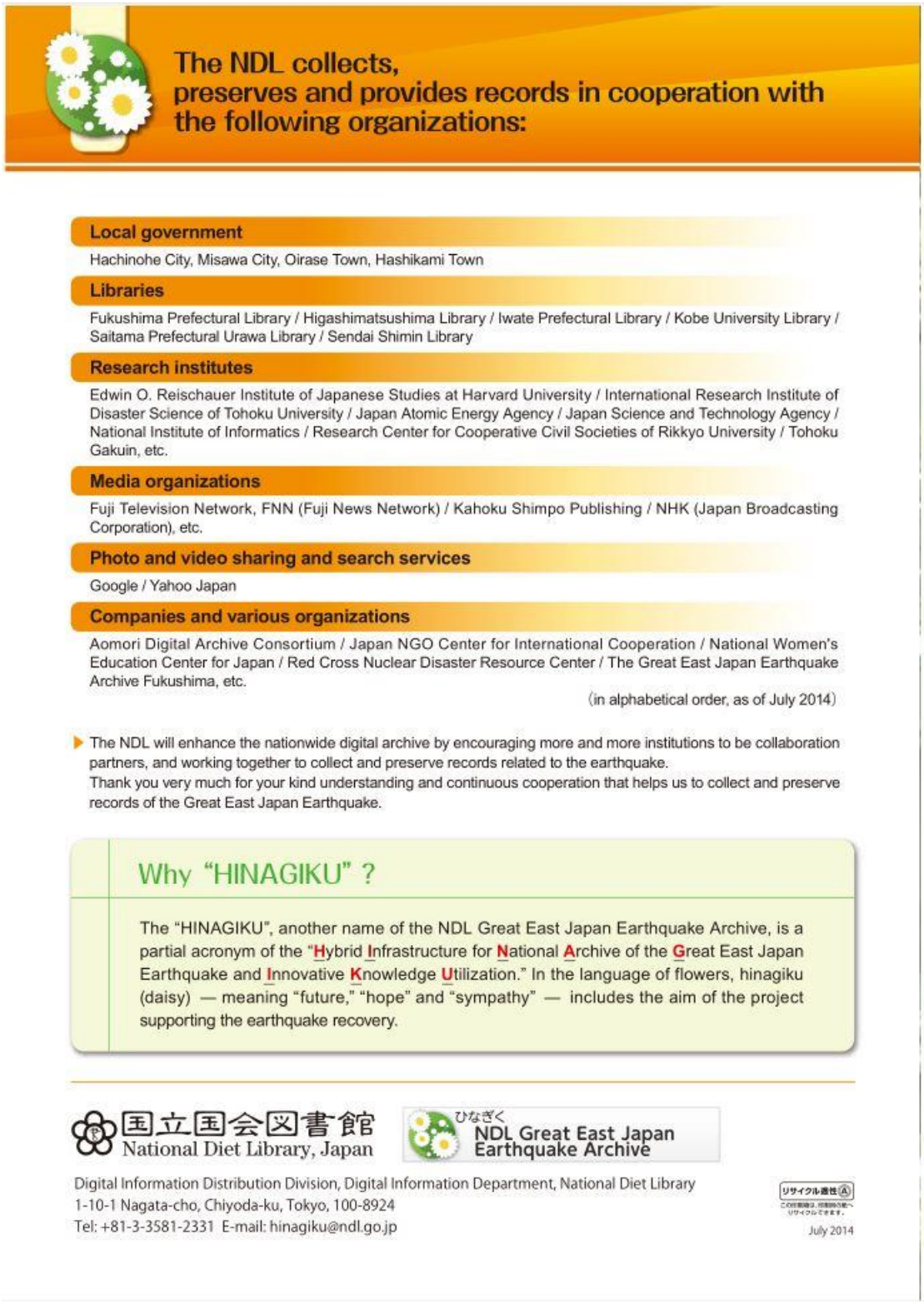
How to use the HINAGIKU

1. Click the NDL Great East Japan Earthquake Archive on the top of NDL website

2. Enter a search keyword

3. Search results are displayed in a list as well as on a map or in a timeline

4. Reports, photos and videos are available
(For some of them, only the index information is available)



The NDL collects, preserves and provides records in cooperation with the following organizations:

Local government

Hachinohe City, Misawa City, Oirase Town, Hashikami Town

Libraries

Fukushima Prefectural Library / Higashimatsushima Library / Iwate Prefectural Library / Kobe University Library / Saitama Prefectural Urawa Library / Sendai Shimin Library

Research institutes

Edwin O. Reischauer Institute of Japanese Studies at Harvard University / International Research Institute of Disaster Science of Tohoku University / Japan Atomic Energy Agency / Japan Science and Technology Agency / National Institute of Informatics / Research Center for Cooperative Civil Societies of Rikkyo University / Tohoku Gakuin, etc.

Media organizations

Fuji Television Network, FNN (Fuji News Network) / Kahoku Shimpo Publishing / NHK (Japan Broadcasting Corporation), etc.

Photo and video sharing and search services

Google / Yahoo Japan

Companies and various organizations

Aomori Digital Archive Consortium / Japan NGO Center for International Cooperation / National Women's Education Center for Japan / Red Cross Nuclear Disaster Resource Center / The Great East Japan Earthquake Archive Fukushima, etc.

(in alphabetical order, as of July 2014)

▶ The NDL will enhance the nationwide digital archive by encouraging more and more institutions to be collaboration partners, and working together to collect and preserve records related to the earthquake.
Thank you very much for your kind understanding and continuous cooperation that helps us to collect and preserve records of the Great East Japan Earthquake.

Why "HINAGIKU" ?

The "HINAGIKU", another name of the NDL Great East Japan Earthquake Archive, is a partial acronym of the "Hybrid Infrastructure for National Archive of the Great East Japan Earthquake and Innovative Knowledge Utilization." In the language of flowers, hinagiku (daisy) — meaning "future," "hope" and "sympathy" — includes the aim of the project supporting the earthquake recovery.

国立国会図書館
National Diet Library, Japan

ひなぎく
NDL Great East Japan Earthquake Archive

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July 2014

Annex II

From NHK World Prime, the documentary, 3/11 – The Tsunami : The First Three Days:

> Using footage shot at the center of the March 2011 Great East Japan Earthquake and tsunami, we bring you a story of horror and heroism during one of history's worst catastrophes. Vast areas along Japan's Pacific coast were devastated. Entire communities were washed away and residents were forced to evacuate. An accident at the Fukushima Daiichi Nuclear Power Plant created a radioactive no-man's-land. But in the days that followed, amid the chaos and confusion, countless people sprang into action to assist victims and search for survivors. [28]

The author acknowledges, with deep gratitude, on-going discussions and exchanges with the editor of this collection Robert Anderson over many years, and his specific comments on this essay.

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9. Mining the Mining Archives

Sachiyo Kanzaki

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It was 2013, post triple-disaster in Fukushima. I chose my postdoctoral subject: the Japanese nuclear facilities and regional development. I make some phone calls, pack a bag and move to Saskatchewan for a year to work at the International Centre for Northern Governance and Development (ICNGD) at the Johnson Shoyama Graduate School of Public Policy. Since I had already worked on part of the Canadian mining industry (asbestos), I knew the Japanese nuclear industry could not exist without Canadian yellow cake, since Japan has no uranium mines. So, Saskatoon was undeniably the best place to access archives on the subject.

Indeed, in Canada, Saskatchewan was the best place to conduct my research. During World War II, Canada participated in the Manhattan project by providing refined uranium to U.S. facilities, though it was rather the uranium from the Shinkolobwe Mine in Belgian Congo that was used for the atomic bombing of Hiroshima and Nagasaki as it filled most of the requirements at the beginning of the project.[1] During the Cold War, Saskatchewan became the major provider of uranium for Western countries, and Canada has been the largest exporter of uranium ore in the world until 2009, when Kazakhstan took the lead. It goes without saying that Canada has been Japan's largest uranium partner over a long period.

However, as is the case for anyone working in the field of nuclear policy, it is not always easy to access all the necessary archives, for military and political reasons. In Japan, the Act on Access to Information Held by Administrative Organs only came into effect in 2001, but it was then followed by the Specially Designated Secrets Act (SDS) in 2013, allowing the government to restrict disclosure of sensitive information. This is why many researchers working on Japan rely on American-disclosed archives to study Japan's nuclear policy. Having limited time to undergo my postdoctoral research and considering the accessibility of archived documents, I had to carefully choose a topic based on feasibility in terms of collecting materials.

Before the Fukushima nuclear accident, with the assistance of the electricity companies, fifty-four operational nuclear reactors were installed in eighteen different power stations in Japan. Forty-four municipalities had nuclear power plants or related facilities. In the 1970s, most of them accepted these facilities described as "clean and innovative" in the hopes of developing their region. At the time, the Japanese government viewed their construction as another way of solving the country's unbalanced regional development. During the ten years preceding the beginning of operation of a nuclear power station, the host and surrounding municipalities received each year, through prefectural governments, grants of 44.9 billion yen (about five hundred million dollars), and after the construction, two billion yen (about twenty million dollars). The host municipalities were believed to be well-off thanks to these grants, subsidies and revenues from electric companies and fuel taxes, as long, of course, as there were no accidents causing loss of life or municipal ground, like in the case of Fukushima Daiichi. However, some of the host municipalities had financial difficulties even before the Fukushima

accident, and this impact on regional development was the starting point of my postdoctoral research. Any reactor has an age limit, and no money will be given to the municipalities after twenty-five to forty-five years of operation. Therefore, they usually sought the installation of another reactor in their municipality in order to secure further funds. This cycle of dependency is problematic considering the use of the budget for “regional development.” Sifting through the central government's archives, it became clear that the problem was rather caused by the fact that the construction period inflated the municipal budget enormously, and then reduced it dramatically once the reactors started to operate. However, ten years was enough to change the socioeconomic situation of a municipality, and it would become difficult to adjust later. The regional development grants were used for construction projects such as amusement parks, museums, *onsen* and even hotels. But there was a maintenance cost attached to these infrastructures that caused severe budgetary burdens for smaller municipalities. Since the money they received was for their “necessary development,” it could not be accrued and had to be used during the same fiscal year. With changes to applicable laws in 2003, municipalities could use the “regional development” related funds to pay their employees and maintenance fees. However, by doing so, the municipalities became more dependent on the allocated funds from the central government. As such, today, almost any expense can be budgeted as a “regional development” expenditure. The focus during my fieldwork was the social impact of these policies.

During my fieldwork in Japan in 2014, I could easily reach most of the municipal budget-related information in the national archives. However, when looking at the social

impact of the installation of nuclear facilities, at the local level, there was little information available at the National Diet Library. This was because the construction of nuclear facilities in rural areas began in the 1960s, and the national archives do not hold the old municipal publications, nor the small-scale citizens' publications. Therefore, it became necessary to visit the municipalities I was working on. The locations chosen to install nuclear power plants happened to be generally dependent on the farming and fishing industries, and had been suffering from rural exodus. In other words, the reactors were installed in the countryside, in remote regions, away from large cities. This explains why the Tokyo Electric Power Company (TEPCO) has no nuclear plants in its service area, but has one in Fukushima and another in Niigata where the local electricity is provided by Tohoku Electric Power. Some see this structure as sharing similarities with colonial exploitation models. It could also be compared to the situation in Canada, where some of the electricity produced is not used by its own population but for export purposes, and where yellow cake is produced in a province that doesn't have nuclear power stations.

As a postdoc, I had a chance to live in Saskatoon, in the heart of the Canadian uranium mining industry, where Cameco's headquarters are situated. At the airport, I was welcomed by a picture on the wall proudly explaining Saskatchewan's contribution to the nuclear industry and by a monument, the Blairmore Ring, in homage to Saskatchewan's potash miners.[2]

My fieldwork in Saskatchewan wasn't easy. Not because of the accident that happened in Fukushima, but rather because, at the time, some northern Saskatchewan sites

were chosen for nuclear (radioactive) waste management, raising the population's concerns around nuclear issues. As for uranium mining in Canada, to my surprise, there was not much in the archives at the time. I learned uranium mining nowadays is closely related to northern Indigenous communities, but there were not many documents in the archives on the subject either. The only way to find more information about the contemporary uranium industry was from the mining companies themselves. But even so, it was difficult to get my hands on actual uranium mining documents as they are considered trade secrets. Also, the inaccessibility of the sites limited my fieldwork. Fortunately, I could visit Pinehouse, a northernmost municipality of Saskatchewan, accessible by Highway 914 which is the only road that passes through the community. Pinehouse is the only established community along this road and uranium mines are accessible almost only by airplane. In addition, in the field in general, in Canada just like in Japan, the fact that I am a woman still capable of bearing children limited my access to these sites. In Japan, the masculine nature of this industrial sector limited even my ability to stay in a private hotel in a northern municipality that did not have rooms or toilets for women.

In Japan and in Canada, I couldn't help but notice some similarities. Perhaps the most obvious was location. The municipalities I visited in Japan were in remote northern regions. The largest city in the province, Saskatoon is higher up North compared to other major Canadian cities. That said it represents "the south" of the province, compared to the Northern Saskatchewan Administration District[3] which encompasses the entire northern portion of the province starting roughly north of Prince Albert National Park (approximately forty-nine percent of the province). There are over forty communities, representing less than four percent of the

province's population,[4] with a high proportion of Indigenous people. Another similarity is in the socioeconomic impact. Both the uranium mines in Canada and the nuclear facilities in Japan became important local job providers. Traditionally, northern and northeast Japan has provided seasonal rank-and-file workers called *dekasegi* (literally, working away from home) to Tokyo and its surrounding factories, but the presence of nuclear facilities in these areas has reduced the number of *dekasegi*. There are also similarities on the social level. The Japanese communities have divided opinions on the presence of nuclear facilities, and Northern Saskatchewan communities have divided opinions on the nuclear waste management.

