Beyond the *Lucky Dragon*: Japanese Scientists and Fallout Discourse in the 1950s

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Abstract

In the history of the 1950s fallout controversy, associated with the first hydrogen bomb tests, scholars often focus on the plight of the Japanese crew of the *Fukuryū Maru*, or as it was called in English-language newspapers, the *Lucky Dragon*. Doing so silences the Japanese who tried to show that fallout was not simply about one ship, one part of the ocean, or even one generation of humans. In this essay we show how Japanese perspectives influenced several American scientists to think differently about the implications of nuclear tests for humans and the natural environment. We propose three fundamental conceptual points about fallout that already were present in Japanese scientific discourse in the mid-1950s. One was spatial; one was temporal; one was legal. The Japanese ideas, from a range of scientists, informed the views of American scientists during the fallout controversy of the 1950s, not just providing data but shaping both scientific and political discourse in the West.

Key words: *Lucky Dragon*, radiation effects, Yasushi Nishiwaki, Jane Nishiwaki, Ava Helen Pauling, Linus Pauling

1. Introduction

The central role of Japan in the 1950s fallout controversy is impossible to ignore. That the same country to be victim of the first atomic weapons should then become victim of fallout from the first hydrogen bomb tests, all at the hands of Americans, is one of the most memorable features of the historical narrative. One particular test, the 1954 Bravo shot, part of several tests called the Castle series, produced a multi-megaton fireball and dumped contaminated debris inadvertently on US servicemen, Marshall Islanders, and the crewmen of a Japanese fishing boat. The Marshallese story, not dealt with here, was easy for the United States to contain, because the islands were under

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American governmental jurisdiction.[1] Similarly, Japan was strictly supervised in the postwar years, with its government designed by American occupation authorities and its leaders friendly to American goals. After signing a security treaty in 1951, ceding broad military rights to the United States, Japan only had its first post-occupation elections in 1952.[2] When the fallout controversy erupted in March 1954, Japan had been a sovereign nation just under two years. Yet unlike the plight of the Marshall Islanders, Japan's role could not be swept aside. Instead the Bravo shot ignited a worldwide controversy, fueled by outraged voices from within Japan.[3]

Remembering the Bravo shot, our stories are typically constrained to the plight of the hapless Japanese crew of the *Fukuryū Maru*, or as it was called in English-language newspapers, the *Lucky Dragon*. Perhaps the attractiveness of the twice-abused narrative, in 1945 and 1954, tempts us to treat the Japanese as victims and to focus on the fate of the *Lucky Dragon*.[4] Ironically, doing so silences the many Japanese voices who tried to show that fallout was not simply about one ship, one part of the ocean, or even one generation of humans. There were in fact many scientists in Japan who tried to communicate, against the wishes of the US government, the wide reach of radioactivity in the ocean and atmosphere, using data collected within Japan itself and aboard a different and less famous vessel, the *Shunkotsu Maru*. There were also many geneticists who tried, using the same scientific principles as American colleagues, to point out the lasting damage from nuclear tests well into the future. And there were even those who challenged the legality of testing, not framed in the context of arms control, but as a violation of basic human rights.

In this essay we show how Japanese perspectives ultimately influenced a number of American scientists to think differently about the implications of nuclear tests for humans and the natural environment. This was despite stiff resistance from offices of the US government. American scientists perhaps were primed to be skeptical of government statements by the mid-1950s. Controversies such as loyalty oath requirements at major universities, visa denials for scientists wishing to travel, and security hearings—particularly the one over the revocation of classified security clearance for the top American atomic scientist, J. Robert Oppenheimer—all were evidence of the growing politicization of science in the United States.[5] Although openly criticizing the AEC was

[1] E. P. Conkite, R. A. Conard, and V. P. Bond, "Historical Events Associated with Fallout from Bravo Shot-Operation Castle and 25 Y of Medical Findings," *Health Physics* 73, no. 1 (1997); Holly M. Barker, *Bravo for the Marshallese: Regaining Control in a Post-Nuclear*, *Post-Colonial World* (Belmont: Wadsworth, 2004).

[2] John W. Dower, *Embracing Defeat: Japan in the Wake of World War II* (New York: Norton, 2000).

[3] A classic text on the fallout controversy, still useful as an overview, is Robert A. Divine, *Blowing on the Wind: The Nuclear Test Ban Debate*, *1954–1960* (New York: Oxford University Press, 1978).

[4] For an early English-language discussion of the *Lucky Dragon* incident, see Ralph E. Lapp, *The Voyage of the Lucky Dragon* (New York: Harper, 1958).

[5] Lawrence Badash, "Science and McCarthyism," *Minerva* 38 (2000), 53–80.

an activity usually limited to scientists whose prestige protected them from reprisal, American scientists did absorb the ideas proffered by their Japanese counterparts. Ours is not an exhaustive treatment of this influence, but rather is a suggestive one built around concepts. Rather than emphasize the victimhood of the Japanese, or simply to suggest that they collected data and passed it on to others who did the real work of interpretation, we propose three fundamental conceptual points about fallout that already were present in Japanese scientific discourse in the mid-1950s. Any reader will recognize them as fundamental tenets of later environmental discourse. One of them was spatial. The Japanese invested considerable intellectual energy into analyzing the effects of nuclear testing over a wide area, whereas Americans tended to imagine nuclear tests affecting a relatively contained, local area. Another was temporal. The Japanese scientists emphasized change over time, seeing the natural environment as newly altered, with contamination increasing over time, and with genetic alterations in humans creating debilitating mutations in generations to come. The third was legal. By altering the way scientists imagined nuclear tests, the Japanese scientists' perspectives transformed them from contained experiments to long-term phenomena with global consequences, opening serious questions about global contamination, human rights, and government responsibilities. The Japanese ideas, from a range of scientists, informed the views of American scientists during the fallout controversy of the 1950s, not just providing data but shaping both scientific and political discourse in the West.

2. Contaminated Across Space

The influence of Japanese ideas upon Americans was circuitous but decisive. This was especially true of the Japanese insistence that nuclear tests had effects far outside the immediate blast area. This influence was perhaps obscured by the fact that official spokespersons devoted a great deal of time to public relations damage control, denying the possibility of effects beyond the *Lucky Dragon* and the Marshall Islands. The Atomic Energy Commission (AEC) and the leading American in Japan, Ambassador John M. Allison, not only denied wide-ranging harm but also denigrated the contributions of Japanese scientists.[6] However, beyond official pronouncements, some American scientists began to take seriously the Japanese claims, and started to question the notion that nuclear tests at the Pacific Proving Ground had only local effects.

Japanese scientists themselves had little to lose by opposing nuclear tests, as doing so was not out of step with the prevailing political sentiment in Japan. The tests were immensely unpopular, and by August 1955 the National Council for the Collection of

[6] Ambassador in Japan (Allison) to the Department of State, 20 May 1954, Foreign Relations of the United States, 1952–1954, Volume XIV, Part 2, China and Japan, document 762, accessed November 10, 2014, https://history.state.gov/historicaldocuments/frus1952–54v14p2/d762.

