Title	Perspectives of the Year 1945 and Turning Points in the History of Science
Author(s)	Tanaka, Yuriko
Citation	ZINBUN (2019), 49: 113-121
Issue Date	2019-03
URL	https://doi.org/10.14989/244052
Right	© Copyright March 2019, Institute for Research in Humanities Kyoto University.
Type	Departmental Bulletin Paper
Textversion	publisher

ZINBUN No. 49 2018

Special Topic 1: The A-bomb and Medical History

Perspectives of the Year 1945 and Turning Points in the History of Science

Yuriko TANAKA

ABSTRACT: Recent studies illustrate the plurality of historical contexts around the emergence of the atomic bomb in 1945 and illuminate the subsequent power politics among different historical interpretations. There are historical issues whose impact holds so much gravity that the issue's historiography entails divergent implications. The context in which the atomic bomb was created could lead to problematic historiographies. In this essay I examine multiple and parallel scientific contexts regarding the search for atomic existence and investigations into related experiences and practices before and after 1945. Those scientific contexts present different rhythms and multiple directions. A historiography with plural viewpoints should be designed to trace the history of those interacting scientific activities.

KEYWORDS: Atomic bomb, science, narratives, plurality, historiography,

Yuriko TANAKA is Program-Specific Associate Professor at the Hakubi Center for Advanced Research, Kyoto University. E-mail: tanaka.yuriko.4v@kyoto-u.ac.jp

1. Plurality, Politics, and History of the Atomic Bomb

In the paper entitled "Beyond Peace: Pluralizing Japan's Nuclear History" (2012), Shi Lin Loh closely examined divergent scenes in the aftermath of atomic bombings in Nagasaki and Hiroshima in 1945, and revealed how "the national readings," namely the official forms of acceptance about these two historical events, had worked effectively in postwar Japan to "elide" other immediate and colorful narratives of the experience.[1] Loh pointed out that throughout the following decade, realities in those two cities were overshadowed by ongoing "other major events: the Allied Occupation of Japan, the start of the Cold War and the crackdown on Communism, and the Korean War."[2] It was only after these new post-wartime-related political and economic conditions in the country had been established that the real national image-building around the atomic bombings began in Japan. By then there were new national policies and priorities that underlay the re-building of "Nuclear History" in Japan.[3]

Ran Zwigenberg called this historical setting "the turbulent 1950s," in his book *Hiroshima: The Origins of Global Memory Culture* (2014),[4] where people both within and outside the atomic-bombed cities oscillated among various representations of the A-bomb experience. On the other hand, Zwigenberg also traced the gradual and complicated—emotionally as well as politically—process, going back to 1945, in which survivors and Hiroshima city officials had chosen the symbolic image of peace and eventually adopted the exceptional position of "victim-martyre."[5] Zwigenberg's keen attention on the value-producing role of the "moral witness"[6] elucidates the intense conflicts and negotiations, even among those "memories" often believed to be the most immediate.

Why, and how, has this synthesis of certain representative or powerful, narratives taken shape? Nakao Maika referred to such terms as "dream," "magic," and "lie," in the closing chapter of her book, *Kaku No Yuwaku* [*Allure of Nuclear*] (2015),[7] arguing that these

---

1 Shi Lin Loh, "Beyond Peace: Pluralizing Japan's Nuclear History," *The Asia-Pacific Journal*, vol. 10, issue 11, no. 6 (March 5, 2012). https://apjjf.org/2012/10/11/Shi-Lin-Loh/3716/article.html [Accessed November 15, 2018]

2 Ibid.

3 Among them were Eisenhower's promotion of the idea of "Atoms for Peace" and need for new electric infrastructure in Japan as a developing country during 1950s. Cf. "Conclusion," Ibid.

4 Ran Zwigenberg, *Hiroshima: The Origins of Global Memory Culture*, (Cambridge: Cambridge University Press, 2014) p. 94.