Uranium mining in northern Saskatchewan was nationalized in 1943 and the federal crown corporation Eldorado Mining and Refining Limited was created in 1944, later to be renamed Eldorado Nuclear Limited. This nationalization policy was lifted in 1948, after World War II, and mineral exploration to find new deposits in the Athabasca region came back in force. With the opening of several mines, the Saskatchewan government established a community, Uranium City, to service the uranium mines in the Beaverlodge area. The provincial government took the company town of Arvida in Quebec as a model town instead of keeping the small mining settlements separated.[5] The population of Uranium City grew; at the time of the two-hour visit of Prince Philip during the Queen's tour in 1959, the mining community was already at 4,500 residents. I looked for recent information on Uranium City in the archives during my postdoc, but did not find much about it. I found more information on the private websites of former residents than at the university library.

The access to Uranium City is usually only possible by airplane, or by Saskatchewan Highway 962 during the very limited time when the ice road opens over Lake Athabasca. Either way, access is not easy. Flights are not so frequent, and its one terminal airport, with no amenities such as shops or wireless internet, is ten kilometres away from the city. If you choose the ice road, you have to plan for gas, food and somewhere to sleep in a -30 degrees Celsius environment. The distance is approximately 824 kilometres by airplane and 1,237 kilometres by car. The city was closed in 1982 with the closure of the mines, and most residents left. There are many former residents of Uranium City in Saskatoon, so I could gather some further information. For those who were still children when they left, the closure of the city was unexpected. Having played an important role during the Cold War, and for the development of the domestically produced CANDU reactor, Uranium City's population declined suddenly with the shutdown of the mines announced at the end of 1981. Most of the population fled before the shutdown itself, not so long after the replacement of Uranium City High School by the newly built Candu High School in 1978.

Before this happened, in 1968, there was a major uranium discovery at Rabbit Lake on the eastern rim of the Athabasca Basin. The mine, opened in 1975, became the longest uranium producing operation in the province until suspending its activities in 2016. It had been operated by Cameco, a merger of the crown corporations Eldorado Nuclear and Saskatchewan Mining Development Corporation. Cameco started the McArthur River/Key Lake operation and opened the Cigar Lake Mine on the same side of the Athabasca Basin where some other uranium mining projects were on the way, such as the McClean Lake Mill.

In the meantime, a new mining model had appeared in Canada. Because of the advancements in technologies related to mining and the environmental and cost issues, there were no new mining "towns" established after 1970.[6] Before this shift, the opening of a mine meant the creation of a community that develops, over time, a local market and various installations to provide the community with goods and public services. However, such a community ran the risk of meeting the same fate as Uranium City. To avoid such outcomes, miners now periodically commute by plane from nearby communities.

Today, hiring from nearby communities implies an increase in Indigenous labour in the uranium mines of Saskatchewan. In addition, because of the land and resource claims from the Indigenous communities and the importance of local employment, more and more Indigenous people are encouraged to work in these mines. Indigenous communities have been ignored in negotiations on natural resources exploration for a long time. The federal government began to show recognition for Indigenous land claims in 1973, following the Supreme Court's decision in the Calder case. Specific land and resource claims have been progressing since the 1990s. Projects related to natural resources, such as mining, now require a tripartite cooperation; the mining company and the government have to establish a partnership with Indigenous communities. Therefore, many aspects of today's uranium mining industry differ from the days of Uranium City.

In the Northern Saskatchewan narrative, mining became a part of life. Job creation is crucial in the region, and mining creates a significant number of jobs for the remote Indigenous communities. Even though the new fly-in fly-out system requires a particular lifestyle, the

northern population rather value the opportunity to work. Ironically, a part of the workforce committed to this “three weeks in a mine, two weeks at home” way of life already experienced Canada’s notorious residential school system. So, the increase in employment is seen as positive, but it is mostly at the entry-level positions[7] in the mining companies, far from the headquarters situated in big cities. And so, in the global energy supply chain, even though nuclear technology is considered a high-tech industry for both the northern Saskatchewan yellow cake and the Japanese coastal town activities, similar issues are raised in these communities given the structural “centre vs. periphery” nature of these industries.

During this workshop, in addition to discovering the work of Marissa Bell edited by Laurel MacDowell,[8] I was delighted to learn that there is recent work done on Uranium City by Robert Boschman and Bill Bunn,[9] and that an archivist in Ottawa recently acquired documents from Eldorado Nuclear that could prove to be a veritable treasure trove.[10] Since Canada’s nuclear history began with the discovery of its uranium, archives on its mining could be a significant contribution to research on the subject.

Figure 7. Pinehouse Saskatchewan, July 2014, photo taken by the author (S. Kanzaki).

Figure 8. Rokkasho Japan, February 2014, photo taken by the author (S. Kanzaki).

A humble protest sign (left) in Pinehouse, the northernmost village of Saskatchewan of 1,000 residents. With no nuclear power in the province, northern Saskatchewan has continued to provide yellow cake to Canada and other countries, including Japan which has no uranium mines on its soil. Resource extraction has been related to Canada's colonial history, and nowadays, the Indigenous communities are targeted for nuclear waste management sites. At the other end of the uranium industry, the village of Rokkasho in the northernmost part of Japan's main island of Honshu receives radioactive waste from all over Japan to its nuclear fuel reprocessing facility that is still under construction after more than three decades. The entrance of the local hotel is filled with workers' rubber boots and work shoes (right), contrasting with the promoted clean and innovative image of nuclear technology.

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10. Navigating a Nuclear Past Where Archives Are Missing

Marissa Bell

Marissa Bell is a Postdoctoral Associate in the Department of Communication at Cornell University. She holds a PhD in Geography from the University of Buffalo. Marissa's approaches combine environmental justice, energy geography, and science and technology studies to critically examine community engagement in knowledge production and environmental decision-making, with long standing interest and expertise in nuclear waste policy and practices.

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Situating Process in Spatio-temporal Context

An outsider to geography might think of it as a discipline preoccupied with space, yet as geographers will attest to, the acknowledgement of the deep interconnection between space and time, otherwise theorized as space-time, is what strengthens the perspective while drawing from across disciplines.[1] In-depth examinations of the geographic context of various phenomena are incomplete without looking back in time at how a place came to be, situating an understanding of the place in historic context. The nuclear geographies literature, to which this work contributes, is strengthened and grounded by perspectives which embed themselves in space-time (e.g. see Karen Bickerstaff's work).[2] The question then becomes how to access the past. Through what mechanisms can we access the details of structures, processes, and institutions that have influenced what is happening today? Archives are one incredibly important component that scholars from across disciplines have relied on to extract information from the past. I will note here that my use of the term "archive" may differ from an historian's use. Rather than focus on the archive as an institution, I focus on archives as an

accumulation of knowledge and information situated across physical and digital spaces, official and unofficial. Yet, even with this liberal definition of the archive, not all is contained within it. This short essay is a personal reflection on experiences of the contested nature of information contained within the past, where such archives do not unlock the secrets of the past, and where information is not contained within the bounds of archival institutions. The aim is to reevaluate archives from the perspective of gaps in archival institutions, and to begin to think about what challenges and opportunities the future may hold for archival research.

I begin by drawing upon experiences writing about a public health controversy surrounding radiation contamination in the town of Port Hope, Canada, with particular attention to how access to and control of information remains a contested issue. I then call for a reevaluation of what information ought to be valued in the archival format, suggesting an expansion to community histories, and perhaps reflecting on the heavy responsibility of archiving. In doing so, I finally offer some reflections on the "information age," and the dual struggles of accessing the right information (1) where an abundance of information exists (the needle in the haystack/tyranny of transparency),[3] and (2) where the right information is everywhere but nowhere (fingers pointing) stemming from the questions surrounding the burden of responsibility. As historians have articulated far better than I ever could, there is a strong need for understanding the social, geographic, and political economic context of how we got to where we are today, such that we might learn from the past to inform future decision-making.

The Burden of Responsibility: Whose archive?

As environmental justice scholars have noted, the burden of responsibility often falls to communities to prove contamination and exposure.[4] While governments and corporations have some duty, the burden often comes to civil society to prove that harm has been done to justify action or reaction. The matter of nuclear waste contamination is further complicated when social and political controversies underlie investigations of harm.

In our study of Port Hope, my co-author, David Bell, and I sought to examine the public health controversy surrounding low-level radioactive waste contamination, focusing on the prolonged political and emotional sensitivity associated with the contamination.[5] The work involved assessing the public health controversy around the unresolved scientific debate over contamination. This meant we poured over previous health studies conducted on this issue along with contextual secondary data, to understand the context of the study and their reception, focusing on scientific ambiguity and contestation, and questions of expertise and scientific authority surrounding opposing medical voices. Slowly the work became centered on one of the dominant stakeholders, a community advocacy organization, the Port Hope Community Health Concerns Committee (PHCHCC), who had raised critical questions concerning significant health studies that had been conducted by the Canadian Nuclear Safety Commission (CNSC) and Health Canada, the federal agencies responsible for ensuring health and nuclear safety through specified jurisdictions. The PHCHCC subsequently requested independent evaluations of those health studies conducted by CNSC and Health Canada. However, during the research, we encountered significant difficulties finding the data, the

studies, and the reports and responses that were created and ostensibly made available. Despite the studies being federally commissioned work, the reports were unavailable in official federal archives. We then turned to digital archival sources, again encountering significant challenges in finding the reports; one source would reference another source that would reference yet another source, leading to a wild goose chase in search of the golden egg not to be found. To this day, one of the studies commissioned by the CNSC in particular, for example, remains unpublished and unavailable, which at best is an oversight of mild incompetence, and at worst a deliberate suppression of evidence. From later private communication, we understood that key community stakeholders believed the latter. Together with other data points, other missing data, and institutional attitudes, the situation points to the latter as the basis for distrust and socio-political controversy. The difficulty is that in this age of digital dominance, intentionality can be masked by technical incompetence, error and mishap, as it often is.

While many sources purported that the only remaining copy of the study remained "in the hands of the PHCHCC" who made it publicly available at the time,[6] the broader point is that a publicly funded and publicly relevant study should continue to be widely available under the responsibility of the CNSC and Health Canada, at the very least in digital archives. The fact that the access to this study must rely on a civic advocacy group, such as PHCHCC, archiving relevant public health data and upholding principles of transparency, shifts the burden of responsibility away from federal and corporate actors again to civil society, reflecting the broader institutional burden on communities. This shift in responsibility puts pressure on civil society in

problematic ways and points to the need for broader accountability of archival work in regulated ways. Some of this work continues to be within the purview of public domain, particularly in the information age, which I turn to next.

The Information Age: Where is the Archive?

Technology has indeed transformed the way we relate to information, particularly in the context of working with archives of various forms. One of the significant challenges scholars face is the overwhelming abundance of information existing within a complex convoluted and dynamic digital internet space. Here, there is a need for emphasis on the nature of and difference between digitized versus digital archives. Both digitized and digital archives can rely on computer information systems and be stored online, with the difference being that digitized archives are still within the scope of archival institutional bounds, whereas digital archives need not be, thus the latter is far more widespread and complex to navigate. Within this disorganized internet space sources can hyperlink to other sources and the original source may be misplaced, mis-linked, lost or even non-existent. Strategies can be utilized, such as Boolean search functions and reliance on databases to search for these missing sources, but sometimes the information is simply somewhere on the web and cannot be accessed as there is no hyperlink pathway, or it is completely lost or non-existent. With this abundance of information, it can be difficult to follow the leads and find the information needed. Yet, in the age of transparency and accountability, this abundance can be deliberately produced to make finding the right information next to impossible, something that has been referred to as the tyranny of transparency.[7] When it comes to multiple stakeholders and federal actors responsible, the

opportunity for the obfuscation of responsibility arises, with the directing of attention to alternate actors whose responsibility it might have been to store and make accessible the information. This perceived tyranny of transparency is demonstrated in other informational contexts. In my more recent research on nuclear waste siting in Canada,[8] community stakeholders and advocates perceived the abundance of information as a barrier to being properly informed, with the "overwhelming" "reams and reams" of information, much of it repeating itself from year to year, with residents feeling "snowed under." This is a challenge that needs to be addressed in the coming decades.

The role of the digital platform is complex and presents both challenges and opportunities. The storage platforms present the challenges of an abundance of disorganized data, technically available but not always practically accessible. However, at the same time, there are opportunities for vast quantities of data to be stored, and there are also possibilities for long-term archiving of materials. Many of the hyperlinks referenced in the Port Hope study are likely to be non-functioning by now, often through websites getting updated or shifting their organizational structure. This presents opportunity for internet archival platforms, such as archive.com, the Wayback Machine, perma.cc, UK Web Archive, among others, to ground and make more permanent the ephemerality of the "hyperlink." Some of these are run by private institutions, other by public government or non-governmental institutions. The problem is that there is no standard for archiving, and the archives are inconsistent. Consequently, I argue for a revisiting of archival work, to reimagine how it might shift with the times, broadening in scope, and within a more organized and perhaps more regulated manner.

Reflections on the Future: Broadening Archival Scope

While access to health studies and reports of a scientific nature may continue to be an issue, the Port Hope study also illuminated the ways in which there is a need to archive experiences and perspectives. Of course, these are captured in oral histories, but it is clear from this work, as well as other emerging issues (see for example the West Valley Demonstration Project) in which the oral histories are not being captured and there is a risk that decades of experience and expertise, belonging to members of the public and advocacy groups, may be lost to time. Consequently, I call for an emphasis on what ought to be valued in archival format and for more institutionalized focus on community and oral histories; this would shift the burden away from the communities already burdened with the effects of radioactive contamination to begin with.

The second note relates to the challenges and opportunities of online archival initiatives, from the proliferation of disorganized material to the opportunities for more organized and institutionalized archival work; these extend beyond the information storage and management, but also to potential training for how to utilize such archival sources. Expanding both the types of data that are emphasized in archival work and the ways we store and archive said work, will likely provide more promising prospects for better utilization of archival work. This is imperative for examining not only data produced in the past, but also the context in which it was produced. This could lead to more geographically-sensitive and temporally-informed decision-making for being a more sustainable, just and equitable world.