Signatures Against Atomic and Hydrogen Bombs obtained more than 31 million signatures.[7]

American spokespersons, led by the AEC and with leading newspapers following suit, typically characterized the Japanese reaction as a wave of anti-Americanism not only from the political left wing but also the traditionally conservative press. American press coverage lampooned specialists in Kyoto and Tokyo who had described the state of the men exposed to the Bravo test, as when *New York Times* columnist Lindesay Parrott noted "the Japanese scientists who have recently been beating roads from the hospitals to the newspaper offices with their own views of the [*Lucky Dragon*] patients' condition."[8]

When the Japanese government sponsored a voyage to survey of the ocean's radioactivity near the test site, aboard the ship *Shunkotsu Maru*, several weeks after the test, American onlookers found themselves on less firm ground dismissing Japanese claims. No comparable American voyage had been launched, so the data and conclusions coming from the Japanese could not easily be ignored. Parrott reported it as the Japanese government's attempt to inject some "firm data" into the controversy, in order to "set at rest the wild rumors circulating" about effects of radioactivity.[9] But rather than set minds at ease, the voyage only fueled the political fire in Japan. When in June the *Shunkotsu Maru* found high levels of radioactivity in water (and fish) some five hundred miles south of Bikini, Japanese offices seized and destroyed some of the tuna from a recent catch in that region. Instead of soothing the controversy with firm data, the voyage opened new questions about how wide-ranging the radioactive contamination was.[10]

The nature of the political pressures on these Japanese scientists may have seemed unclear to Americans. The US government hoped the Japanese would not play up dangers to fish, yet the government under Shigeru Yoshida, typically pro-American, also had to be responsive to the extraordinary unpopularity in Japan of nuclear testing. The *Lucky Dragon* incident happened just as the Japanese government was making its first postwar appropriations intended for peaceful atomic energy research, so government bodies were jockeying to claim those funds and assert their relevance in atomic affairs. Ambassador Allison lamented that forces inimical to American interests were strengthened by the incident: "neutralists, pacifists, feminists, and professional anti-Americans."[11]

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[7] "31 Million Sign Japanese Plea to Ban A-Bombs," *Los Angeles Times*, August 4,1955, 13.

[8] Lindesay Parrott, "Case of Bikini Fishermen Causes a Furor in Japan," *New York Times*, March 28, 1954, E5.

[9] Lindesay Parrot, "Japan to Survey Radioactivity of Sea Around the Bikini Tests," *New York Times*, April 17, 1954, 5.

[10] "Japanese Find Radioactivity," *New York Times*, June 11, 1954, 3.

[11] American assessments of the range of issues confronting Japan, and complicating Americans' desire to move past the issue, are discussed in a letter from the Ambassador in Japan (Allison) to the Department of State, 20 May 1954, Foreign Relations of the United States, 1952–1954, Volume XIV, Part 2, China and Japan, document 762, accessed November 10, 2014, https://history.state.gov/historicaldocuments/frus1952-54v14p2/d762.

Those looking for firm, reassuring statements based on unified opinion were unlikely to get them from the new data coming from the *Shunkotsu Maru* voyage. There was no unified opinion, and reports from scientists seemed conflicting. One of the *Shunkotsu Maru* scientists, Hiroshi Yabe, told reporters that the hydrogen bomb tests seriously affected waters, fish, and other marine life, and urged public action. Other scientists scoffed at what they perceived as overreactions. Kazuhisa Kameda, for example, told reporters that despite the exposure to fish, the expedition scientists themselves ate them.[12] The Japanese Fisheries Agency, eager to make short work of the controversy and protect future catches from seizure, stated four months after the blast that the voyage had proven there was little danger from radioactivity in fish and marine life. Parrot beamed in the *New York Times*, "the official report explodes scare stories spread here by anti-American elements, some university professors and the sensational Tokyo press" over the previous few months.[13]

Like the *New York Times*, American Ambassador Allison viewed Japanese university scientists as crucial pieces of the crisis. After the incident, he said, the Japanese government seemed unable to govern, and that "breakdown was triggered by a small group of Japanese scientists and doctors, many of whom were fuzzy-minded leftists, pacifists, neutralists," animated by resentments about bans on atomic research, purges of scientists under occupation, and hostility toward the post-war Atomic Bomb Casualty Commission. Allison belittled the Japanese but warned that the United States needed to recognize how vulnerable they felt, making them willing to believe anything. "Throughout the past eight weeks," he observed to colleagues at the US State Department, "no report of long-range air or sea contamination, no story of food or water pollution, no theory of genetic deterioration seemed too wild for acceptance."[14]

The US Atomic Energy Commission attempted unsuccessfully to contain the criticism of Japanese scientists. Its efforts backfired, and the Americans sent by the AEC to offer their "cooperation" to the Japanese, to guide their findings, soon departed, politely rejected by the Japanese. Two of them, John Morton and Merril Eisenbud, so conspicuously played down the event and the health dangers, that they found themselves having no one to talk to, and they soon left. The Japanese Ambassador, Sadao Iguchi, explained to American officials that Morton had alienated many people, having acknowledged no harm and having expressed no words of consolation to the patients.[15]

[12] "Japanese Scientists Eat Fish in H-Bomb Area," *New York Times*, July 5, 1954, 13.

[13] Lindesay Parrott, "Bikini Area Safe, Japanese Report," *New York Times*, July 7, 1954, 3.

[14] Ambassador in Japan (Allison) to the Department of State, 20 May 1954, Foreign Relations of the United States, 1952–1954, Volume XIV, Part 2, China and Japan, document 762, accessed November 10, 2014, https://history.state.gov/historicaldocuments/frus1952-54v14p2/d762.

[15] Memorandum of Conversation, by the Acting Director of the Office of Northeast Asian Affairs (McClurkin), 22 Apr 1954, Foreign Relations of the United States, 1952–1954, Volume XIV, Part 2, China and Japan, document 759, accessed November 10, 2014, https://history.state.gov/historicaldocuments/frus1952-

The Americans seemed unsympathetic and dismissive, eager to redirect concerns rather than acknowledge them. As in the case of the Atomic Bomb Casualty Commission after World War II, the United States sent experts to study, not to help treat, the patients.[16]

Although American commentators hoped that the official voyage of the *Shunkotsu Maru* would neutralize statements about the wide-ranging effects, they instead found that more and more Japanese scientists were publishing on fallout beyond the blast zone, based on oceanographic data from the ship and on atmospheric data recorded in Japan. At Kagoshima University, in the southern part of Japan, M. Kamada measured radioactivity in rainwater on May 14, 1954, several weeks after the first test in the Castle series, and thereafter the rains in Japan contained some radioactivity. In mid-September, Japanese scientists detected radioactivity in rainwater in the north, which they believed was associated with a series of tests in the USSR. In his paper based on the *Shunkotsu Maru*'s data, Yasuo Miyake (based at the Meteorological Research Institute in Tokyo) recorded not only the presence of radioactivity around Bikini, but also "the large scale contamination of sea water in North Pacific Ocean."[17] Other Japanese scientists noted that current systems pushed radioactive waters far beyond the US's stated exclusion zone, and also suggested that data should be collected on a much wider basis, in the sea and in the air, well into the stratosphere using balloons. Like American scientists, they saw the scientific opportunity in using radioactivity as a tracer for ocean and wind currents, but they were more bold in their conclusions, routinely using the word "contamination" and noting consistently the transport of radionuclides far and wide. To the Japanese, the Pacific Proving Ground was not a contained laboratory at all.[18]

The Japanese further highlighted the complexity of the problem by pointing out multiple sources of contamination, as well as its ongoing nature. The *Lucky Dragon* incident was not merely a single incident, they observed. Fish continued to be seized and discarded, having shown traces of contamination long after the Bravo blast. Japanese economists argued that the American blast zone was the main spawning area for swordfish and tuna, so all fishermen should continue to expect to have some of their hauls contain radioactivity.[19] Plotting the locations of contaminated catches, the physicist Eizo

54v14p2/d759.