5 Ibid., pp. 23–93, especially p. 86.

6 Ibid., pp. 18–19.

7 Nakao Maika, *Kaku no Yūwaku: Senzen Nihon No Kagaku Bunka To 'Genshiryoku Yūtopia' No Shutshugen* [*Allure of Nuclear: Science Culture in Prewar Japan and the Emergence of "Atomic Utopia"*], (Tokyo: Keiso Shobo, 2015) pp. 327–335.

forms of ambiguity or blindness generated around nuclear science during the 1900s to the 1930s had strongly attracted every kind of popular imagination in prewar Japan, which, in turn, built up an "Atomic Utopia." Those promising "lies" or "jests"[8] had emerged through a hybridization of different voices such as scientific ambition, people's aspirations, or military propaganda, as Nakao vividly described. Those voices overpowered any opposing claims, until the next "true word" unequivocally presented itself, namely the actual exploding atomic bomb, and those previously powerful voices had to admit defeat.

Loh, Zwigenberg, and Nakao powerfully illustrate the plurality of possible historical contexts and interpretations surrounding the A-bomb in 1945. They also illuminate the power-politics among those contexts and interpretations: from those politics a certain hegemonic narrative emerged, which overshadowed the immediate confusions or indeterminacy around the incident.

Figure 1: An image of atomic bomb captioned "Many a true word spoken in jest", from *Asahi Graph*, vol. 1139, 1946, p. 12, cited in Nakao, *Kaku No Yuwaku*, p. 1.

[8] Nakao introduces an article in a Japanese journal *Asahi Graph* that includes a picture of an atomic explosion with a caption saying "Many a true word spoken in jest (uso kara deta makoto)" (see Figure 1) and insightfully examines meanings and origins of this "uso (lie, jest)"(Ibid., p. 1 & p. 334–335).

There are certain broad historical issues whose impact holds so much gravity that their historiographies should almost immediately entail political or ethical implications.[9] What happened around the atomic bomb before and after 1945 is such a broad historical issue, which could lead to historiographical problematics. For instance, as Zwigenberg rightly points out in his book, that the atomic bombings in 1945 had to be defined as "a mistake,"[10] should be interpreted in the context of the need to cope with the heaviness of what had happened. As such, what was considered "normal" and "temporal slippage,"[11] became fluid in sorting out the courses of history.

2. Entangled Developments in the History of Science Surrounding the Atomic Bomb

Accepting the A-bomb as "a mistake" or a "slippage into a darker time"[12] is a quite common attitude in the period after the atomic bombings. As has often been discussed[13] in the history of the atomic bomb, narratives about *who* made the mistake tend to be rather ambiguous. In a similar way, *from where* the slippage happened is not clear either. In other words, *where* the "normal" course of history had been, is uncertain.

From this standpoint, turning to the history of science before and after the atomic bombings, we notice some confusing twists and shifts that eventually led to various "never imagined"[14] outcomes. For reference, Figures 2 provides a brief chronology of significant scientific events surrounding the invention of the atomic bomb.

Werner Heisenberg, who together with Niels Bohr, discovered the foundations for quan-

---

9 On this point, Zwigenberg's book contained another powerful investigation through the examination of the forms of commemoration juxtaposing Hiroshima and Auschwitz. Cf. Hayden White, "Historical Emplotment and the Problem of Truth," in *Probing the Limits of Representation: Nazism and the "Final Solution,"* ed. by Saul Friedlander, (Cambridge, MA: Harvard University Press, 1992) pp. 37–53; Hashimoto Nobuya, *Kioku No Seiji: Yōroppa No Rekishi Ninshiki Funsou [Politics of Memories: European Conflicts about Historical Perceptions]*, (Tokyo: Iwanami Shoten, 2016).

10 Zwigenberg, *Hiroshima*, p. 2.

11 Ibid.

12 Ibid.

13 Zwigenberg vividly illustrates the striking absence of subjectivity in the explanatory discourses concerning the atomic bombing in Hiroshima, which has been presented as if it were "separated from any historical chain of events" and narrated only as "history in the passive voice" (Carol Gluck). Ibid., pp. 1–2.