Figure 9. The oldest refinery of uranium in the world, Cameco, once known as Eldorado Mining and Refining Ltd., is located on the outskirts of the Town of Port Hope in Ontario, Canada. The facility processed and refined weapons-grade uranium, and in this process produced copious amounts of low-level waste that contaminated the local area. It is these activities that have been at the center of radioactive public health controversy in Port Hope, including controversies of transparency around the provision and access to data and studies. (Photographer Robert Taylor, Cameco Nuclear, Port Hope, Ontario_4715, June 20, 2011, https://www.flickr.com/photos/bobolink/5857844634/in/photostream/. Used under a CC BY 2.0 Generic license.)

[1] Doreen Massey, *For Space* (London: Sage, 2005), 61-74.

[2] Karen Bickerstaff, "Because We've Got History Here: Nuclear Waste, Cooperative Siting, and the Relational Geography of a Complex Issue," *Environment and Planning A* 44, no. 11 (2012): 2611-28.

[3] Aarti Gupta, "Transparency under Scrutiny: Information Disclosure in Global Environmental Governance," *Global Environmental Politics* 8, no. 2 (2008): 4.

[4] Institute of Medicine Committee on Environmental Justice, "Toward Environmental Justice: Research, Education, and Health Policy Needs," (1999), vii.

[5] David Elijah Bell and Marissa Bell, "Port Hope Burning: The Trail of Eldorado, the Uranium Medical Research Centre, and Community Tension over Scientific Uncertainty," in *Nuclear Portraits: Communities, the Environment, and Public Policy*, ed. Laurel S. MacDowell (Toronto, CA: University of Toronto, 2017), 250.

[6] Bell and Bell, 250.

[7] Marilyn Strathern, "The Tyranny of Transparency," *British Educational Research Journal* 26, no. 3 (2000).

[8] Marissa Bell, "Energy Justice, Nuclear Landscapes, and Consent: An Examination of Canadian Nuclear Waste Siting," (University at Buffalo, SUNY, 2021), 230-231.

11. Listening to the Radiogenic Community Archive

Sarah Fox

Sarah Fox, author of *Downwind: A People's History of the Nuclear West* (University of Nebraska Press 2014, paperback 2018) is currently a PhD student in history at the University of British Columbia, where she is beginning research under Coll Thrush's supervision into histories of environmental restoration projects in the Pacific Northwest Salish Sea region. Fox holds a Master's degree in History and Folklore from Utah State University and a Bachelors degree in American Studies from the Evergreen State College.

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Archival records of nuclear weapons and power development generated by governments, industries and scientific researchers are important sites for scholarly inquiry in multiple fields. They hold material relevant to historians of science, labour, environment and the body, as well as scholars of Indigenous Studies, Geography, International Studies and Health Physics. Post-Cold War declassification has made a vast number of these records available, yet these newly visible archives remain layered with the manipulations, omissions, assumptions and agendas of nuclear industry overseers.[1] While conscientious researchers can identify many of these shortcomings in these so-called official archives, achieving a fuller understanding of the impacts of nuclear technology requires attentiveness to unconventional archives and alternative epistemologies; in particular, those oral narratives and records maintained by ordinary people living in communities impacted by radiation from nuclear activities.

Since the dawn of the so-called atomic age, Indigenous and rural communities and predominantly working-class bodies have shouldered the health and environmental legacies of

nuclear production, a result of the colonial calculations of nuclear states worldwide.[2] Environmental anthropologist Barbara Rose Johnston observes:

> Actions taken in the name of national security have profoundly shaped both the biophysical nature and sociocultural identity of host communities, creating what might be best termed radiogenic communities. A radiogenic community is produced by the process of radioactive decay: its members are people whose lives have been profoundly affected and altered by a hazardous, invisible threat, where the fear of nuclear contamination and the personal health and intergenerational effects from exposure color all aspects of social, cultural, economic, and psychological well-being. Some radiogenic communities are the end result of a geographic location… Others are formed by occupational exposure.[3]

As I argue in my 2014 book, *Downwind*,[4] residents of these communities draw on varied and intersecting ways of knowing – about environment, food production, health and disease, and place-based history – to make sense of their proximity to nuclear risk. These forms of local knowledge emerge from constellations of relationships and community connections, many of them informed by practices of care: for crops and livestock, for family members, and for the environments that hold these bodies. In many radiogenic communities, economic relationships with nuclear sites or stigma around health issues and radiation exposure have made it unpopular and socially risky to speak out about these topics. Those local people who are willing to share their experiences, documentation and observations can offer critically important evidence about radiation health and environmental changes near nuclear sites, illuminating phenomena that may not be represented in official archives.[5]

In my talk for the 2019 “Future of Nuclear Studies” symposium, I utilized participant observation and oral history methodologies in tandem with traditional archival research to historicize the curious persistence of the Richland High School mushroom cloud mascot, near

the heavily contaminated Hanford plutonium production site in eastern Washington State. In this community, local traditions of pro-nuclear rhetoric and risk obfuscation on the part of government and industry overseers date back to the construction of the Hanford site in 1943. These tendencies have contributed to a flattened understanding among Richland residents of the extent to which their own bodies were made vulnerable in the course of nuclear weapons production.[6]

In 2018, Nagasaki *hibakusha* (atomic bomb survivor) Mitsugi Moriguchi visited Richland and observed the mascot for himself. A local high school student told him she thought the mushroom cloud mascot was important, "because it helps us to remember the past." Through his translator, Dr Norma Field, Moriguchi suggested that placing an image of the mushroom cloud on the floor of the high school gymnasium and hallways was like inviting students to tread on the graves of those who died in the bombing. Reflecting on the student's statement later that day, Moriguchi stated: "She said that it's a good thing that we have that image of the mushroom cloud so that we don't forget it, but that's not sufficient knowledge. I want them to learn, from materials, from historical writings… nuclear weapons have not benefitted human beings."[7] In order to illuminate the ways local people had been put at risk by Hanford operations, I shared the story of Muriel Sears, a Richland resident, mother of three, and Hanford worker, who ingested radioactive promethium-laced orange juice as part of a study by her employer in the mid-1960s; decades later, she developed serious health problems that contributed to her death.

My conference paper concluded that:

> Stripped of its context and plastered onto high school football helmets, the mushroom cloud represents nuclearism as an event contained in time and space, rather than its actuality: a disorderly, ongoing, global dispersion of indefinite toxicity across geographies, genomes, and generations. Mushroom cloud iconography overlooks the cost of over seventy-five years of slow and mobile violence. It is imperative that we consider the deployment of the mushroom cloud through the gaze of radiation-impacted people like Muriel Sears and Mitsugi Moriguchi, for whom radiation exposure is a lived experience.[8]

Increasingly, university archives are recognizing the value of ordinary people's stories of radiation exposure, many of which are being digitized and made available online, allowing scholars worldwide to gain critically important insights about nuclearism's material and cultural effects. The Downwinders of Utah Archive, hosted online by University of Utah's Marriot Library, is an excellent example. Records from legal cases and public hearings – like *Irene Allen et al. v. United States* and the 1992 World Uranium Hearings in Salzburg – are rich sources of local historical, ecological and health impact knowledge.[9]

Knowledge-holders in radiogenic communities often live at the intersection of multiple marginalized identities, and most are dealing with chronic health problems in their own bodies or in the bodies of loved ones. Many Indigenous people impacted by radiation exposure must also grapple with the ongoing trauma of displacement from ancestral lands seized for nuclear production or waste disposal, the often irrevocable contamination of traditional food and water sources, and the loss of community knowledge-holders to premature death from health conditions potentially related to radiation-exposure. For Indigenous nations who have been resisting genocide for centuries, these impacts are exponentially devastating. Nuclear scholars who work primarily in official archives must be cognizant of these legacies, which are often hidden from their view. Researchers working in the radiogenic community archive must be

cautious about engaging in damage-centered research and attentive to community concerns and stated needs.[10] Both forms of record are vital to the field of nuclear studies.

Figure 10. Nagasaki *hibakusha* Mitsugi Moriguchi speaking to a Richland High School student about the "bombers" mascot while Dr. Norma Field translates. Photo taken by the author (Sarah Fox).

Figure 11. The mushroom cloud logo on the floor of the Richland High School's Arthur Dawald Gymnasium. Photo taken by the author (Sarah Fox).

[1] I address problems of accuracy and ethics in official records relating to nuclear development in *Downwind: A People's History of the Nuclear West* (Lincoln: University of Nebraska Press, 2014). These topics also receive careful attention in Barbara Rose Johnston, *Half-Lives and Half Truths: Confronting the Radioactive Legacies of the Cold War*, (Santa Fe: School for Advanced Research Press, 2007). For analysis of the global extent of health and environmental effects due to nuclearism see Arjun Makhijani, Howard Hu, and Katherine Yih, *Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and its Health and Environmental Effects,* (Cambridge: MIT Press, 1995, 2000).

[2] Valerie Kuletz offers a cogent analysis of nuclear colonialism in *The Tainted Desert: Environmental and Social Ruin in the American West* (New York: Routledge, 1998), xv. For additional theory and analysis regarding the intersection of nuclearism and colonialism, see Traci Brynne Voyles, *Wastelanding: Legacies of Uranium Mining in Navajo Country* (Minneapolis: University of Minnesota Press, 2015); Winona LaDuke, Ward Churchill, "Native America: The Political Economy of Radioactive Colonialism," *The Journal of Ethnic Studies* 13,

no. 3 (Fall 1985): 107-132; Robert Jacobs, "Nuclear Conquistadors: Military Colonialism in Nuclear Test Site Selection during the Cold War," *Asian Journal of Peacebuilding* 1, no. 2 (November 2013): 155-177; Danielle Endres, "The Rhetoric of Nuclear Colonialism: Rhetorical Exclusion of American Indian Arguments in the Yucca Mountain Nuclear Waste Siting Decision," *Communication and Critical Studies* 6, no. 1 (March 2009): 39-60; and Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge: MIT Press, 2012).

[3] Barbara Rose Johnston, "Half-Lives and Half-Truths: Confronting the Radioactive Legacies of the Cold War," in Johnston, ed., *Half-Lives and Half-Truths: Confronting the Radioactive Legacies of the Cold War* (Santa Fe: School for Advanced Research Press, 2007), 2.

[4] Sarah Fox, *Downwind: A People's History of the Nuclear West*, (University of Nebraska Press, 2014, http://www.downwindhistory.com), Board member of Consequences of Radiation Exposure-Hanford (https://www.corehanford.org), PhD student in History, University of British Columbia.

[5] I discuss community hostility toward individuals who speak out about radiation health effects in *Downwind*; see 208-9. See also Robert Jacobs, "The Radiation that Makes People Invisible: A Global Hibakusha Perspective," *Asia Pacific Journal* 12, no. 21 (July 28, 2014), online at https://apjjf.org/2014/12/31/Robert-Jacobs/4157/article.html (accessed September 10, 2018). In an August 6, 2020 panel "Managing Nuclear Memory" held on the 75th anniversary of the U.S. bombing of Hiroshima, Dr. Yuki Miyamoto and Dr. Norma Field reflected on the parallels between Richland, Washington, impacted by US plutonium production, and communities impacted by radiation from the 2011 Fukushima accident. Dr. Field asserted that at both sites: "Silence [about radiation impacts] is shaping everyday life." (Author's notes).

[6] See CM Grossman, WE Morton, RH Nussbaum, "Hypothyroidism and Spontaneous Abortions among Hanford, Washington Downwinders," *Archives of Environmental Health* 51, no 3 (1996): 175-76; CM Grossman, WE Morton, RH Nussbaum, "Reproductive Outcomes after Radiation Exposure, Correspondence," *Epidemiology* 10 (1990): 202-203; JR Goldsmith, CM Grossman, WE Morton, RH Nussbaum, et al., "Juvenile Hypothyroidism Among Two Populations Exposed to Radioiodine," *Environmental Health Perspectives* 107 (1999): 303-8; CM Grossman, RH Nussbaum, FD Nussbaum, "Thyrotoxicosis Among Hanford, Washington Downwinders: A Community-Based Survey," *Archives of Environmental Health* 57, issue no.1 (2002): 9-15; CM Grossman, RH Nussbaum, FD Nussbaum, "Cancers Among Residents Downwind of the Hanford, Washington, Plutonium Production Facility," *Archives of Environmental Health* 58, no. 5 (2003): 267-74; RH Nussbaum, CM Grossman, "Environmental Contamination and Health Studies: Conflicts of Interest and Reasons for Community-Based Participatory Studies, Editorial," *Archives of Environmental Health* 58, no. 5 (2003): 261-62.

[7] Mitsugi Moriguchi through translator Dr. Norma Field, Richland, Washington, March 8, 2018, Author's notes. Translation verified in email from Norma Field to Sarah Fox, September 8, 2020.

[8] Sarah Fox, "Rooting for the Bombers: Commemoration, Forgetting, and Ways of Knowing in Richland, Washington," presented at *The Future of Nuclear Studies*, Green College, University of British Columbia, Vancouver, June 3, 2019.

[9] The *Irene Allen et al. v. United States* case was filed on August 30, 1979, representing plaintiffs from Utah, Arizona, and Nevada who believed their health problems were connected to atmospheric nuclear testing in Nevada. I discuss this case in *Downwind*; see p. 13 and 192-5. *Irene Allen et al. v. United States*, No. c79-0515-j, United States District Court for the District of Utah, Central Division, Salt Lake City. 588 F Supp. 247 (1984). The World Uranium Hearings in 1992 brought together Indigenous activists from around the world to testify to the environmental and health effects of uranium exposure. World Uranium Hearings, Salzburg, Austria, September 16, 1992. See testimonies at http://www.ratical.org/radiation/WorldUraniumHearing (accessed July 15, 2020). Downwinders of Utah Archive: https://lib.utah.edu/services/geospatial/downwinders/ (accessed July 15, 2020).