[16] The decision to study rather than treat victims at Hiroshima and Nagasaki is dealt with at length in M. Susan Lindee, *Suffering Made Real: American Science and the Survivors at Hiroshima* (Chicago: University of Chicago Press, 1994).

[17] Yasuo Miyake, "Effects of Atomic Explosions on the Atmosphere and the Sea," in Committee for Compilation of Report on Research in the Effects of Radioactivity, *Research in the Effects and Influences of the Nuclear Bomb Test Explosions* (Tokyo: Japan Society for the Promotion of Science, 1956), 1–6.

[18] R. Otsuka and K. Shimada, "On the Upper Currents in Low Latitudes of the Northwest Pacific Ocean at the Beginning of March, 1954," in Committee for Compilation of Report on Research in the Effects of Radioactivity, *Research in the Effects and Influences of the Nuclear Bomb Test Explosions* (Tokyo: Japan Society for the Promotion of Science, 1956), 7–26.

[19] Yasuo Kondo, Keizo Fujita, and Hirokatu Ogura, "Economic Aspects of Effects of Bikini H-Bomb

Tajima determined that most of the contamination east of the blast area lined up with 10°N latitude parallel, affecting boats in large numbers, but not always fish. This suggested that the contamination was primarily carried by the air, following eastward atmospheric currents. Tajima noted that contamination to the west tended to follow the path of the north equatorial current (an ocean current). Fishing boats in that area were sometimes free of contamination on deck despite their fish containing radioactivity. Sporadic results elsewhere suggested that the fish themselves carried radioactivity throughout the region, whether following a current or not.[20] Together the Japanese scientists emphasized that the blast zone identified by the US AEC bore little relation to reality, given the effects of wind, currents, and fish, which would carry the radioactivity great distances.

Several American marine scientists, many of whom had helped to plan the nuclear tests, began listening to the Japanese scientists. In part this was because of the new data. The Americans did not send a scientific voyage to collect radioactivity data as quickly as the Japanese did, so Miyake's work became the core data set for studies of the effects of fallout on the ocean. When the National Academy of Sciences wrote its first major study of the biological effects of atomic radiation (the 1956 BEAR study), the panel of oceanographers, led by Roger Revelle, relied heavily on Miyake's and others' studies, lacking comparable data of their own. But further, the extensive Japanese work undermined the concept that the Pacific Proving Ground was a contained space akin to a laboratory. As historian E. Jerry Jessee has pointed out, treating the Bikini atoll "as a discrete, isolated, and hence closed system" was a leading reason that scientists from such a range of disciplines, including marine ecology, took an interest in nuclear tests. After the *Lucky Dragon* controversy, it was increasingly difficult to characterize the Proving Ground as an isolated space. American scientists such as Lauren Donaldson, who for many years had conceptualized the Bikini atoll as a contained laboratory, now saw Japan's *Shunkotsu Maru* voyage as a first step in tracing the "Bravo footprint" over a much larger area.[21]

Although they shied from doing so publicly, American scientists broke with official government pronouncements about "contained" effects. Immediately after the blast, American scientists such as Donaldson and Arthur Welander engaged in correspondence with Yoshio Hiyama, and the latter asked if they would like to be included on the

Experiments on Japanese Fisheries," *Research in the Effects and Influences of the Nuclear Bomb Test Explosions* (Tokyo: Japan Society for the Promotion of Science, 1956), 1251–1279.

[20] Eizo Tajima, "Statistical Investigation of Contaminated Fishing Boats," in Committee for Compilation of Report on Research in the Effects of Radioactivity, *Research in the Effects and Influences of the Nuclear Bomb Test Explosions* (Tokyo: Japan Society for the Promotion of Science, 1956), 449–455.

[21] Emory Jerry Jessee, "Radiation Ecologies: Bombs, Bodies, and Environment during the Atmospheric Nuclear Weapons Testing Period, 1942–1965" (PhD diss., Montana State University, 2013), 155. See also p. 276 ff.

Shunkotsu Maru voyage.[22] The AEC sent Donaldson to Japan with an AEC scientist, Willis Boss—a move that may have been interpreted as sending Donaldson with a government handler. By the time the two arrived in Japan, the *Shunkotsu Maru* had set sail. Whether the Japanese set off early to get the best data or to avoid American interference remains an open question. But Donaldson himself did not deny the wide-ranging effects, and one of the Japanese scientists to analyze the *Shunkotsu Maru* data, Toshiharu Kawabata, would later become a visiting researcher with Donaldson at the Applied Fisheries Laboratory in Washington. Another American scientist, Allyn C. Vine of the Woods Hole Oceanographic Institution, used the *Shunkotsu Maru* data to hypothesize an extraordinary amount of radioactive material reaching the coast of Japan. Laying to rest the possibility of simply dismissing the Japanese work, Vine stated unambiguously that "the Japanese data presented is believed to be good data." In a report to the AEC, he concluded that radioactivity from the blast "had already extended far enough in time and space (4 months and 900 miles) to where reasonable extrapolating indicates that a discrete and measurable radioactive water mass might be following the western Pacific circulation for a year or more."[23] Not only had the radioactivity extended far and wide, but also its duration appeared to be long-lasting. The voyage compelled the Americans to make a similar voyage, which the AEC supported only grudgingly, resenting having its scientific pronouncements undermined by the Japanese. As John Bugher, the director of the AEC's Division of Biology and Medicine put it in January 1955, "We would like to know what the boundaries of that problem are before the Japanese demonstrate them to us."[24]

In referring to the oceans, Japanese scientists focused on making defensible statements about wide-ranging distribution and long-term persistence. For example, Miyake had not tried to say that fish were currently contaminated beyond limits of safe consumption. Yet he did say that they would become so if nuclear tests continued. Later, in April 1958, he made the disturbing claim that the 1954 Bikini tests had raised the Pacific ocean's radioactivity level, from Hawaii to Japan, some ten times that of the Atlantic ocean, indicating both the wide-ranging and long-term effects of testing. But even by 1958, the AEC held firm in response: "There is no threat to the U.S. West Coast fishing industry from radioactivity in Pacific waters," not denying the findings but carefully re-framing their meaning. The *Los Angeles Times* cast this as a sharp divergence of views, stating that according to the AEC there was "no evidence" to support the Japanese claims.[25] Although American marine scientists were abandoning the view that

[22] On Hiyama, see Higuchi, this volume.

[23] Allyn C. Vine, *Analysis of Data Obtained by Japanese Scientists during the Cruise of the Shunkotsu Maru* (US Atomic Energy Commission, 1955).

[24] Jessee, 286–292. Quote on p. 292.

[25] "AEC Denies Harmful Fall-out in Pacific," *Los Angeles Times*, April 11, 1958, 7.

radioactivity had been contained, the official line of the US government was to deny scientific evidence of harm.

3. Contaminated Across Time

In addition to taking seriously Japanese claims about the wide-ranging effects of nuclear testing, American scientists were increasingly sympathetic to the notion that those effects would persist for long periods. Officially, many American scientists toed the line in playing down the dangers from atmospheric testing, and dismissed Japanese scientific work as ill-informed at best or wildly irresponsible at worst. The AEC used the Bravo incident as an opportunity for the Atomic Energy Commission to utilize the press to re-educate Americans about the dangerous world they lived in and the need for sacrifice to defeat communism.[26] Nevertheless, especially in the realm of genetic effects, several Americans took exception to general statements from the AEC that long-term effects would be negligible. They needed no prodding from the Japanese to disagree with the AEC.[27] Yet the Japanese geneticists had a unique characteristic in that they did not need to temper their own conclusions by noting the alleged necessity of nuclear testing. What the Japanese provided was a scientific viewpoint about genetic harm shorn of its pro-weapons testing compromises.