14 David Lochbaum, Edwin Lyman, Susan Stranahan, The Union of Concerned Scientists, *Fukushima: The Story of a Nuclear Disaster*, (New York: The New Press, 2015), pp. 1–33 (Chapter 1: "March 11, 2011: A Situation We had Never Imagined").

tum physics (opposing Einstein) and asserted the revolutionary uncertainty principle, testified that he had been certain in 1941 that the production of the atomic bomb during the World War II would be technically impossible and shared that certainty with Bohr.[15] Even on the day of the atomic detonation in Hiroshima, Heisenberg was doubtful that the weapon was truly atomic, this time pointing to financial and psychological obstacles that, in theory, should prevent the realization of the atomic weapon both in Germany and the United States.[16] Heisenberg's doubt regarding the atomic bomb was later judged as proof of his incompetence by fellow physiologist Samuel Goudsmit.[17] After the defeat of Germany in WWII, Heisenberg was freed from and proceeded to stand against German military motivated atomic research, and rather worked on "grand" and "general" theoretical problems.[18]

1895 Röntgen discovered X–ray
1896 Bequerel discovered radiation from uranium
1897–98 M. & P. Curie defined "radioactivity/radioactive,"
and isolated Uranium, Polonium →generality of radioactive elements
1898 Rutherford discovered α & β rays (later γ ray)
1904 Rutherford & Soddy co–wrote "Radioactive Change"
1905 Einstein presented idea of Mass–Energy Equivalence ("$E=mc^2$")
1905 Nagaoka introduced the idea of using atomic energy in Japan
1913 Bohr presented the "Bohr Model" of Atom with Quantum Condition
1927 Muller found X–rays being mutagen with fruit flies
1932 Chadwick proved the existence of Neutron
1930 Lawrence invented the cyclotron
1935 Delbrück suggested genes as polymer
1937 Nishina built small cyclotron with the aid of Lawrence
1938 Hahn & Strassmann turned uranium into barium by neutron attack
Meitner & Frisch called the phenomenon "nuclear fission"
1939 Fermi mentioned the use of nuclear power by nuclear fission
1943 Luria & Delbrück discovered random mutation of bacterium with phage
1945 Oppenheimer et al., success of Manhattan Project
1945 Luria & Delbrück opened "Phage Course" at Cold Spring Harbor Labo.
Watson attended the Course
1953 Watson & Crick presented the double helix structure of DNA
at Cold Spring Harbor

Figure 2: Scientific events around the invention of the atomic bomb, 1895–1953

[15] Weiner Heisenberg, *Der Teil und das Ganze: Gespräche im Umkreis der Atomphysik*, (München/Berlin: Piper Verlag, 1996[1969]), pp. 213–214.

[16] Ibid., pp. 226–227.

[17] Suzuki Masashi, *Busshitsu Kara Seimei He: 20-Seiki Kagakushi No Tenkan To Nihon* [*From the "Material" to the "Life": Re-direction of the 20th Science History and Japan*], (Tokyo: Gakken, 2009), p. 99.

[18] Heisenberg, *Der Teil und das Ganze*, pp. 286–287.

Heisenberg was pursuing the theoretical states of the world which no one else had explained, but the practical reality that was produced during the wartime went beyond his prospects. How should we interpret this gap from a prominent scientist?

In Figure 2, there are three major and distinct scientific contexts: the physical-material, the experimental-technological, and the genetic-biological. The physical-material context started with the discovery of the X-ray by Röntgen, namely an encounter with material in an unknown state that would eventually lead to a series of discoveries of cosmic rays, radioactive materials, and elements.

This notion of radioactivity, on the other hand, led to the technical search for the existence of atoms through optical traces and the theoretical bases of those traces or experimental proofs. Simultaneously, the notion of the atom was nothing but an ancient philosophical explanation for the whole materials. The impacts and implications of the development of atomic science around the turn of the twentieth century were enormous. In this scientific context, the above mentioned "grand" theoretical problems for Heisenberg should lie too. The new reality of atomic existence profoundly changed how to deal with ancient ontological questions.

The combination of theoretical and experimental physics presented new areas of inquiry and methods for scientific activities. From these experimental practices arose the possibilities of using and manipulating the energy within atoms, around the time of Einstein's "miracle year." Surely the idea was in the form of a hypothesis at first, which, as Nakao's book argues,[19] drew various images of aspirations or dreams, partly presented by scientists in their pedagogic popular speeches and then widely spread with vulgar variations.