[10] See Eve Tuck, "Suspending Damage: A Letter to Communities," *Harvard Educational Review* 79, no. 3 (Fall 2009): 409-427. For instructive examples of scholarship which attends carefully to the knowledge and accounts of radiogenic communities, see works cited in note 2, as well as: Doug Brugge, Timothy Benally, and Esther Yazzie Lewis, eds, *The Navajo People and Uranium Mining* (Albuquerque: University of New Mexico Press, 2006); Robert Jacobs, "The Radiation that Makes People Invisible: A Global Hibakusha Perspective," *The Asia-Pacific Journal*, 12, no. 31 (July 2014), online at https://apjjf.org/2014/12/31/Robert-Jacobs/4157/article.html; Traci Brynne Voyles, *Wastelanding: Legacies of Uranium Mining in Navajo Country* (Minneapolis: University of Minnesota Press, 2015); Rudi H. Nussbaum, Patricia P. Hoover, Charles M. Grossman and Fred D. Nussbaum, "Community-Based Participatory Health Survey of Hanford, WA, Downwinders: A model for Citizen Empowerment," *Society and Natural Resources*, 17, no. 6, (August 2010): 547-559. See also Linda Richard's chapter 13 on Hanford in Washington State, in this volume.

12. Sociologist-Spy in the Atomic Archive

Lindsey A. Freeman

Lindsey A. Freeman is a writer and sociologist. She is author of *This Atom Bomb in Me* (Redwood/Stanford Press, 2019) and *Longing for the Bomb: Oak Ridge and Atomic Nostalgia* (University of North Carolina Press, 2015). Originally from atomic Appalachia, Freeman teaches on top of a sci-fi mountain in Canada in the Sociology & Anthropology Department at Simon Fraser University, Vancouver British Columbia.

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In this research, I employ the popular Benjaminian tool of "brushing history against the grain."[1] My sensibilities and sociological training demand this effort, although, my relationship to Oak Ridge, Tennessee, the "Atomic City," at times makes this practice uncomfortable. The folks I have spoken to during my fieldwork, who have been so kind and generous, have given me coffee and cookies and told me stories, will not universally agree with what I have written about their city. It might cause some sore feelings and tense conversations. I am prepared for the splinters I will incur from brushing this history against its grain, hoping that Adorno is right that "the splinter in your eye is the best magnifying glass."[2]

This is the burden of the sociologist, the burden of the outsider who studies a place. In the opening pages of *Let Us Now Praise Famous Men*, James Agee goes so far as to call himself a "spy." The spy metaphor pops up again in Peter Berger's *Invitation to Sociology*. My relationship to Oak Ridge has sometimes felt this way. My insider-outsider status (I was born in Oak Ridge, my mother grew up there and my grandparents lived there since 1943 and the secret city days of the Manhattan Project) has occasionally made me feel like a double agent,

critical and understanding by turns, as I have tried to make sense of this place as it confronts its atomic past and nuclear legacy. I feel this most when I'm in the archives.

In following Walter Benjamin, I have tried to develop a kind of "mental atomic fission" and a way of looking at multiple time periods simultaneously, where patterns of social practices and social outlooks could be observed.[3] This is not possible without access to large amounts of documents. By spreading out files, I have found in the secret city of Oak Ridge what Italo Calvino found in his *Invisible Cities*: "The city is redundant: it repeats itself so that something will stick in the mind" and also that "memory is redundant: it repeats signs so that the city can begin to exist."[4] From the archive to my grandfather and grandmother – to my mother and uncle, to me – some of the stories of the Atomic City repeat. As Walter Benjamin writes in "The Storyteller": "Memory creates the chain of tradition which passes a happening on from generation to generation." Although each new storyteller tells the story of the happening a bit differently, "traces of the storyteller cling to the story the way the handprints of the potter cling to the clay vessel."[5]

In my years of studying Oak Ridge, I have visited touristic sites such as museums and monuments, but I've also visited moth-balled nuclear factories; I've been chased by squatters out of the aging Oak Ridge Guest House, now known as the Alexander Inn, which housed traveling dignitaries and star atom splitters during the Manhattan Project; I've tramped through the woods getting brambles stuck to my jeans to get a look at ruins of the former trailer park community, where the Manhattan Project construction workers were housed; and I've also done less dramatic things, like going to the archives and drinking coffee with my grandmother

in her Manhattan Project era house, while she told me stories. This research attempts to understand and articulate not only one small city's connection with the Bomb, but also to provide a piece of a larger story that remains to be written: the story of the American relationship to the decline of the Atomic Age.

[1] Walter Benjamin, "On the Concept of History," in *Selected Writings, vol. 4, 1938 – 1940*, p. 391. Cambridge, MA: Belknap Press of Harvard University Press, 2003.

[2] Theodor Adorno, *Minima Moralia,* p. 50 New York: Verso, 1974.

[3] Theodor Adorno described his friend Benjamin's intellectual abilities as "mental atomic fission" in "A Portrait of Walter Benjamin," p. 230 in *Prisms.* Cambridge, MA: MIT Press, 1967.

[4] Italo Calvino, *Invisible Cities,* 19.

[5] Walter Benjamin, "The Storyteller," in *Illuminations,* pp. 98, 92. New York: Schocken Books, 1968.

13. Reproducing the Techno-Nuclear State in Washington State and Ontario

Linda Marie Richards

Linda Marie Richards has studied nuclear history, human rights, environmental justice, and nonviolence for over thirty years while teaching all ages in the streets and the classroom. She has a PhD in History of Science and teaches in Oregon State University's School of History, Philosophy, and Religion. Her current book project, *Human Rights and Nuclear Wrongs* asks how nuclear weapons and technology shaped what we think of as human rights.

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On a spring day in 1994, the endearingly gruff Dr. Jay Mullen thrust a heavy archive box at me. "You have a degree in science," he demanded, "figure this out!"

I sat down and started to fumble through the box, tentatively pulling out a study or two, seeing them stamped declassified. "You want me to understand the scientific papers?" I stammered, stunned.

"Yes," he said, "make it make sense. Just take the whole damn box. I don't want it in my office anymore. Get it out of here," he barked.

I didn't drive so I carried the box home. I walked with it cradled in my arms; then upon each shoulder for more than a mile and a half while invoking some higher power to be able to decipher the papers in the box. I earned the burden many years before when I first recognized Dr. Mullen's mark of being a Downwinder. From my first day as his student at then Southern Oregon State College, the scar around Dr. Mullen's neck glared ominously at me.

I adored everything else about him. He mesmerized with his stories too farfetched to be real. Such as he used to be a CIA agent, worked in eastern Africa in the 1970s, and was friendly with and spied on Idi Amin. Turns out, it was all true.[1] One day in class he told a story about how he had been paralyzed and his thyroid removed as a teen.[2]

I had to blurt out
"I've seen that scar many times."
He asked, "really?"

His eyes went wide. He asked me to come to his office after class. There, I told him about my vows, first to end war when I was a child and my father was in Vietnam. Then, in 1986, hoping that abolishing nuclear weapons would build enough trust to actually someday end war, I walked on "The Great Peace March for Global Nuclear Disarmament," a nine-and-a-half-month protest from LA to DC. Walking, I learned about the damage nuclear weapons can do at each step, from mining and milling to production, testing, use, and storage. I promised the Navajo, Hopi and Pueblo elders, including Roberta Blackgoat and too many widows of uranium miners, that I would share their stories of contamination, loss, and death with everyone I met. The only vow I could keep.

"Many different types of people, with a scar like yours, told me their stories," I said.

Their thyroid had been removed because the radioactive iodine emitted by fallout and nuclear fission products can concentrate in the gland. I reached in my backpack and pulled out my biological illustration class assignment which was to draw a "web of life." In my macabre sketch, thick black ink arrows, dots and specks tried to convey an anti-web caused by invisible radiation. Iodine 131, radionuclides and rays showered the soil and growing plants, breaking

bonds, only to be eaten by cows, contaminating their bodies. From there, a raised glass of milk poured into a thyroid.

Nuclear technology can do all kinds of unexpected harm. I told Dr. Mullen about how my uncle had been decorated for his heroism in Korea but he lived tortured by his memory of the atomic bombs he was forced to march through, sterilized despite the assurances. My cousins were adopted. Dr. Mullen's office had turned dark like a tomb. Packed with books and papers, it was the quintessential professor's office but now filled with unease.

I finally ventured: "Where did you grow up? Did you live near the Nevada Test Site?"

"When I was a little boy, I lived in Farragut Naval Station, in Idaho," he said.

"You're a Hanford Downwinder. They made plutonium there!" I exclaimed point-blank, unequivocal.

After hearing my own voice sound immutable, like concrete, I was mortified. It took Jay Mullen thirty years to finally understand why a healthy fit nineteen-year-old football player would not be able to move one morning. But in seconds, I watched it all click plainly on his pained face. When children learn to read, there is a light in their eyes as the letters finally make words and the words align to suddenly made sense, a visible gasp shares their awe. I was the midwife of his curse.

We sat quietly
in the irretrievable
pronouncement of it.

I tried to undo it, to mumble it away. “I am sorry, I am probably wrong. There is no way the radiation from Hanford could have ever gone that far, nearly two hundred miles northeast?” We did not fully understand the magnitude of the pollution and the releases yet.

Six or so years later, Dr. Mullen shoved the box at me. Until that moment, science gave my life meaning and order; so unlike the rest of the world. His box was crammed tight with Atomic Energy Commission and nuclear contractors’ declassified radiation studies released in 1986 as part of a FOIA request. These were mixed in with other studies and documents he had collected while strategizing with other Downwinders for medical care or just some semblance of truth or amends.[3]

But I could never decrypt the papers in the box, week after week. The language I loved of science, organic biochemistry and molecular reactions left me mute. Health physics was inchoate. It mathematized risk by inserting unknowns and assumptions into calculus, using derivatives and probabilities to look certain. After my boyfriend died suddenly from a heart arrhythmia in 1994, Dr. Mullen mournfully came to my house to pick up the box. “I am sorry,” I said. “I can’t keep this box of papers anymore. I can’t make this science make sense like science is supposed to. It is all chance with uncertainties, like gambling.” Like life and death.

I suspected radiation health safety was a puzzle on purpose unless you were disciplined as a health physicist. But then, your training might obscure other ways of seeing.[4] Antoine Lavoisier argued chemistry was not a science until it could be clearly explained to anyone. Like him, erudite scientist Linus Pauling argued the Atomic Energy Commission view of radiation

safety was more a construction of ignorance, long before the History of Science had the word "agnotology."[5]

Pauling extensively annotated his copy of the 1957 Congressional Hearings, now in the Oregon State University Special Collections and Archives Center. Pauling highlighted health physicist Lauriston Taylor's testimony. Taylor stated: "Any radiation exposure received by man must be accepted as harmful." Then on the same page, Taylor defined radiation protection standards as "the limits of radiation exposure which the individual or whole population can be exposed without encountering risks incommensurate with the benefits to be expected from its use."[6] This dichotomy disassembles the ideas of what safety means.

A counternarrative to radiation safety science is buried in the bodies of those exposed like Dr. Mullen and my Uncle Vic. It is in the illnesses, diseases, cancers, birth defects, spontaneous abortions and sterility; the mental anguish, suffering and the betrayal of the word "safe." Documents at the UN in agencies like the IAEA and WHO show how a regulatory threshold for intergenerational contamination was accepted, disciplined, inscribed and globally reproduced by UN Technical Experts and academics standardizing practices, education and radiation legislation. The harms of radiation have legally multiplied in time and space.

A vast nukescape from
uranium mining is
in Elliott Lake.

This is the traditional home to the Serpent River First Nations in Ontario. A rocky outcropping, where Serpent River First Nation used to hold ceremonial dances, is stained red by heavy metal toxicity. Most of the other danger is imperceptible. To lose sacred space, sturgeon

fish and the eighteen lakes that are now “uranium tailings management areas,” is unfathomable. Twelve former mines in the area, according to the executive summary of the Canadian Nuclear Safety Commission report (January 2015) caused “irreversible damage” to lands and lakes. However, the Commission also determined that radium, uranium and other toxins materials “are generally below” the Canadian water safety guidelines, and therefore, the Commission states confidentially: “The general public can safely consume fish from the lakes in the region.” [7]

My science degree
cannot make this type of risk
make sense as “safely.”