The most widely-cited Japanese influence during this period is probably Yasushi Nishiwaki, a biologist from Osaka City Medical College, who was among the first to examine the crew members of the *Lucky Dragon*. Despite his early role in the affair, he is typically remembered not for his ideas, but for the data he passed on. Nishiwaki traveled widely after the Bravo shot, communicating information to scientists in several countries, including British scientist Joseph Rotblat. Using Japanese data on the enormous presence of fission products, including uranium-237 in the blast fallout, passed to him by Nishiwaki, Rotblat was able to determine that the blasts in the Pacific had been fission-fusion-fission weapons.[28]

In addition to the important role of communicating data, Nishiwaki had a particular agenda—to reveal the persistence of radionuclides in the natural environment, and to highlight the long-term health effects. Nishiwaki initially wrote the AEC for help to respond to the crisis, when Geiger counter measurements in Japan suggested there could be devastating health and long term impacts for both the Japanese fishermen exposed and

[26] Stewart Udall, *Myths of August: A Personal Exploration of our Tragic Cold War Affair with the Atom* (New Brunswick: Rutgers University Press, 1998), 246; Philip L. Fradkin, *Fallout: An American Tragedy* (Tucson: The University of Arizona Press, 1989), 121.

[27] One prominent case of a geneticist criticizing the AEC's handling of the fallout question was A. H. Sturtevant of the California Institute of Technology. See "Geneticist Warns on Radiation Rise," *New York Times*, September 12, 1954, 117.

[28] See Introduction and Nakao, Kurihara, and Yamazaki, this special issue.

fish markets.[29] Receiving no reply, Nishiwaki's American wife Jane tried her hand. She sent two additional letters and a cablegram to President Eisenhower. To the AEC she enclosed her husband's data on the radioactivity he had detected in fish and people after the Bravo test. In June, John C. Bugher of the AEC's Division of Biology and Medicine responded. The delay, explained Bugher to Sherman Adams, the Assistant to President Eisenhower, was to "obtain additional background information concerning Mrs. Nishiwaki." Bugher suspected she was a communist and because the official AEC response would merit public attention, he chose his words to her with care. [30] Bugher told Jane Nishiwaki that the "grim consequences you feared have not in fact resulted." There were no serious permanent injuries, he reassured her, and the contamination of fish had been "greatly exaggerated." Bugher acknowledged only that "a few cargoes of fish in Japan were found to have detectable but hygienically insignificant amounts of contamination." Markets were disturbed only because of fear, not due to radiation damage. The US government sought to give every assistance possible, stating that while injuries were "a matter of deep regret," the tests themselves were "a source of pride."[31]

Bugher cast the issue as one of comparative perspective. He invited Jane Nishiwaki to consider the large loss of many fishermen in recent storms off the coast of northern Japan. "Impressive as these man-made nuclear detonations may be, they are dwarfed by the frequently occurring manifestations of nature." He also appealed to her patriotism. "I am sure you will agree that devastating general war and tremendous suffering can be prevented only by keeping the free world overwhelmingly strong," he wrote. "To this end, personal inconvenience and some risks must at times be accepted by everyone of us."[32]

Yasushi Nishiwaki's claims about environmental persistence focused on errors in the data that could be traced to methodological flaws. For example, he noted that the gummed films used to collect dust particles in Japan tended to underestimate exposure. He went on to claim that bones from northern Japan were registering radioactive content at some 10−100 times that of two years prior. AEC scientists and officials took these claims no more seriously than they had taken those of Jane Nishiwaki. When queried by

[29] "Scientist Immediately Sought Details from the US on Bikini H-bomb Test" *Japan Times*, January 11, 2012, accessed March 9, 2015, http://www.japantimes.co.jp/news/2012/01/11/national/scientist-immediately-sought-details-from-u-s-on-1954-bikini-h-bomb-test/#.VKYduskYHhA; Sandra Ionno Butcher, Executive Director, Pugwash Conferences on Science and World Affairs, "Revisiting the Russell-Einstein Manifesto: Prescriptions for Our Future" March 16, 2014, International Peace Research Institute, Meiji Gakuin University.

[30] John C. Bugher to Sherman Adams, Assistant to the President, June 1, 1954, Eisenhower Presidential Library, White House Central Files, Confidential Files, Box 9, File "Atomic Energy Commission."

[31] John C. Bugher, Director AEC Division of Biology and Medicine to Jane Nishiwaki, June 1, 1954, Dwight D. Eisenhower Presidential Library, White House Central Files, Confidential Files, Box 9, File "Atomic Energy Commission." Many thanks to historian Neil Oatsvall for providing a copy of this document.

[32] John C. Bugher, Director AEC Division of Biology and Medicine to Jane Nishiwaki, June 1, 1954, Dwight D. Eisenhower Presidential Library, White House Central Files, Confidential Files, Box 9, File "Atomic Energy Commission." Many thanks to historian Neil Oatsvall for providing a copy of this document.

American geneticists about the Nishiwaki statements, AEC scientist Merril Eisenbud explained that Nishiwaki's views did not surprise him at all. On his recent trip to Japan (the one in which he and Morton had made few friends), Eisenbud gained the impression that Nishiwaki was prone to extreme, anti-American views. According to AEC scientist Charles Dunham, Eisenbud dismissed Nishiwaki's views on the grounds that he was "married to an American girl with alleged Communist leanings who has been a center of anti-American agitation in Japan." Without seeing Nishiwaki's data, Eisenbud simply rejected it, stating that the level of radioactivity in bones he mentioned was simply not possible.[33]

At the California Institute of Technology, scientists were taking the Japanese work much more seriously. A number of renowned scientists there were already dissatisfied with the AEC's public statements about fallout. One was Alfred Sturtevant, who used his public address as president of the Pacific division of the American Association for the Advancement of Science to issue a stern rebuke to the AEC after its spokesmen denied any possibility of damage from nuclear testing.[34] Another was geneticist George Beadle, who would go on to share a Nobel Prize for his work in plant genetics, and a third was Linus Pauling, whose work on the chemical bond earned him the Nobel Prize in Chemistry in 1954. Both Beadle and Pauling had particular difficulty squaring the AEC's depictions of Japanese scientists with their own experiences. For example, Beadle observed in 1956 that Nishiwaki's opposition to nuclear testing was not a cause to dismiss his scientific claims. He wrote to the AEC that Nishiwaki was "an emotional fellow inclined to some extravagance and pretty strongly biased against our tests and other AEC activities." But while he agreed that Nishiwaki may be "way off base" on fallout and bone data, he disliked the way the people at AEC simply disregarded him. Nishiwaki had acted as Beadle's interpreter when he gave a lecture in Osaka the previous year. He did not see Nishiwaki and his wife as communists, and they seemed to be anti-American only in regard to bomb tests. Beadle and his wife spent a whole day with them in Osaka, and Beadle also interacted with Nishiwaki during a genetics symposium. "Maybe I've been completely fooled but I don't believe so," he wrote to Dunham at the AEC. "I find both Nishiwakis intelligent, charming people. He is amazingly well informed in many areas." Not only that but, Nishiwaki had an excellent reputation among his colleagues and was "enormously influential among the younger group." And yet the AEC was prepared to simply ignore him.[35]

Beadle saw the Nishiwaki case as a major flaw in the AEC's approach. The

[33] Charles L. Dunham, Director, Division of Biology and Medicine, AEC, to George Beadle, December 10, 1956, Caltech Archives, Papers of George Beadle, Box 17.5.

[34] Jacob Darwin Hamblin, "'A Dispassionate and Objective Effort:' Negotiating the First Study on the Biological Effects of Atomic Radiation," *Journal of the History of Biology* 40 (2007): 147–77.

[35] Beadle to Dunham, December 17, 1956, Caltech Archives, Papers of George Beadle, Box 17.5.

commission tried to find ways of marginalizing dissenters rather than engaging with them. "Here is an able, intelligent, influential fellow who can, if handled right, be on our side," Beadle stated. "On the other hand he can do us a lot of harm if we handle him in the wrong way." To Beadle's mind, a good relationship with Nishiwaki would provide a credible way of communicating with Japanese scientists when their statements are "off the beam." Beadle continued, against the grain of both Dunham's and Eisenbud's dismissiveness: "I feel so strongly about this that I want to urge you to give serious thought to the proposal we look for ways to encourage good relations." Beadle also pointed out that the AEC might try to get some better advice from those who had spent considerable time in Japan.[36]

The AEC's attitude had the opposite effect than that intended, and Beadle took it not only as an affront but a personal challenge. He noted that he planned to have more, rather than less, connection with Japan, and he meant it: he struck up a lively correspondence not only with Nishiwaki but also with Taku Komai, the chairman of the Japanese Genetics Society's Committee on Radiation Hazards.[37] Rather than await the AEC's blessing, Beadle took the initiative by contacting Komai and circulating Japanese materials to the other members of the genetics committee of the National Academy of Sciences' series of committees tasked in 1955 with assessing the biological effects of atomic radiation. Komai pointed out that a great deal of the work by geneticists under the auspices of the Atomic Bomb Casualty Commission (ABCC) had been discontinued, especially support of Japanese scientists, and he urged Beadle to do what he could to encourage the US government to start it up again.[38]

Komai's mention of the ABCC was a sore spot for geneticists in the United States. The Atomic Energy Commission routinely used the absence of evidence of genetic harm, from the ABCC studies, as a talking point in playing down the dangers from nuclear tests. And yet geneticists did not believe that all genetic effects, such as birth defects, would manifest in the first generation of births from survivors of Hiroshima and Nagasaki. The absence of harm was a red herring. For example, in 1952 when geneticists convened in Washington to discuss whether to continue the studies, H. J. Muller pointed out that the results would most likely not give positive evidence of genetic effects even if such effects had been produced. Shields Warren, a leading pathologist working with the AEC, responded that this was a reason to continue them. Muller characterized Warren's attitude thus: "such results would tend to dispel the fear of the public that genetic effects had been produced." This struck Muller as patently dishonest.[39] Further, the fact that Japanese

[36] Beadle to Dunham, December 17, 1956, Caltech Archives, Papers of George Beadle, Box 17.5.
[37] Beadle to Dunham, December 17, 1956, Caltech Archives, Papers of George Beadle, Box 17.5.
[38] Taku Komai to Beadle, December 26, 1956, Caltech Archives, Papers of George Beadle, Box 17.5.
[39] H. J. Muller to Dael Wolfle (with handwritten notes to George Beadle), October 8, 1955, Caltech Archives, Papers of George Beadle, Box 5.3.6.

participation in genetic studies had been curtailed meant American scientists were increasingly the sole voices on genetic effects from Hiroshima and Nagasaki.

Beadle was right that Nishiwaki had taken on an important role in Japanese scientists' understanding of radiation effects. He was one of four scientists designated by the Genetics Society of Japan to prepare a formal statement on the genetic effects of radiation. That document would serve a function in Japan similar to that of the NAS report in the United States—it would represent a consensus view of some of the leading scientists.[40] The Japanese statement lacked the ambiguous statements playing up uncertainties that typically marked American documents. Yet its core statements reflected the views of American geneticists. It stated outright that "generally speaking, any kind of radiations cause some damage to organisms." But unlike the 1956 reports by Americans, the Japanese document did not hint at a threshold of safety by identifying acceptable limits. Nor did the Japanese suggest that humans might be exempt from damage (as some Americans did, because the data about induced mutations came from mice and flies rather than humans). Instead it spelled out the reasons why genetic effects were serious: radiation increased the frequency of mutations; the majority of mutations were harmful, and most commonly appeared after the first generation; incidence of mutation was proportional to total dose and would be handed down to progeny.[41]

Despite standing in agreement with American geneticists, the tone of the Japanese statement went beyond what Americans had done. While several prominent geneticists in the United States had taken contrary stances to the AEC, notably Muller, Sturtevant, and Beadle, these took the form of opposition to dishonesty rather than policy recommendations. They did not necessarily pass judgment against nuclear testing. By contrast, the Japanese statement was unambiguous in its discussion of the consequences, casting it as a long-term problem for the human population as a whole. Normally, harmful mutations were removed over time by natural selection, the Japanese scientists noted, ensuring that new mutations and removed mutations remained in equilibrium. Adding new mutations beyond natural rates disrupted that equilibrium, increasing the mutant genes in the population. Such changes would lead to gradual increases in "individuals handicapped in physical strength or in mental capacity." These were sacrifices to individuals and burdens to the whole society, leading "to eventual disaster for mankind." The Japanese drew a sharp distinction between, on one side, decisions to set permissible limits to protect those now living, and on the other side, decisions to protect descendants. "We must be on guard against the genetic effects of atomic or hydrogen bomb tests," they

[40] "Report on the Activities of the Special Committee on the Genetic Effect of Radiation of the Genetics Society of Japan," n.d., attached to Taku Komai to George Beadle, December 26,1956, Caltech Archives, Papers of George Beadle, Box 17.5.

[41] Statement Concerning the Genetic Effects of Radiation Upon Man, April 1, 1957, Caltech Archives, Papers of George Beadle, Box 17.5.

stated, "which increase the level of radioactive contamination in the air and water."[42] Although unambiguous about the negative, long-term genetic effects of nuclear testing, the Japanese statements had no combative tone. Indeed the Japanese were masters of understatement, outlining in sober and methodical fashion a future that held "eventual disaster for mankind."

4. The Right Not to be Contaminated

Probably the most significant influence on American scientists was the idea that nuclear testing violated human rights, a notion rooted in the spatial and temporal perspectives discussed above. The most significant American figure to connect these interpretations of radiation exposure to human rights was the biochemist Linus Pauling, who had been investigating the structure of DNA in the year prior to the Bravo shot. His scientific activities blended with political activism, and his perspective evolved from one of scientific disagreement about effects toward political disagreement about the right of any nation to test nuclear weapons. Making that connection owed much to Pauling's contacts with Japanese scientists.

Pauling was connected to nuclear science and Japan long before his opposition to the bomb because of his study of quantum mechanics. Pauling synthesized his biochemical knowledge of structure with quantum mechanics to make claims that structure could eventually identify the healthy function of cells. As he later wrote, Pauling came to believe that the structure of something, whether a molecule or a society, determined its healthy function. If society could be restructured according to respect for human rights and international law, all war, especially nuclear war could be abandoned.[43] Much of his thinking came from science, but his friendships led him to believe a better world without war was imperative.