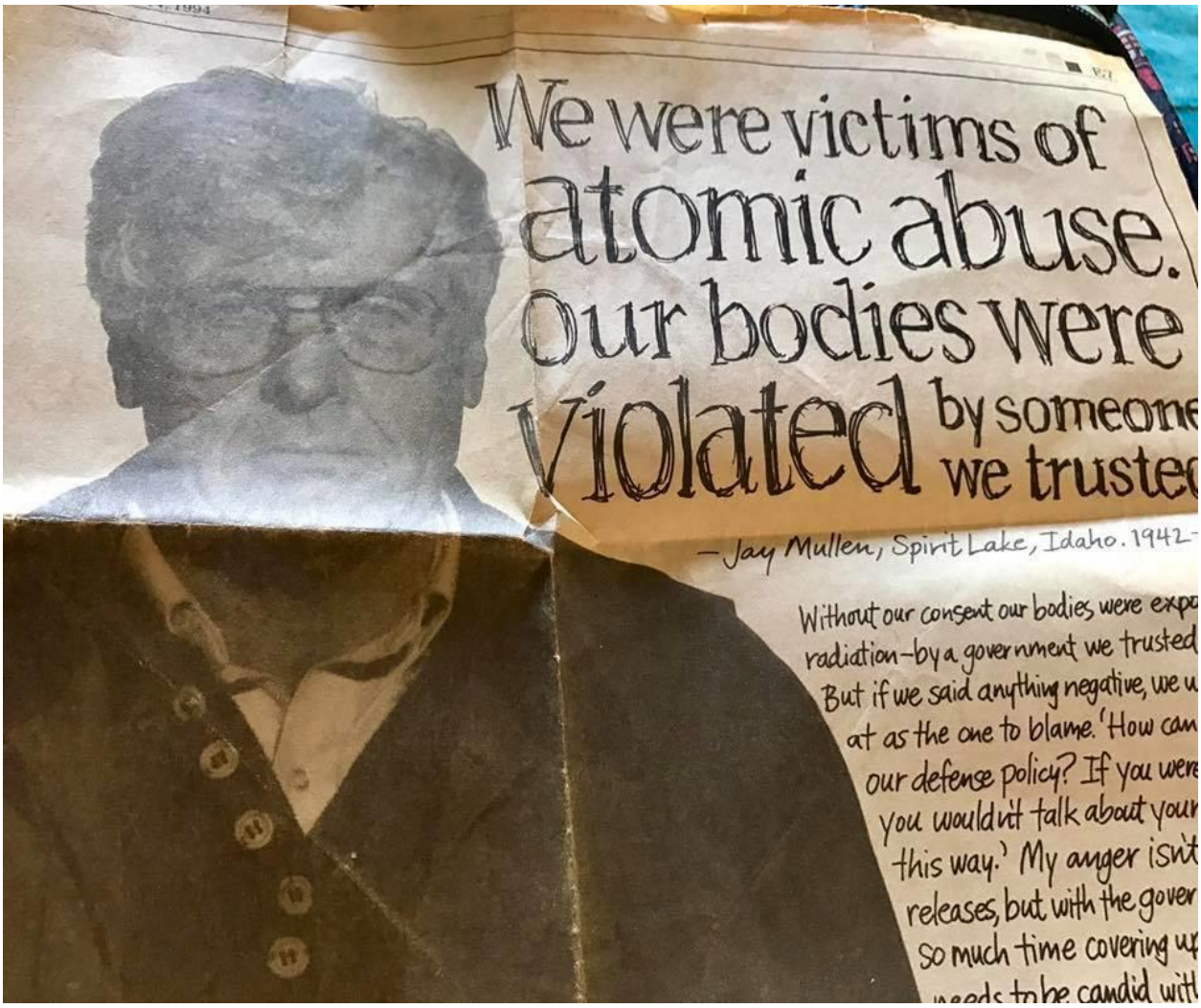

Figure 12. This photo of the late Dr. Jay Mullen is just a part of one of the many full-page newspaper advertisements made by Hanford Downwinders to alert the public about Hanford's legacy of harm from the secret production of plutonium. Mullen displayed several of the ads featuring different Hanford Downwinders during the annual Hiroshima Nagasaki Vigil on the Ashland, Oregon downtown plaza, where he occasionally lectured to educate the public about the harms of propaganda, secrecy and nuclear weapons. (Jay Mullen Poster, Series 1: Donor Materials, Donation #670, Hanford Health Information Archives Collection, AR69-2-0-21, Washington State Archives, Office of the Secretary of State, Olympia, WA. Image is in the public domain.)

[1] Rudy Maxa, "Our CIA Man in Idi Amin's Uganda," *The Washington Post,* January 6, 1980, https://www.washingtonpost.com/archive/lifestyle/magazine/1980/01/06/our-cia-man-in-idi-amins-uganda/264b533a-c029-46fe-8e66-a2e44f9d7a80/.

[2] See Jay Mullan's oral history in Trisha Pritikin, *The Plaintiffs: Voices from the Fight for Atomic Justice* (Lawrence: University Press of Kansas, 2020), 49-55.

[3] Kinsella, William J. and Jay Mullen, "Becoming Hanford Downwinders: Producing Community and Challenging Discursive Containment," in *Nuclear Legacies: Communication, Controversy and the U.S. Nuclear Weapons Complex,* eds. Bryan C. Taylor, William J. Kinsella, Stephen P. Depoe and Maribeth S. Metzler (New York: Lexington Books, 2007), 73-108.

[4] National Science Foundation Award #1734618 supported OSU to collect oral histories from Hanford Downwinders involved in litigation, scientists, and others exposed to radiation in order to give history and science a fuller picture. Learn more at the Downwinders Project Blog, http://blogs.oregonstate.edu/downwinders/

[5] Robert N. Proctor and Londa Schiebinger, eds., *Agnotology: The Making and Unmaking of Ignorance* (Stanford University Press, 2008).

[6] US Congress, Joint Committee on Atomic Energy, *The Nature of Radiative Fall-out and its Effects on Man, Hearings before the Joint Committee on Atomic Energy,* 85th Cong., 1st sess., vol 2. (1957), 828. https://books.google.com/books?id=zRSOsetPM2EC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q=%22Any%20radiation%20exposure%20received%20by%20man%20must%20be%20accepted%20as%20harmful&f=false.

[7] Canadian Nuclear Safety Commission, *History of Uranium Mining in the Elliot Lake Region of Ontario and Associated Effects on Water Quality and Fish Intended for Human Consumption*, January 2015, i, document number: 308 NAT32_VA 6211-08-012 http://142.44.245.8/sections/mandats/uranium-enjeux/documents/NAT32_VA.pdf and in possession of the author.

14. The Subject of Territory: The Body-Archive after Chernobyl

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Accidental Territory, Extended

Most often, the explosion at the Chernobyl Nuclear Power Plant in April 1986 is referred to by one of two terms, used interchangeably: “accident” or “catastrophe.” Among the two, the term “catastrophe” is broader, and it suggests the devastating and damaging outcome of the event. Neither of the terms, however, implies that the tragic outcome is entirely unforeseeable. “Catastrophe” originates from the ancient Greek word καταστροφή, which means “coup,” “the end,” “overthrow,” “death.” The term came from drama, where it stood for a fatal consequence of adverse events that had occurred earlier. Such fatality, for the Greeks, always involved a clear deadly logic and an inevitable trajectory of deployment, the understanding of which, unfortunately, always comes too late; thus, the catastrophe may be unexpected, but only due to the limitation of knowledge or the lack of information. As philosopher Ian Hacking reminds us, the meaning of “accident” changed in the nineteenth century due to what he

describes as “the erosion of determinism” leading to “the taming of chance” through the development of mathematical statistics and probability theory, which led to formulating the laws of random phenomena. He writes:

> A new kind of “objective knowledge” came into being, the product of new technologies for gaining information about natural and social processes. There emerged new criteria for what counted as evidence for knowledge of this kind. The statistical laws that could thus be justified were used not only for description but also for explaining and understanding the course of events. Chance became tamed, in the sense that it became the very stuff of the fundamental processes of nature and of society.[1]

Of course, the very fact that a random event obeys any sort of logic is utterly paradoxical, but this very paradox is inherited and embedded in the scientific and philosophical thought of the following centuries. Since chance was no longer accidental and could be captured by a mathematical formula or calculation, its status changed from non-systemic to systemic: it became a predictable logical part of complex events, even if hiding in plain sight.[2] This new epistemology of chance, that later developed via cybernetics and systems theory, came as foundational for cultural theorist Paul Virilio’s description of the Chernobyl disaster as “the original accident.”[3] Virilio argued that without an accident, we remain unaware of how technology functions. He elaborated by citing French writer Paul Valéry, who observed that “[t]he tool is tending to vanish from consciousness.” “We commonly say that its function has become automatic,” Valéry wrote, so “consciousness only survives now as awareness of accidents.”[4] This reading suggests that the accident functions like psychoanalytic “afterwardness” that initiates a belated understanding or retroactive attribution of meaning to a technology: although created beforehand, it can only qualify as an invention after the accident exposes the whole range of its creative and destructive capacities. Here, Virilio offers

an Aristotelean view of accidents that suggests a non-linear development of technology: “the accident reveals the substance,” in other words, accidents are teleological in how they expose the essence of technical objects through the purpose they serve rather than the cause by which they come to be. Take a shipwreck, Virilio explains, without it, the invention of the ship is incomplete. He writes, “[t]he shipwreck is consequently the ‘futurist’ invention of the ship, and the air crash the invention of the supersonic airliner, just as the Chernobyl meltdown is the invention of the nuclear power station.”[5] Quite symptomatically, “the worst nuclear disaster in history both in terms of cost and casualties”[6] is a representative event of modernity for a particular reason: it contributes to the irreversible convergence of war and peace. Nuclear power stations are the most illustrative example of such convergence – in the United States, in the United Kingdom, in the Soviet Union, or anywhere in the world torn by the Cold War competition for economic and military domination. Their heavy military legacies were often carried onto the present by the stations performing their single or parallel task of serving military research and industries under the typical camouflage of celebratory narratives about the “peaceful atom.”[7] The Chernobyl Nuclear Power Plant (ChNNP) was not an exception. The evidence that its reactors were used for both civilian and military purposes remains persuasive. The clandestine production of weapons-grade plutonium, and that its four reactors’ “most likely military purpose [was] to make tritium, a rare isotope of hydrogen used in thermonuclear weapons”[8] was an open secret even in the Soviet Union despite the popular cover-up narrative about the “peaceful atom.”

By introducing the notion of "risk society" immediately after the explosion of the ChNNP reactor, sociologist Ulrich Beck described a novel sense of emergency characterizing all life processes after Chernobyl in a similar way – as a culmination of technological modernity. Such awareness also implies a state of awaiting when the subject is caught by the inverted temporality of the future accidents determining the past. Living in a "risk society," according to Beck, means witnessing a global increase in the number of man-made disastrous accidents,[9] including technogenic catastrophes that leave irreversible imprints on large areas turning them into ghostly exclusion zones, the *accidental* territories, in the Virilian sense of the word.

In *The Birth of Territory*, political theorist Stuart Elden explores "the emergence of the concept of territory in Western political thought" as "a distinctive mode of social/spatial organization"[10] by reading it against such notions as "land," "terrain," and "territoriality." Let us look closely at each of the notions, traced by Elden. Land is "a relation of property, a finite resource that is distributed, allocated, and owned... Land can be bought, sold, and exchanged; it is a resource over which there is competition."[11] Terrain is "a relation of power, with a heritage in geology and the military, the control of which allows the establishment and maintenance of order. … [It is] something that is acted upon rather than itself active."[12] The definition of territory, according to Elden, is wider and more complex: it encompasses the relation of property, the relation of power, and also, the relation of production and cooperation – in a politico-economic sense, but also, as production and reproduction of life, the active forces of transgression, the complexity of life-sustaining processes of the "new wilderness" and the cooperative assemblages that are forming within it. Then, he goes to elaborate the relation

and difference between the notions of territory and territoriality. Territoriality, understood through "two conflicting traditions: the first biological, the second social": the latter considers the rapid changes of human social organization; the former studies the fundamental biological drives and the forms of animal association crucial for understanding of territory.[13] "Where it is defined," Elden notes, "territory is either assumed to be a relation that can be understood as an outcome of territoriality, or as a bounded space."[14] However, the relation between *territory* and *territoriality* is more complex. When Elden writes that "territory… is conceptually prior to territoriality, even if existentially second,"[15] he suggests that even if the meaning of *territoriality* "has today a rather more active connotation,"[16] it is a concept of *territory* that serves as a condition of possibility that mobilizes the processes associated with *territoriality* understood as "the condition, or status of territory, rather than a mode of operating toward that territory."[17] Thus, *territory* and *territoriality* are not bound by causality, nor they are in any way sequential. Instead, the dynamics of their relation show the patterns of volatile co-existence, where the persistent territorialization is disturbed by unmappable territoriality. *Territoriality*, then, encompasses both deterritorialization, or the process of losing the territory's organization and context, and reterritorialization, or the territory's re-establishing and re-setting, as the two demonstrate a pulsating relation of "the push-pull, almost dialectical, balance."[18] *Territoriality* is that third term without which the map-to-territory relation will remain an unresolvable paradox: it demonstrates an impossibility of mapping a territory that is always unequal to itself – being either smaller or larger than what is mapped.

In this theoretical setting I locate the discussion about the territory of the Chernobyl Zone and its border that *allegedly* bounds *all* – but *certainly*, *not-all* – larger contaminated areas along with a variety of smaller spots marked by radioactive pollution into one single entity. The *territory* of the Chernobyl Zone of Exclusion is the production of a *systemic accident*, now stripped of its accidental nature. Still a work-in-progress, my five-year-long ethnographic project exploring the technological, political, and cultural circumstances of delineating the Zone's border already reveals that this border is anything but a container; even if it was established by the Soviet Armed Forces after the 1986 explosion, then, since 2011, administered by the State Agency of Ukraine on the Exclusion Zone Management (SAUEZM), an agency within the State Emergency Service of Ukraine, and is currently guarded and policed by special units of the Ministry of Internal Affairs. This territory is continuedly deterritorialized and reterritorialized by the agents and processes of *territoriality* that not only destabilize and transgress the territory's borderline, but also disseminate and process its content: contamination. The diverse community of various life forms, the biotic population of the Chernobyl Zone including any human and "non-human people,"[19] who act as the *agents of territoriality*, are the *subjects of territory*.[20]

Biological Citizens, Revisited

"To be in the territory is to be subject to sovereignty," Elden writes: "you are subject to sovereignty while in the territory, and not beyond; and territory is the space within which sovereignty is exercised: it is the spatial extent of sovereignty." Therefore "sovereignty… is exercised over territory: territory is that over which sovereignty is exercised."[21] What might be

true for most cases of political geography is more complicated when it comes to the post-1986 realities after the collapse of the Soviet Union and the nodal status of the Zone bounding the territories of the three former Soviet republics. The dual position of the *agent of territoriality* who simultaneously is the *subject of territory* cannot be changed upon a departure from the contaminated areas. The body of the agent of territoriality is an extension of territory. No matter how far the subject drifts away from the epicentre of the non-accidental catastrophe, the body is marked by a radioactive *trace* of the state's techno-politics, a material *inscription* of the state on the body of the subject to sovereignty. Here the body is occupied or subsumed by the state, and it serves as a realm for the state's territorial expansion on a microlevel of the flesh, biopolitically, governing it towards (un)certain futures.