Pauling's Japanese friendships tell a story about the ambiguous relationship of nuclear technology with the pursuit for peace and human rights. The clearest embodiment of that ambiguity was Yoshio Nishina, with whom Pauling became acquainted as early as 1926, when both men spent time at Niels Bohr's laboratory in Copenhagen.[44] Nishina

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[42] Statement Concerning the Genetic Effects of Radiation Upon Man, April 1, 1957, Caltech Archives, Papers of George Beadle, Box 17.5.

[43] Linus Pauling, *No More War!* (New York: Dodd, Mead and Company, 1958); Linus Pauling, "The Molecular Theory of Civilization," California Library Association, October 5, 1960, Courtesy of Ava Helen and Linus Pauling Papers, Special Collections and Archives Research Center, Oregon State University (hereafter OSU SCARC) 04. Manuscripts and Typescripts of Speeches, Box 1960s2.13; OSU SCARC, "The Messenger Lectures," *The Pauling Blog*, October 13, 2009, https://paulingblog.wordpress.com/2009/10/13/the-messenger-lectures/ and "The Molecular Theory of Civilization," *The Pauling Blog*, October 20, 2009, https://paulingblog.wordpress.com/2009/10/20/the-molecular-theory-of-civilization/.

[44] Nishina to Pauling, March 7, 1929, LP Correspondence, Box 287 File 287.1 N: Correspondence, 1929, AHLPP, OSU SCARC; Andrew J. Rotter, *Hiroshima: The World's Bomb* (Oxford: Oxford University Press, 2008), 64; Interview of Dr I.I. Rabi by Thomas Kuhn on December 8, 1963, Niels Bohr Library & Archives,

returned to Tokyo to direct the Riken lab, and by 1935 he established his own lab and started building cyclotrons. He was no peace advocate then, but instead agitated for science to be mobilized for the Japanese war effort. Nishina was a major figure in Japanese nuclear science and mentor to Hideki Yukawa (who would win the 1949 Nobel Prize in Physics).[45] He was directed in 1940 to enrich uranium for the Japanese atomic project. Lacking uranium, electricity, manpower, and funds, the project languished. Nishina's home was destroyed by fire in the same B-29 bomb attack in April 1945 that destroyed the fledgling atomic bomb project at Riken lab.[46]

After the war, Nishina spearheaded Japan's efforts to re-enter the world community of science. In 1950, he embarked on a tour sponsored by the (US) National Academy of Sciences, visiting American nuclear physics research facilities, and he was central to the popularization of peaceful uses of nuclear technology.[47] Nishina stayed with the Paulings in Pasadena when he visited the USA in 1950.[48] The two men must have had much to talk about, especially since Nishina had investigated both Hiroshima and Nagasaki days after the bombings. Nishina died in 1951 from cancer before the men could visit again. Pauling often spoke of his fondness for his friend Nishina with the clarion call to develop nuclear technology for peaceful applications like energy, education and medicine. At the time, Pauling and other scientists saw peaceful nuclear technology as an integral part of the larger United Nations mandate for human rights.

This need for nuclear energy and development seemed especially pressing for Japan, suffering in the aftermath of WW II. The situation for science in general seemed dire. Pauling observed scientists in Japanese universities were critically overworked.[49] In 1950

American Institute of Physics, College Park, MD USA http://www.aip.org/history/ohilist/4836.html; Thomas Hagar, *Force of Nature: The Life of Linus Pauling* (New York: Simon and Schuster, 1995), 637; OSU SCARC, "A Guggenheim Fellow in Europe during the Golden Years of Physics, 1926–1927" accessed March 1, 2015 http://scarc.library.oregonstate.edu/coll/pauling/chronology/page9.html; Dong-Won Kim, *Yoshio Nishina: Father of Modern Physics in Japan* (CRC Press, 2007), 172; Ito, "Making Sense," 208. In 1927, Pauling was in Munich studying with Arnold Sommerfeld and Nishina in Hamburg with I.I. Rabi and Wolfgang Pauli.

[45] Kenji Ito, "Making Sense of Ryoshiron (Quantum Theory): Introduction of Quantum Mechanics into Japan, 1920–1940" (PhD diss., Harvard University, 2002), 175, 356.

[46] Kenji Ito, "Values of 'Pure Science': Nishina Yashio's Wartime Discourses between Nationalism and Physics, 1940–1945" *HSPS* 33, no.1 (2002): 61–86; Rotter, *Hiroshima*, 66-7.178-9, 223-6; "About Riken: Story," accessed March 10, 2015, http://www.riken.jp/en/about/history/story/ and "About Riken: Historical Figures, Yoshiro Nishina," accessed March 10, 2015, http://www.riken.jp/en/about/history/figures/.

[47] Shunichi Takekawa, "Drawing a Line between Peaceful and Military Uses of Nuclear Power: The Japanese Press, 1945–1955" *The Asia-Pacific Journal* u.d. http://www.japanfocus.org/-Shunichi-TAKEKAWA/3823; Kim, *Yoshio Nishina*, 173.

[48] Nishina to Pauling, September 25, 1950, AHLPP, OSU SCARC, LP Correspondence, Box 287 File 287.17 N: Correspondence, 1950; Kim, *Yoshio Nishina*, 173.

[49] "Japanese Scientists and their Work Lauded" *Asahi Evening News*, March 8, 1955, AHLPP, OSU SCARC, LP Biography, LP Scrapbooks, Box 6.006 File 6.149; "No Need of Destruction of Atom Bombs: Professor Pauling Suggests Better Use for Peaceful Purposes" *Amrita Bazar Parkika*, February 9, 1955, AHLPP, OSU SCARC, LP Biography, LP Scrapbooks, Box 6.006 File 6.146. Pauling's support of peaceful uses is well documented by Hagar and other scholars but a particular example is the lecture reported on here delivered by

another Japanese scientist, San-Ichiro Mizushima, a professor of Physical Chemistry at the University of Tokyo, remarked to Pauling how little funding and ability there was for Japanese scientists to even have reprints of their work made to send to other researchers. Muzushima hand-drew for Pauling his work on the ring shape of glycine anilide in polypeptide chains. Excited about Mizushima's work, Pauling made plans to visit him in person in 1954.[50]

Pauling's relationships with the Japanese were complicated by his difficulties with the US government. The US State Department denied Pauling a travel passport, foiling plans for a visit to Japan. The passport was withheld on the grounds that his activities agitating against the executions of Ethel and Julius Rosenberg and for international control of nuclear weapons made him both a danger and likely a communist. Mizushima had planned several lectures for Pauling sponsored by the Japanese Chemical Society, but the events had to be cancelled.[51]

Pauling's stature in the United States, along with his obvious lack of official government position, made him an ideal ally for Japanese scientists hoping to influence their American colleagues on issues for which the US government had little sympathy. Although his first Japanese friend, Nishina, had been fervently nationalistic before eventually promoting international cooperation, his new scientific friends and colleagues often tried to provide evidence for conclusions that would lead to a termination of nuclear testing. Annoyed by his passport troubles, and shabby treatment of colleagues who were perceived as sympathetic to communism, he was receptive to critique of his own government, and least likely to reflexively defend the US's position.[52] Several of the Japanese scientists involved in post-Bravo studies of the atmosphere sent reprints of their scientific papers directly to Pauling. For example, Pauling received a reprint of the 1954 paper on the Bikini ashes. He annotated "U-237 found" prominently on the title page of the study.[53]

For Pauling, the question of rights and the scientific doubts about radiation safety came together in the Bravo incident. His ability to draw attention to that connection, heretofore stifled by the US government, expanded considerably when he was announced

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Pauling to the Allabhabad Press Club on his visit to India.