In a *Manual for Survival: An Environmental History of the Chernobyl Disaster*, historian of science Kate Brown draws attention to how human and non-human bodies as well as various life forms were exploited as part of the complex assemblage of heterogenic entities that cycled and filtered radioactive substances days after the explosion at the Fourth reactor of the ChNPP. She writes:

> The newsreels of the May holiday did not record the actions of two and a half million lungs, inhaling and exhaling, working like a giant organic filter. Half of the radioactive substances Kyivans inhaled their bodies retained. Plants and trees in the lovely, tree-lined city scrubbed the air of ionizing radiation. When the leaves fell later that autumn, they needed to be treated as radioactive waste. Such is nature's stunning efficiency at absorbing bursts of radioactivity after a nuclear explosion.[22]

Understanding the impact of ionizing radiation on health and environment, both in the cases of short-term and long-term exposures, requires the study of many generations. Today, the mounting evidence presented by radiologists, who research "the complex interplay

between exposure, organism physiology and phenotypic response over extended timescales" through the lens of epigenetics, already demonstrates that the changes caused by the impact of radiation in "gene activity and transcript architecture, including splicing variation, that cannot be explained solely by changes in DNA sequence" are heritable over generations.[23] The difficulty of studying such changes is that they could be observed not in the generation that had undergone short- or long-term radiation exposure, but in the performance of genes of future generations; and also, because, depending on the specifics of different cases, these effects could be multigenerational or transgenerational.[24] Even though the logic of its occurrences is still unclear, the fact that the biopolitical epigenetic inscription occurs on citizens' bodies, the extension of the state's territory, is archived in the bodies and is transmittable to other generations. Turning the bodies of the subjects of territory into such an *archive* is an ultimate expression of territorial sovereignty written into the subjects on the level of the flesh. Along with all life forms whose matter is affected by radiation, these human bodies literally *archive* the record of the subjects' short- and long-term encounters with radiation that can be read in DNA sequence, but the comprehension of this record is delayed due to the complexity of time-consuming research. Producing understanding of the record in the bodies done by radioactive depositions requires time: it is significantly slower than the upfolding performance of the *written*. This performance is "a material trace of and a 'material witness' *to* the history of political violence." Such material witness, Susan Schuppli writes, opens a possibility for

> an exploration of the evidential role of matter as registering external events as well as exposing the practices and procedures that enable such matter to bear witness. Material witnesses are nonhuman entities and machinic ecologies that archive their complex interactions with the world, producing ontological transformations and

> informatic dispositions that can be forensically decoded and reassembled back into a history. Material witnesses operate as double agents: harboring direct evidence of events as well as providing circumstantial evidence of the interlocutory methods and epistemic frameworks whereby such matter comes to be consequential. Material witness is, in effect, a Möbius-like concept that continually twists between divulging "evidence of the event" and exposing the "event of evidence."[25]

Soon after the Chernobyl catastrophe, medical anthropologist Adriana Petryna studied "the state's public health and welfare infrastructure where increasingly poor citizens – former and current Chernobyl plant workers and populations resettled from contaminated zones – mobilize around their claims of radiation-induced injuries." She called such social practice that has emerged in Ukraine in the early 1990s, "biological citizenship" (1999): "In Ukraine, where an emergent democracy is yoked to a harsh market transition, the damaged biology of a population has become the grounds for social membership and the basic for staking citizenship claims."[26] For Petryna, the concept of biological citizenship "sheds light on a fundamental practice of polity building in post-socialism."[27] Today the notion of "biological citizenship" is particularly valuable in how it lends to reconceptualization with the consideration of contexts I outlined earlier. My take on it, however, is rather pessimistic: if Petryna's version of the notion captures the processes of citizens' mobilization around claiming rights to health care, I use this term to mark their loss due to the subsumption of citizens' bodies by the state. Citizenship is always a result of politico-economic arrangements, power relations and techno-politics preserved and re-enacted by what Ann Laura Stoler calls durable imperial infrastructures.[28] One of such infrastructural micro-elements escaped the nuclear reactor in macro-quantities and disseminated as a radioactive fallout producing the contaminated territory and its extension, biological citizens. The *subjects of territory*, together with their next generations and the

generations of other life forms exposed to radiation, became the carriers of an infrastructural inscription of the state beyond the Union of Soviet Socialist Republics' collapse in 1991 and into the future. The state survives by its *traces*.

Figure 13. An apartment building #3 on Sergeant Lazarev Street in Pripyat featuring a celebratory slogan typical for the Soviet atomic cities, "Let the atom be a worker, not a soldier," that supported and reinforced the ideological narrative about "peaceful atom." Although its scale cannot be fully assessed and understood today, I am reading the bodies of the *subjects of territory* (human and non-human) as a collective *body-archive* where epigenetic transformation occurs. This mark is a direct imprint of the state techno-politics and its information policy on risk communication (or rather, a lack thereof) made the subjects connected, subscribed, and subordinated to the contaminated territory – biopolitically. The promotional slogan proudly installed on the top of one of the highest buildings was seen by many citizens as a reversal of the truth, which paradoxically revealed the impossibility to hide it and served as its expression in a

negative form: an open secret, especially, in a small, restricted-to-visitors atom city where most of the population were the NPP workers. (Pripyat Film Archive. Found footage. Year not identified. Photo courtesy of Oleksandr Syrota. Used under a CC-BY-NC-ND license.)

[1] Ian Hacking, *The Emergence of Probability: Early Ideas About Probability, Induction and Statistical Inference* (Cambridge: Cambridge University Press, 2006), vii.

[2] Ibid., 4.

[3] Paul Virilio, *The Original Accident* (Cambridge: Polity, 2007), 5. Also see Yui Hui's detailed account of Virilio's theory of accidents: Yui Hui, "Algorithmic Catastrophe – The Revenge of Contingency," parrhesia 23 (2015): 122-143.

[4] Qtd. in Virilio, The Original Accident, 5.

[5] Ibid.

[6] *Richard Black, "Fukushima: As Bad as Chernobyl?" BBC News. August 16, 2011.* https://www.bbc.com/news/science-environment-13048916

[7] See, for example, Adam Higginbotham on Calder Hall nuclear power station, on the northwest coast of England constructed to manufacture plutonium for Britain's nascent atom bomb program in Higginbotham, *Midnight in Chernobyl*. (New York: Simon & Schuster, 2020), 40-41.

[8] Robert Gillette, "Soviet Military Apparently Had Role at Chernobyl A-Plant," The Los Angeles Times, Oct. 3, 1986, https://www.latimes.com/archives/la-xpm-1986-10-03-mn-4176-story.html. Most recently, in the interview to Yanina Sokolova, Ukraine's first President Leonid Kravchuk stated that the Chernobyl NPP was used for military purposes. See, "Леонід Кравчук: про Байдена, ядерну зброю, дачу, дзвінок Януковича | Рандеву з Яніною Соколовою," https://www.youtube.com/watch?v=1-5_DAO07NA. In my own field work in and around the Chernobyl Zone of Exclusion, a former high-rank official working at the ChNPP in the 1980s, whom I interviewed in August 2019, also confirmed that the ChNPP has been used for production of weapons-grade plutonium.

[9] Ulrich Beck, *Risk Society: Towards a New Modernity* (London: SAGE Publications, 1992).

[10] Stuart Elden, *The Birth of Territory* (Chicago: The University of Chicago Press, 2013), 10.

[11] Ibid., 9.

[12] Ibid.

[13] Ibid., 4.

[14] Ibid., 3.

[15] Ibid., 6.

[16] Ibid., 4.

[17] Ibid. Elden also notes that this is "the other, older sense of territoriality … [that] is generally lost, though it would be good to retrieve it."

[18] Stuart Elden, "The State of Territory under Globalization: Empire and the Politics of Reterritorialization," *Thamyris/Intersecting* 12 (2006): 56.

[19] Timothy Morton, *Humankind: Solidarity with Non-Human People* (London: Verso, 2019).

[20] Here the notion "subject" is used in the Lacanian and Marxist sense, at the same time. This is not the liberal subject, a liberated and/or liberating agent of change, but the alienated subject of the system and of the unconscious, whose agency itself is either estranged or a matter of appropriation.

[21] Elden, *The Birth of Territory*, 329.

[22] Kate Brown, *Manual for Survival: An Environmental History of the Chernobyl Disaster*, Kindle Edition (New York: W. W. Norton & Company, 2019), 6.

[23] Nele Horemans, David J. Spurgeon, Catherine Lecomte-Pradines, Eline Saenen, Clare Bradshaw, Deborah Oughton, Ilze Rasnaca, Jorke H. Kamstra, Christelle Adam-Guillermin, "Current Evidence for A Role of Epigenetic Mechanisms in Response to Ionizing Radiation in An Ecotoxicological Context," *Environmental Pollution*, 251 (2019): 470.

[24] Ibid., 472.

[25] Susan Schuppli, *Material Witness: Media Forensics, Evidence, Kindle Edition* (Cambridge, MA: MIT Press, 2020), 18-19.

[26] Adriana Petryna, *Life Exposed: Biological Citizens after Chernobyl* (Princeton: Princeton University Press, 2002), 5.

[27] Ibid., 6.

[28] Ann Laura Stoler, *Duress: Imperial Durabilities in Our Times* (Durham: Duke University Press, 2016).

15. Looking for Research Alternatives in the Face of Secrecy

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The nuclear program in India operates with a lot of secrecy. For the nuclear weapons arsenal, this secrecy refers to the denial of information. But for civilian facilities that secrecy is exercised through concealment or camouflage, argues Ramana in “India’s Nuclear Enclave and the Practice of Secrecy”.[1] Unlike most policy matters where the cabinet has the ultimate authority, nuclear affairs in India are under the complete control of the Atomic Energy Commission (AEC). The AEC is comprised of mainly scientists and top leaders of the Department of Atomic Energy (DAE), which reports directly to the Prime Minister. Two acts particularly provide the legal structures supporting secrecy: the 1962 Atomic Energy Act and the Official Secrets Act. These acts have been used only rarely. However, on occasion, DAE has used this legal structure to subject those who have exposed its technical and safety failures to harsh punishment.

A tragic example involved BK Subbarao, a naval officer who challenged the designs produced by DAE scientists for the submarine's nuclear reactor on technical grounds, leading to the rejection of these designs.[2] In 1988, he was arrested and charged under the Official Secrets Act and the Atomic Energy Act with trying to smuggle secret documents out of the country.[3] Subbarao was imprisoned for five years and denied bail. After a prolonged legal battle, he was acquitted by the Supreme Court and awarded 25,000 rupees as "costs for his mental suffering and financial loss." Those behind his prosecution went unpunished.

In another instance, in 1992, journalist Rupa Chinai disclosed in an article in the Bombay newspaper *The Sunday Observer* that there had been a major radioactive leak at the Bhabha Atomic Research Centre.[4] The DAE's reaction to the article was to try to "amend the 1962 act to increase punishment for unauthorized disclosure to five years rigorous imprisonment instead of three earlier and to allow them to prosecute without first seeking the solicitor general's approval."[5]

Yet another example is from the Kakrapar nuclear plant that has had several accidents since being commissioned in 1993. In 1996, Manoj Mishra, a lab technician, was terminated from service at the plant for turning whistleblower and revealing damage done to the plant in 1994, when the reactor was flooded and water reached inside the reactor building.[6] The Supreme Court agreed with the Nuclear Power Corporation's argument that he could not be declared a whistleblower and accorded any of its protections under the act, since he did not have technical degrees and was not an expert in the field.[7]

Even after the Right to Information (RTI) Act was enacted in India in 2005, the nuclear weapons division was kept out of its purview under Section 8(I)(a) of the RTI Act which stipulated that there shall be no obligation to give information, among other things, pertaining to "information, disclosure of which would prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the State, relation with foreign States or lead to incitement of an offence."[8] However, this clause has been used to deny information to the public related to nuclear energy on several occasions.[9] Following the US-India civil nuclear deal, India has had to differentiate between civil and military nuclear facilities and allow the International Atomic Energy Agency (IAEA) to regulate and inspect the "civilian" facilities. This has allowed for some papers to be available through IAEA's *publication International Nuclear Information System (INIS)*.

These papers available through IAEA were helpful for me to analyze the studies done on the environmental and health impacts on the people working in and living around the uranium mines in India for a paper that is currently going through the process of publication.[10] These mines lie in a small region called Jadugoda in Jharkhand, an eastern state of India. The first of these mines started operation in 1967. Over the last two decades, roughly from the period following the nuclear weapon tests conducted by the country in May 1998, there has been a public debate about various health effects on mine workers and the inhabitants of the villages near the mines and the mill ponds, many of them belonging to the local Indigenous community.

The debate has involved contentious claims about the veracity of these health effects, the causes, and the linkages with radiation, with different positions staked out by local anti-

nuclear activists, international NGOs, physicians, physicists, and officials from the Uranium Corporation of India Limited (UCIL), who have all used different methodologies to analyze the situation and seek attribution for the ill-health. While a handful of independent studies done by NGOs and activists claim that there are health effects and also link them to radiation exposure, UCIL denies these claims with multiple studies. However, not all studies done by UCIL are accessible, especially the early ones. This essentially means that there are no baseline surveys of the region's environment available for the public to scrutinize. The recent ones that are accessible do not always share their methodologies. This has posed a great challenge in deriving meaningful conclusions about the environmental and health impacts in the region. Another project I worked on in the past year is an update of India's nuclear arsenal.[11] Most of the information, in this case, had to be collected through newspaper reports or reports from defence organizations of other countries because of the secrecy around the program.

Denial of access to official archives regarding nuclear matters is a challenge to researchers working in this sensitive field. However, I believe using people's history and/or oral histories on nuclear matters is an important direction that has not been explored enough in India yet. This is because oral traditions are not considered rigorous enough for data collection and cannot be considered evidence in court. However, research in oral history is arguing for their increasing importance in data collection.

Figure 15. The demand for the Right to Information Act (RTI) grew out of the demand for minimum wages for workers. An association of labourers and farmers based in Rajasthan called Mazdoor Kisan Shakti Sangathan (MKSS), announced a strike on April 6, 1996 following an expose of systemic corruption across the state. MKSS began a historic forty-day-long dharna (to sit in protest) to demand the Right to Information. An eminent Hindi language journalist Prabhash Joshi published an editorial entitled "Hum Jaanenge, Hum Jiyenge" (we will know, we will live). This title became a slogan of the RTI movement in India and was modified to say, "the right to know is the right to live." (Photograph with permission of Mazdoor Kisan Shakti Sangathan, *India Telegraph*, Feb 9, 2019, https://epaper.telegraphindia.com/imageview_289784_113147336_4_71_02-09-2019_12_i_1_sf.html. Rights belong with Mazdoor Kisan Shakti Sangathan.)