[50] "Mizushima, 1936–37, 1950, 1953–55, 1967, 1983," AHLPP, OSU SCARC, LP Correspondence, Box 248, File 248.6. In addition as a postscript in his 1950 letter Mizushima says Pauling's textbook "General Chemistry" would be good to use in Japan's "new system of education."

[51] "Mizushima, 1936–37, 1950, 1953–55, 1967, 1983," AHLPP, OSU SCARC, LP Correspondence, Box 248, File 248.6; Pauling Central Intelligence Agency and US State Department Files, 1947–1991, AHLPP, OSU SCARC, 16 Pauling Biographical 1910–1996, 2. Political Issues, 1945–1989, 2.030 Files 30.1 and 30.2.

[52] On Pauling's exasperation at the treatment of colleagues, see William G. Robbins, "The Academy and Cold War Politics: Oregon State College and the Ralph Spitzer Story," *Pacific Northwest Quarterly* 104, no. 4 (2013): 159–75.

[53] M. Ishibashi, et al., "Radiochemical Analysis of the Bikini Ashes," November 1954, AHLPP, OSU SCARC, LP Peace, Box 7.001 File 1.5.

as the winner of the Nobel Prize in Chemistry in October 1954, seven months after the *Lucky Dragon* incident.[54] The State Department proved unwilling to risk the increased public scrutiny if they were to bar Pauling's travel to receive the prize in Sweden. The prestige afforded Pauling the leverage to travel elsewhere as well. He and his wife Ava Helen visited Japan as part of a world tour to celebrate his award. The Nobel was given to Pauling for his work in elucidating the chemical bond. Radiation, however, can break those very bonds. The visit to Japan from February 21 to March 11, 1955 was the last stop. According to biographer Thomas Hagar, the around the world trip convinced Pauling that he had the support of the world's citizens against nuclear weapons.[55]

While in Japan, the Paulings "heard a lot about radioactive fallout." They were in Kyoto on the first anniversary of the *Lucky Dragon* incident.[56] At his lectures, Pauling was swamped. "Hundreds of people" had to be turned away from his public talks despite the large auditoriums that were booked.[57] Pauling gave lectures and seminars, including at Osaka University.[58] Pauling may have met with Nishiwaki, whose mother Rika Nishiwaki was president of the Japan Chapter of World Peace Maternal Association and a supporter of the Hibakusha, the atom bomb survivors. Pauling later arranged for Nishiwaki to come to Caltech in 1959.[59] Photos record Pauling with Nishina's protégé, Hideki Yukawa and Yukawa's activist wife, Sumi. Yukawa was famous by then, having become the first Japanese Nobel Prize winner in 1949 for his prediction of the existence of mesons. While Nishina had been tireless in promoting and organizing peaceful applications of nuclear technology, Yukawa was passionately outspoken in his opposition to nuclear weapons.[60] Yukawa's essay "Atomic Energy and the Turning Point for Mankind" was written and published in March of 1954 in *Mainichi Shimbun*, a leading Japanese newspaper. Yukawa argued, like Albert Einstein, that nuclear weapons had fundamentally altered the relationship of man to nature in ways that had not been accounted for. [61]

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[54] "Mizushima, 1936,-37, 1950, 1953–55, 1967, 1983", AHLPP, OSU SCARC, LP Correspondence, Box 248 File 248.6.

[55] Thomas Hagar, *Force of Nature: The Life of Linus Pauling* (New York, Simon & Schuster, 1995), 454–60; Pauling Central Intelligence Agency and US State Department Files, 1947–1991, AHLPP, OSU SCARC, 16 Pauling Biographical 1910–1996, 2. Political Issues, 1945–1989, Box 2.030 Files 30.1 and 30.2.

[56] Hagar, *Force of Nature*, 454–60, quotation on page 459.

[57] Al Farley, "Dr. Linus Pauling Returns from World Tour following Nobel Prize Ceremony in Sweden" *The California Tech*, April 7, 1955, Box 6.006, File 6.150 LP Scrapbooks, LP Biography, AHLPP, OSU SCARC.

[58] "Itinerary" AHLPP, OSU SCARC LP Travel, Box 1.002 File 2.1 "Travel Materials, 1955"; Also see Yamazaki et al, this volume.

[59] Yamazaki et al, this volume.

[60] Ito, "Making Sense of Ryoshiron" 344–7, 360. Nishina promoted Japanese atomic science even in his death, as he was buried not in his family plot but in the Tama Cemetery in Tokyo, to be near his Nishina laboratory.

[61] Hideki Yukawa, John Bester, trans., *Creativity and Intuition: A Physicist Looks at East and West*

Pauling's reflections on Japanese science and the long term meaning of the errant Bravo test were captured in a statement he prepared for *Asahi Press* (*Asahi Shinbun*) his last evening in Tokyo. His statement notes, written on the back of the Tokyo Imperial Hotel stationery, are testament to the Japanese impact on his ideas. He spoke about his admiration for the Japanese scientists, especially Yukawa and the late Nishina. Pauling said the relationship "of science to the modern world seems to have been accelerated" in Japan "by the atom-bomb and radiation disasters." Pauling felt both the "continued deaths from old radiation injuries" and the fallout from hydrogen bombs "make evident" the need for control of nuclear "fission and fusion." Pauling felt it might be only a few generations until negative effects from the global spread of radioactivity would cause human suffering.[62] Less than a few months after the world tour, Bertrand Russell issued a manifesto highlighting global dangers from nuclear war calling for world leaders to take meaningful steps toward peace. It included the memorable phrase, "Remember your humanity, and forget the rest." It was signed by eleven eminent scientists from several countries, and Yukawa, Pauling, and Einstein were among them.[63]

Relationships with Japanese colleagues were critical in Pauling's framing of his arguments against nuclear weapons testing. He embraced scientific arguments about the global reach and long-term persistence of radioactivity that American government officials shied away from. Perhaps more importantly, he spoke of nuclear testing in legal terms as a human rights violation. The Paulings worked with and were influenced by the Japan Council Against A and H Bombs that was formed in the wake of Bravo in 1955.[64] As Ava Helen Pauling's biographer Mina Carson argues, "the fates of Japan and its people started the Paulings down the road to global activism."[65] Less than two years later, Pauling agreed to be the lead plaintiff to sue the US, UK, and USSR to end their nuclear tests. The first of two US "fallout suits" argued that nuclear weapons tests violated international law and human rights. In the first "fallout suit", representatives of world citizens included four Japanese co-plaintiffs, including three who were fishermen who saw their livelihood endangered by the tests in the Pacific and a resident of Hiroshima.[66]

(Kodansha International Limited, 1973), 185–88.

[62] LP Notes [re: Japanese scientists and science] for *Asahi Press*, Tokyo, [written on Imperial Hotel Tokyo Stationery], March 10, 1955, AHLPP, OSU SCARC, 2.025 Box "Family Bank," File 25.12, Linus Pauling's Safe-Drawer 2, Personal Safe, 1912–1993.

[63] Russell-Einstein Manifesto, July 9, 1955, accessed January 12, 2015, http://www.umich.edu/~pugwash/Manifesto.html.