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[1] MV Ramana, "India's Nuclear Enclave and the Practice of Secrecy" in *South Asian Cultures of the Bomb: Atomic Publics and the State in India and Pakistan*, ed. I. Abraham (Bloomington: Indiana University Press, 2009), 41-67.

[2] TS Gopi Rethinaraj, "ATV: All at Sea before It Hits the Water," *Jane's Intelligence Review* (June 1, 1998): 31–35.

[3] MS Siddhu, "Victimised by the Official Secrets Act: The Story of Dr. BK Subbarao," *Manushi* (1998): 108.

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[6] S Gadekar, "Floodwaters Drown Kakrapar," *Anumukti (Liberation from the Atom),* 7, no. 6 (1994): 1–2.

[7] V Deepa, "In Light of the Secrecy Surrounding India's Nuclear Programme, the Decision to Build 12 More Reactors Is Cause for Concern," *The Caravan*, April 13, 2016, https://caravanmagazine.in/vantage/light-secrecy-surrounding-indias-nuclear-programme-decision-build-12-reactors-cause-concern-2.

[8] The Right to Information Act, section 8(1)(a) (2005), *Central Government Act,* Article 226 in *The Constitution of India* (1950), https://rti.gov.in/rti-act.pdf.

[9] V Deshmukh, "Kudankulam Nuke Project Lacks Transparency While NPCIL Thwarts CIC Decision," *Moneylife NEWS & VIEWS*, September, 12, 2012. https://www.moneylife.in/article/kudankulam- nuke-project-lacks-transparency-while-npcil-thwarts-cic-decision/28421.html. Also: Ramana, "India's Nuclear Enclave."

[10] AH Khan, SK Basu, VN Jha, S Jha, and R Kumar, "Assessment of Environmental Impact of Mining and Processing of Uranium Ore at Jaduguda, India," *International Nuclear Information System*, 33, no. 7 (2002); JL Bhasin, "Uranium Mining and Production of Concentrates in India," *International Atomic Energy Agency (IAEA)* 28, no. 24 (1997), https://inis.iaea.org/search/search.aspx?orig_q=RN:28073139.

[11] P Gupta, and MV Ramana, "India," *Assuring Destruction Forever: 2020 Edition* (2020) https://www.reachingcriticalwill.org/images/documents/Publications/modernization/india-2020.pdf.

16. The Inaccessible Archive

MV Ramana

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For the entirety of the educational part of my career, I had never ever thought about going into an archive. Two years after I completed my PhD, I changed my area of research focus from elementary particle physics to thinking about nuclear weapons in India. This was in the mid-1990s, a little before India conducted the 1998 nuclear weapon tests in Pokharan. Some months after my career transition, I started developing an odd feeling, that I was spending most of my time on useless activity. That was an odd feeling, because a key reason for my switch from particle physics was my view that it was completely irrelevant to anything in the real world; thus what I was doing then seemed useless. In contrast, my problem was not that thinking about nuclear weapons seemed useless; it was the fact that I was spending most of my time figuring out things that others – for example, the head of the Indian Atomic Energy Commission – already knew quite well.

In my previous area of work, I would be working out what might be seen at experiments at, say, the Large Hadron Collider in Switzerland, if the world were to be described by various abstruse particle physics theories called dynamical electroweak symmetry breaking. No one had likely ever wondered about these questions in the specific way I was. Although very few people cared about the answer, I was definitely not reinventing something others already knew. Indeed, if someone knew it, they would have likely published it in some standard academic journal. And I could swallow my pride at having been scooped, and go on to working on something else that was not known to anyone. That was how it was in the world of physics, or most disciplines.

In contrast, when thinking about nuclear weapons in India, I was trying to figure out straight forward questions; one that I have gone back to multiple times over the years is how much plutonium had India produced? That number, I learnt soon enough, was a secret. But it was not a complete secret. If you looked around, you could find estimates. Here is where my background in physics came in useful. For, even if the exact number was a secret, it could be worked out from other technical characteristics: from the power capacities of the main nuclear production reactors, the capacity of the reprocessing plant, and so on. Though these are all publicly known numbers, by themselves these characteristics could only allow me to calculate a maximum value for how much plutonium India could have produced. To get a more accurate figure, one needed to know how efficiently these had operated over the years. How often was the CIRUS nuclear reactor shut down over the years, and for how long? Those numbers, again,

were secret. Still, over the decades I have tried to come up with the best possible guesses for these based on whatever information is publicly available.[1]

It was in grappling with such questions that the idea of an archive even came into my mind. I could imagine that there was some Department of Atomic Energy (DAE) archive, perhaps at the Bhabha Atomic Research Centre in Trombay, where one could find the performance records for CIRUS, the Dhruva reactor and the Trombay reprocessing plant, neatly sorted out by year. If only I could go through these records systematically, I could calculate the plutonium stockpile as it increased year after year. Or it might give data on releases of various radioactive gases such as krypton on an annual basis, which could be used to estimate how much spent fuel was reprocessed each year, and thus how much plutonium might have been produced each year.

But I could also imagine that this archive, too, will be out of bounds for researchers like me, for the same reason that no one would reveal the amount of plutonium produced in India. While I have not tried to access any such archives, I do know that much less sensitive information is denied.

In 2007, my friend and collaborator JY Suchitra and I petitioned Bharat Nabhikya Vidyut Nigam (BHAVINI), a DAE company, and the Indira Gandhi Centre for Atomic Research (IGCAR), two units involved in designing and constructing the Prototype Fast Breeder Reactor (PFBR) in southern India, using the Right to Information (RTI) Act of 2005, to provide us with the estimated cost of fabricating fuel for the PFBR, the projected cost of reprocessing the irradiated spent fuel that will be generated by the PFBR, and the estimated cost of transporting spent fuel.

These were the data we wanted to use in our examination of the economics of nuclear power in India, including at the PFBR and its associated facilities.[2]

Both IGCAR and BHAVINI responded pointing to Section 8.1(a) of the RTI Act, which, *inter alia*, protects "information, disclosure of which would prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the State, relation with foreign State or lead to incitement of an offence." The Public Information Officers at both places stated: "the information you have requested falls within the above definition and therefore, BHAVINI will have no obligation to give the information requested to anyone."

Suchitra and I appealed this decision, pointing out that we were requesting purely economic information and had not sought any technical details on quantities or processes, and that the petitions were in the public interest because the information sought pertained to the cost of electricity that consumers and the tax payers will have to bear. The appeals, including one to the Central Information Commission (CIC), were denied.[3]

If something like transportation costs for radioactive materials is deemed strategic information, too sensitive to be released, what is the likelihood that any archive that deals with plutonium production at the Bhabha Atomic Research Centre will ever be open to me?

The only way I can see that happening is if the Indian government were to give up its nuclear weapons program, as South Africa did at the end of the apartheid regime there. Maybe some day? One lives in hope.

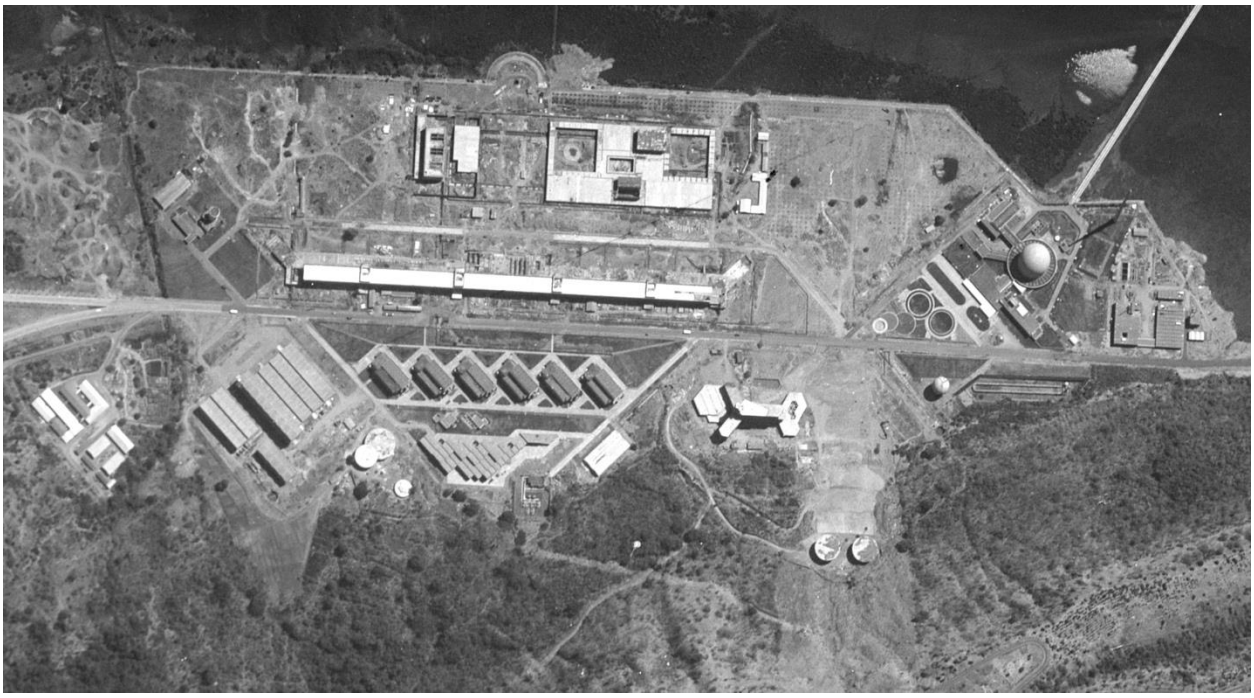

Figure 16: Image of the CIRUS reactor captured by the U.S. KH-7 reconnaissance satellite on February 19, 1966. Though the image was captured in 1966, it was classified for decades. It was only in September 2002 that the US government de-classified all KH-7 imagery—other than images of Israel. (Thus, it was not available to me when I was first starting my exploration of plutonium production in India. Of course, such images do not tell us much about the efficiency with which the reactor would have operated.) The acronym "CIR" stands for Canada India Reactor and the "US" was added after the United States supplied heavy water for the reactor. The reactor is the small bulb like figure on the top right, near the water. The same complex also has a reprocessing plant that is outside the frame in this image. This plant processed the spent fuel generated in the CIRUS reactor to produce the plutonium used in the 1974 nuclear weapon test in Rajasthan. A picture of that blast site can be seen on Robert Anderson's Chapter 17 in this volume, below. The CIRUS reactor was shut down at the end of 2010. (National Reconnaissance Office, Trombay, India, February 19, 1966, KH-7/GAMBIT satellite photograph, U. S. Government, Washington, D.C. https://nsarchive2.gwu.edu/NSAEBB/NSAEBB186/image05.pdf. Image is in the Public Domain.)

[1] For more on these methodologies, see IPFM, "Global Fissile Material Report 2010," (Princeton: International Panel on Fissile Materials, 2010). For the evolution of these estimates, see the International Panel on Fissile Materials website (http://fissilematerials.org/).

[2] This was eventually published as J. Y. Suchitra and M. V. Ramana, "The Costs of Power: Plutonium and the Economics of India's Prototype Fast Breeder Reactor," *International Journal of Global Energy Issues* 35, no. 1 (2011): 1–23.

[3] JY Suchitra and MV Ramana, "Fast Breeder of Expenditure?" *Hindustan Times*, October 23, 2007.

17. Slow Release: Multi-Generational Understandings of Two Open "Incidents" in the Closed Nuclear Files

Robert Anderson

Robert Anderson is a professor emeritus of communication at SFU, and is working (slowly) on a book whose working title is *Negotiating Nuclear Power*, focusing on the inter-play of the nuclear powers and India and Pakistan 1950-2000; or, understood another way, the uses by India and Pakistan of the nuclear "great" powers. He is author of *Nucleus and Nation: International Networks, Scientists, and Power in India*. University of Chicago Press 2010.

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Unlike a young administrator or novice historian-in-training, I did not really enter the archival nuclear world on purpose. People with that kind of life and career objective would have been sent to the archives and properly guided, according to their purpose, which I suppose translates as their *need to know*. I was more like Alice, descending sideways down the rabbit hole into Wonderland. I clearly did not have a need to know. I do not think there was such a thing as nuclear studies in the mid-60s when I began. So I am speaking more to those so-called accidental nuclear historians who might feel awkward, like me, about their innocence and lack of preparation. I hope to inspire all of you to take the long view of your research. I reveal here how very slowly some useful information about two single nuclear decisions came to me – and by implication came to others, too. It is the slow release of information and the extreme patience required to see it which sometimes frustrates our field, particularly those for whom this cannot be a full-time activity. There are, of course, other sources of frustration like

deliberate disinformation, but I am focusing here on the time element: the slow release of the evidence for our studies.

I am offering here my slowly evolved understanding of three separate moments in India's and Canada's nuclear history, namely the 1957 decision to mix American heavy water as the moderator in the CANDU reactor being built near Mumbai, the 1972 decision to test a nuclear explosion, and the test itself on May 18, 1974 in a Rajasthan desert in India. Those decisions were separated by seventeen years. I am writing about a series of my passive entanglements with that evidence; I'm noting it was not evidence I was actively seeking, but found nevertheless. The US heavy water was delivered to India in about 1959, and installed in 1960. The CANDU reactor went critical in 1960 and came to full power in 1963. Although the 1971 through 1972 decision in Delhi to conduct a nuclear test was a secret, neither of the other activities – not the heavy water in the reactor in which the plutonium was produced nor the bomb test in 1974 – were hidden; nor could they be.