[64] "Correspondence: Japan Council Against Hydrogen Bombs 1957," AHLPP, OSU SCARC, LP Peace, Peace Groups, Box 4.008 Japan Council Against Atomic and Hydrogen Bombs 1957–1965, 1991 File 8.1; OSU SCARC, "The Paulings and Japan: Roots of a Fruitful Relationship" *The Pauling Blog*, November 30, 2011, https://paulingblog.wordpress.com/2011/11/30/the-paulings-and-japan-roots-of-a-fruitful-relationship/.

[65] Mina Carson, *Ava Helen Pauling*, *Partner*, *Activist*, *Visionary* (Corvallis: Oregon State University Press, 2013), 92–4.

[66] "Court Document, Complaint for Declaratory Judgment and for Injunction," 1–3, AHLPP, OSU

Pauling would return to Japan to give the keynote address in the 1959 Hiroshima commemorations "Atomic Death or World Law: Our Choice."[67] These fallout suits, as Toshihiro Higuchi has noted, were an early (but unsuccessful) attempt to place nuclear pacifism into a legal framework by linking it to environmental exposure.[68]

Ava Helen Pauling also continued to work with Japanese scientists to critique positions of the US government. On the 1959 visit to Japan, she was invited by Dr. Katsuko Saruhashi to speak about peace to the Society of Japanese Woman Scientists, a group dedicated to peace and the support of women's scientists.[69] Saruhashi had received her geochemical doctorate in 1957 working at Yasuo Miyake's Central Observatory in the Tokyo Meteorological Research Institute, just at the time that Miyake was analyzing data coming from the *Shunkotsu Maru* and other sources. She developed a gauge to measure radioactivity in seawater with greater precision. When the US AEC insisted the Japanese numbers were in error, being too high, she went to the Scripps Institution of Oceanography in 1962 upon the insistence of her mentor Miyake to prove the Americans wrong.[70] While at Scripps she co-authored a paper with Ted Folsom, who had studied ocean effects from the Bravo and Wigwam nuclear tests for the AEC. He promoted the use of weapons explosions as radioactive tracers to study the ocean. Their paper together showed that the Japanese estimates from Miyake's lab did align with Scripps measurements.[71]

The Paulings' arguments linking nuclear testing to human rights did not prevail and eventually the fallout cases were dismissed. This was partly due to the court's rejection of "global citizens" as plaintiffs, but also the suits lost purpose when the 1963 Partial Test Ban Treaty (banning atmospheric tests) made the cases moot. The treaty, however, did not resolve the legal question about the "right to test" or the right of humans all over the world to live without being contaminated by any given nation's experiments. It did not acknowledge significant harm from testing, and it did not outline the temporal and spatial reach of radioactivity from the tests. Instead, American officials treated it primarily as an

SCARC, LP Peace, Other Peace Activism, Box 6.001 "The Fallout Suits, 1957–1962" File 1.7 "Court Document, Complaint for Declaratory Judgment and for Injunction".

[67] Hiroshima Appeal, August 6, 1959, AHLPP, OSU SCARC, LP Peace, Other Peace Activism, Box 6.004 Files 4.1–3.

[68] Toshihiro Higuchi, "Tipping the Scales of Justice: The Fallout Suit of 1958 and the Environmental Legal Dimension of Nuclear Pacifism," *Peace and Change* 38, no. 1 (2013), 33–55.

[69] K. Saruhashi to Ava Helen Pauling, August 17, 1959, Ava Helen Pauling, AHLPP, OSU SCARC, Box 1.004 File 4.4 "N: Correspondence N-S."

[70] T.R. Folsom and Katsuko Saruhashi, "A Comparison of Analytical Techniques Used for Determination of Fallout Cesium in Sea Water for Oceanographic Purpose," *Journal of Radiation Research* 4, no. 1 (March 1963): 39–53; Jennifer Robertson, ed., *A Companion to the Anthropology of Japan* (John Wiley & Sons, 2008), 468–79; Y. Miyake, K. Saruhashi, and Y. Katsuragi, "Strontium 90 in Western North Pacific Surface Waters," *Papers in Meteorology and Geophysics* 11 (1960): 188–91; Y. Miyake, K. Saruhashi, Y. Katsuragi, and T. Kanazawa, "Cesium 137 and Strontium 90 in Sea Water," *Journal of Radiation Research* 2, no. 1 (1961): 25–28.

[71] Jessee, "Radiation Ecologies," 284, 297, 301.

arms control measure, a step toward peace between the US and Soviet Union. Therefore, the human rights issues raised by this history and the Japanese still lingered unresolved.[72]

5. Conclusion

After the Bravo incident, many Japanese joined the new Japan Council Against A and H Bombs. Led by international law professor Kaoru Yasui, the council argued that the bombing of Hiroshima and Nagasaki, and now the radiological contamination from fallout, degraded what it meant to be human. "Bring Back the Human" was one of the early poems to voice the experiences of survivors. Written by Sankichi Tōge (1917–1953), who died from leukemia from his exposure to radiation from the Hiroshima bomb, it states, "Give me back myself, Give back the human race."[73] While Tōge was a victim, his message was broader than himself or even his country. Instead his words invoked something belonging to all humanity that had been lost.

Our approach in this essay has been to highlight conceptual differences between Japanese scientists' statements and those of American officials, and to show influences upon a few American scientists. In doing so, we hope to draw attention to the important place that Japanese voices have in a longer discussion about environmental and health effects in the nuclear age. We do not emphasize the victimhood of the Japanese, but instead show several voices making claims that sound remarkably similar to statements that scientists worldwide would make in subsequent decades about health and environmental issues. They note the wide-ranging effects of activities perceived by others as safely contained. They focus on the long-term effects of actions perceived by others as ephemeral and fleeting. And they hold up the right of humans not to suffer contamination at the whims of those more powerful than they. As historians, we also argue that casting the Japanese as victims, especially if doing so focuses solely on the fate of the *Lucky Dragon*, is to ignore these contributions. Instead, we should shine historical light on the Japanese as actors trying to exert influence, and succeeding, at a crucial moment of the nuclear age and the environmental age.

Speaking to an audience in Hiroshima, Ava Helen Pauling said in 1959, "We learned long ago to admire and love our Japanese friends."[74] She and her husband, Linus Pauling, spent much of the 1950s clamoring for an end to nuclear testing. Their arguments were closely linked to those of Japanese scientists, to whom they looked for friendship and inspiration. Japanese scientist's perspectives on the nuclear age influenced not only

[72] Linda Richards, "Fallout Suits and Human Rights: Disrupting the Technological Narrative" *Peace & Change* 38, no. 1 (January 2013): 56–57; Higuchi, "Tipping the Scale of Justice," 33–55.

[73] Makito Yurita, *Metahistory and Memory: Making/remaking the Knowledge of Hiroshima's Atomic Bombing* (ProQuest, 2008).

[74] "Manuscript, Typescript: No Title, speech delivered in Hiroshima Japan by Ava Helen Pauling, August 3, 1959," Ava Helen Pauling, AHLPP, OSU SCARC, Box 2.001, File 1.5.

scientific ideas, but also the meaning of radiation exposure as a question of universal rights. In the aftermath of the *Lucky Dragon* incident, Japanese scientists helped to foster a critical conversation about whether nuclear technology would stand as a human right, because of its role in development and medicine, or as a violation of such rights, because of wide-ranging and long-term contamination without consent.

(Received on 18 March 2015; Accepted on 25 May 2015)