To refer specifically to my own experience, in late May 1974, I happened to be in Ottawa visiting the International Development Research Centre. The Centre was funding the new Canadian journal called *Science Reporter*, and I knew the editor, David Spurgeon, slightly. He somehow knew I was about to publish a monograph which touched on Homi Bhabha and his plan to build reactors and prepare for a nuclear test in India before he died in a plane crash in 1966. The editor bumped into me in the elevator and said: "Give us an article quickly on this nuclear test in India, it will go in the next issue."

There I was in Ottawa, drafting an article on India's very recent nuclear history and its first nuclear bomb test. I knew there would be experts in Ottawa who knew the background of the test but did not have any connection with them. I may have seen their names in writing but had no idea where to find them. They were not public figures, and some would be reluctant, if not forbidden, to talk to me. I thought that there must be essential documents in Ottawa to make a realistic assessment, but it did not occur to me to go to the National Library and Archives and knock on the door to ask to read them. I simply assumed that *everything nuclear* was closed up tight. Moreover, the idea that I would ever request and/or have the right to see those 1955 to 1968 files on Canada-India nuclear relations did not arise in my head. While training as an anthropologist, I had been among archival historians as friends at the University of Chicago, but I had not acquired a personal expectation that official nuclear files in archives were something one could request to read. I had worked as a research assistant in the Enrico Fermi Institute of Nuclear Studies (1965-67), surrounded by the rather professional openness of physicists (and their engineers) in a contradictory context of professional and state-managed nuclear secrecy. I was allowed to read Enrico Fermi's personal and administrative files in the institute. In the 1960s, professional historians requested and were reading sensitive files on the recent World War II or maybe the Korean War. But despite the 1971 release and publication of the secret Pentagon Papers about Vietnam by Daniel Ellsberg, such an expectation of access had not yet settled into the popular academic culture in Canada in which I was playing my novice role.

Thus, I wrote that article for *Science Reporter* based on what I knew, referring to Homi Bhabha's famous 1965 statement to the *New York Times* that India could build and test a nuclear explosive device within eighteen months of a go-ahead.[1] I doubt there was space to mention that the plutonium was produced in the Canadian reactor outside Mumbai in which US heavy water was the moderating medium. As it was going to press in October 1974, I heard from an official historian that those pre-1974 files about India and Canada relations, the ones which would have been useful to me, had been segregated and closed after the May 1974 bomb test. This was done, he said, in order to allow a new generation of professional specialists in the Departments of External Affairs and Defence to sift through them so they could understand the circumstances which led to Canada's contribution to India's capability for that bomb test, which India had promised to Canada it would not do. That capability included construction of the CANDU reactor near Mumbai, with a flow of many Indian physicists and engineers being trained through Chalk River. That form of cooperation was terminated by Canada immediately following the May 18 test.

Who knows what I might have found, had I searched in the National Archives during April 1974, just one month *before* that bomb test? Would anything nuclear from External Affairs or AECL or Defence have been transferred to the National Library and Archives of Canada before the May 1974 nuclear test? And if so, what? Or were all nuclear files too sensitive to release at that time?

This experience explains how slowly and accidentally I became an archive-oriented nuclear historian. About twenty-five years later, in the year 2000, I was given my first viewing of

those closed 1974 to 1975 files. I was starting to look for the existence of the Western Suppliers Group, which I was convinced were the 1960s ancestors to the Nuclear Suppliers Group that was formed immediately after the Indian test. There I saw my own journal article on the 1974 Indian bomb test, lying in a thick file marked "*secret*." It had formed an ironic part of the specialists' closed confidential resources ever since 1975.[2] Though the article itself showed just how limited anyone's understanding of the Indian situation was in 1974, my rediscovery of it also proved that at least one official person had read it and put pencil notes in the margin, before the article was put into this file and closed up for twenty-five more years!

Then, ten years after my first viewing of those closed files in Ottawa in 2000, while trawling through the State Department records in 2010 in Washington (supported by a SSHRC grant), I found the records which showed me just how long American diplomats reporting to Henry Kissinger had contrived to shield from view the fact that *that* particular Canadian reactor, later called CIRUS, contained and operated with US heavy water. They did not want questions raised by the Congress in Washington.

At the time of the CIRUS start-up in 1960, embassy officials of both countries had been discussing this heavy water exchange since March 1956! Canadian heavy water supplies were very heavily committed (perhaps due to a contract to supply the US reactors), so the Canadians turned quietly to US suppliers, who quietly supplied almost twenty tonnes.[3] Those papers from the Nixon-Ford era showed how the State Department was told in 1974, probably by Kissinger himself, not to engage in "needless criticism" of the Indian test. It is not clear how many senior people who were involved in the 1960 delivery of US heavy water to India were still around

Washington in 1974 and 1975. Not all nuclear history was on paper. So, official silence about the US heavy water in CIRUS was probably not hard to achieve and quite useful to the Americans at the time.[4] Kissinger was not a strong opponent of nuclear proliferation anyway, and his officials probably picked that up. And we all know that during those months of late 1974, Kissinger was secretly negotiating for the creation of the Nuclear Suppliers Group, the group that was supposed to monitor the international transfer of the nuclear items which triggered concern for some members of the International Atomic Energy Agency (IAEA).

My accidental discovery in the US archives twelve years ago (2010) reminded me to look again at the Canadian files in the next year (2011), to look for the timing when Canadian officials finally confronted American leaders with the complaint that they ought to admit and announce that the CIRUS reactor at Trombay had operated on American heavy water from its beginning. Canada waited months to do this, accepting all the criticism for the 1974 test in India, annoyed by American evasiveness, waiting for the right moment. And there it was in the archived papers of Ivan Head, PM Pierre Trudeau's advisor, documents affirming that Kissinger & Co had been avoiding this evidence after the Indian nuclear test, hoping it would go away. And that file also showed that American officials themselves had trouble in late 1974 finding the firm evidence about that heavy water installed in the Trombay reactor in 1960. They had looked everywhere in Washington in May and June 1974 but only found the evidence eventually in a cupboard in their Delhi embassy.[5]

Then, in the following year of 2012, at the UK National Archives at Kew London, I learned accidentally (meaning, not looking for it) why the official British reaction to the 1974

nuclear test was only briefly a furious objection and criticism of Canada. Behind the scenes, of course, the UK was secretly, with its allies, planning to criticize Canada for its careless handling of their safeguards in India. And then, publicly and suddenly, the UK adopted a more muted approach to the nuclear test in India. I had always wondered why. Would it be Kissinger's influence? I doubted that. But finally in 2012, at the UK National Archives, I accidentally found the long-hidden fact that a London journalist had discovered a British bomb team in Nevada on May 17, 18 or 19, 1974, a team which had just conducted one of a regular series of British underground nuclear tests. "It was decided," as they say in the passive voice, that the less said critically by Britain about the underground Indian nuclear test, the better. I did not follow up with the journalist asking when and how she was finally allowed to publish this story, but the intervention to slow this story down went right from the top, from the UK's Foreign Secretary himself to the journalist's publisher in London.

At the very same time, Britain had requested from India, earlier that month, flyover rights for the new supersonic Concorde aircraft on its planned route from London to Australia, something India had not been quite ready to approve. As a result, British indignation toward India's nuclear test quickly turned very quiet. Meanwhile in early 1975, just as the Nuclear Suppliers Group was getting started, the Canadians began to renegotiate an agreement with India to restart their nuclear relationship without telling their allies. It was only a split in the Canadian Cabinet, and not a big one, which suspended and ended those negotiations which could have led to a re-start of the nuclear relationship.

What can we conclude from these three incidents and their ripple effects? I mean the US-Canada heavy water exchange decision, the Indian decision to do a nuclear test and the American decision to conceal their role in the reactor? I have referred to the UK-Canada relation and the US-Canada relation after the test; the Canada-India nuclear relationship was being reconstructed, although unsuccessfully. But each was revealed to me at very different times and places. I shall let you ask the questions now.

Only now do I realize that the archivists' knowledge of the nuclear files and the fractal patterns in which they are arranged is a special tacit knowledge, different for every department and agency. Archivists are trained in the systematics of these vast data sources, rather like systematic botanists trained to know the genus and species relations of plants. They can disagree learnedly about species differentiation and biotypes, usually about how big units called Record Groups are sub-divided and their records re-arranged. The tacit knowledge of archivists, built up through years of experience, has been extremely important to me, even though they must have found it difficult to explain to me. I got quite far on my own using my personal stumbling method. But without their guidance, I would never have found my way to the links between the records and thus to the moderate understanding I have acquired.[6]

Worse, I might never have seen these comparisons of Canadian practice with American, British, or Indian ones. You could say that I noted it at the time but only now do I *really appreciate* what it means, in the sense that only now do I really *appreciate* Bach's music. Perhaps this later kind of appreciation of these sensitive records is what being a nuclear historian really means. I say this because nuclear history really did begin only as recently as

1939 or 1940, and the knowledge of it at that time (say, between 1940 and 1960) was supposed to be closed forever. That is why this public archival knowledge in nuclear studies is always in the form of slow release!

When I think of my occasional entanglements with 18 May 1974, a single day forty-eight years ago, I also realize that archivists of Canada, Britain, United States and India would fit that day into rather different patterns and contexts of their record systems. Even the French, Japanese, Australian, Chinese and Russian observers in India, while watching India very closely in 1974, would have different ways to accommodate the evidence which interests historians, particularly how they covered their astonished embassy's surprise. That is why I think comparative nuclear studies, across many archives and different traditions, and also using oral history, are now so much more doable and so extremely important. I am lucky I was supported by SSHRC to do this archival work in 2010-2013, the rest was done without support for many years. So let's be thankful and protect the laws which keep those closed records preserved and those boxes arriving on the open shelf, preferably sooner than in the stories I have told here.

Figure 17. Standing in the radiated blast site of the single May 1974 nuclear test in the desert of Rajasthan India are some of the key actors in the drama: PM Indira Gandhi, Homi Sethna, engineer and chairman of the Atomic Energy Commission (*middle, gesturing*); JRD Tata, leading industrialist and member of the Atomic Energy Commission (*on right, standing apart*). There were very few records related to this first Indian nuclear explosion, and neither the sixty scientists and engineers involved nor the political leadership revealed the plan; the technical results of the test were not released for years. Thus, the efforts of foreign powers which included early satellite surveillance, were, despite awareness of the eventual probability of this event, unable to provide advanced detection. This photo was taken seven months after the test, in December 1974: it signaled the beginning of the end of nuclear cooperation between India, Canada, and the United States for the next thirty years. Although archival records were therefore minimal, oral history has provided a more complete understanding. How long this image had been confidential and inaccessible is unknown. (Photograph by permission of Photo Division, Ministry of Information and Broadcasting, Delhi, India, January 2009. Rights belong with Photo Division.)

[1] Homi Bhabha's public announcements began in October 1964, right after the first Chinese nuclear test, and in that statement to the National Herald he said a bomb could be done in eighteen-months. Bhabha repeated that claim a year later and said India had not advanced "along that eighteen-month road". Anthony Lukas, "India Rules Out Secret Atom Test." *New York Times*, November 29, 1965. For the larger context see Robert Anderson *Nucleus and Nation: scientists, international networks, and power in India*. University of Chicago Press, 2010.

[2] It was published in *Science Reporter* (Ottawa), Winter 1974; that journal is discontinued, was not archived and is not in the National Library and Archives of Canada.

[3] I speculate that the H30 in CIRUS was Canadian in origin but en route, under contract, to the US from the heavy water plant in Warfield near Trail, BC, a few kilometres from the border. It would be convenient, therefore, to re-label the shipment as American-origin so as not to disturb the contract. Sources are US Atomic Energy Agency, March 16, 1956, and Canadian files RG-25 Atomic Energy – Cooperation and Agreements 14003-J-2-3-40 Part 1 and 14003-J-2-1-40, Library and Archives of Canada, Ottawa.

[4] Paul Leventhal reported in 2005 that as a young staff officer for the US Senate, he was phoned on May 19, 1974 and informed by the Atomic Energy Commission that the CIRUS reactor and the Indian nuclear test had nothing officially to do with the US. If asked, he was to repeat that line. However, Leventhal became sceptical and began to investigate. Even with his special access, it took him two years "to discover that the information provided to me… was false." Source is Paul Leventhal's statement at the James Martin Center for Non-Proliferation Studies, December 19, 2005, in a statement called "CIRUS Reactor's Role in a US-India Nuclear Agreement," in the archived website of April 2007; see statement of the same name in website of "Nuclear Control Institute" at nci.org.

[5] The reactor had first been named the "CIR" reactor but when American heavy water was introduced it was re-named "CIRUS." Throughout the 1950s, Canada traded, via barter, materials for reactors with the US, UK, France and Norway in exchange for similar materials, often without exchange of money. In the CIRUS case, the American contribution to the CANDU reactor in 1957 was known but not publicized in the USA. I found the reference to the Ivan Head meeting in the State Department in the very well-ordered papers of Warren Christopher, deputy Secretary of State under Cyrus Vance in Jimmy Carter's Cabinet, deposited in the National Archives and Records Administration, Maryland. Ivan Head had raised the issue with Cyrus Vance in Christopher's presence. The secret burial of the US heavy water in the Indo-Canadian reactor near Mumbai (which was for nuclear powers a side show) was carried out by a giant machine which wrapped nuclear matters in greater and greater secrecy, the origins of which are laid out in a new majesterial work by Alex Wellerstein, *Restricted Data: the history of nuclear secrecy*. University of Chicago Press, 2021. The first work I know of on this subject was written by my dissertation supervisor Edward Shils, *The Torment of Secrecy*. Glencoe Illinois,

Free Press, 1956. Although there are many scholars in Canada who study secrecy and secret issues, there does not appear to be a tradition of studies such as Wellerstein.

[6] I was astonished when an archivist at our June 2018 workshop at the National Archives of Canada in Ottawa said casually that he had just received five kilometres of files in boxes from the unit in which he specializes, ready for cataloguing and archiving. These boxes contained millions of pages of paper. But although delivered, those boxes were not “really ready for cataloguing” he said, thus requiring much more work. At first, I thought I had misheard and/or misunderstood his statement regarding the volume of files; it seemed impossible to me that there would be five kilometres of archive boxes delivered in trucks!

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