Certainly, the fulfillment of those vulgar aspirations regarding scientific research outcomes should be classified as "applications." Among those applications of what was going on within atomic physical science, for example, is case of "Petite-Curie," a car equipped with the X-ray device designed by Marie Curie to serve during World War I (see Figure 3). X-rays were used to locate wounds inside the bodies of injured soldiers for medical treatment.

As shown in Figure 2, this "Petite-Curie" application had little to do with scientific findings that came *after* the world wars concerning radioactive effects on the molecular structure of living bodies.

Possible effects of radioactivity on living bodies became a scientific interest around 1927, where highly elusive mutations in animals were theoretically connected to atomic collisions with quantum movements inside various cosmic rays running across the natural world.[20] This genetic-biological context regarding the history of the atomic bomb is the most remote from the military motivated technological developments, yet remained in the background

[19] Nakao, *Kaku No Yūwaku*, pp. 31–51.
[20] Suzuki, *"Busshitsu" Kara "Seimei" He*, pp. 33–36 & pp. 43–44.

until the 1950s when it came forward as a new terrain for the exploration of biological science.

The connections between nuclear radiation and living bodies, which attracted the attention of Bohr as well, were the subject of the life vicissitudes and research led by Nishina Yoshio, a leading figure in Japan's atomic science efforts during the 1930s and the 1940s.[21]

Nishina studied physics under the instruction of Bohr at the Institute for Theoretical Physics at Copenhagen University from 1923- to 1928. Nishina was appointed by the Japanese government to conduct military research, including the development of the atomic bomb that was ordered in 1943. Many of Nishina's pupils and colleagues testified that the research lacked both financial and material resources and Nishina knew the Japanese researchers would never achieve the goal, though he had once built a small cyclotron with the aid of American physiologist Ernest Lawrence in 1937. Tsuji Tetsuo, one of Nishina's disciples, mentioned that Lawrence and Nishina had a common interest in biological radiation studies.[22] While Nishina never developed an atomic bomb, based on his knowledge he knew for certain that an atomic weapon had exploded in Hiroshima in 1945 when he visited the city two days after the bombing. When his cyclotron was destroyed by the GHP in 1945 he shifted his research to the production of Penicillin but died from liver cancer in 1951.

Even over the course of just Nishina's life, the aforementioned three major contexts regarding atomic research intermingled, and what resulted did not correspond to what he

Figure 3: M. Curie in one of "Petite Curie"

21 Tamaki Hidehiko & Ezawa Hiroshi (eds.), *Nishina Yoshio: Nihon No Genshi Kagaku No Akebono* [*Nishina Yoshio: The Dawn of Japan's Atomic Science*], (Tokyo: Misuzu Shobo, 2005[1991]).

22 Ibid., p. 30. Cf. Tsuji Tetsuo, *Butsurigakushi He No Michi* [*A Road toward the History of Physics*], (Tokyo: Kobushi Bunko, 2011, p. 218, 234.

thought he knew, intended, or prospected. Could he have led a more "normal" life course, but for the wartime related factors?

Around the atomic bomb, what science could tell us and what it could not were entangled. A group of scientists in 1940s succeeded in triggering atomic chain reactions and developed the machines to do so in a portable size. But no scientist had ever answered the ontological questions pursued by Heisenberg until his death. Various systems of knowledge and issues of different natures together constituted the body of science. Each of those systems of knowledge and issues or objectives developed in divergent directions and on different rhythms. A bomb was developed before the whole nature of the atom was understood. Regarding the "normal" outcome of this historical situation discussed above, which, in reality, was never realized, could it have been different from what we know as our history? We should ask how and where we would reconstruct such normality.

3. In Place of a Conclusion: Pluralizing History and Science

In place of a conclusion, I quote here two important remarks on historiography vis-à-vis the history of science after the twentieth century.

In a paper entitled "Science Is Dead; Long Live Science" (2012),[23] Peter Dear declared at the very opening of his argument: "There is nothing novel in proclaiming the diversity of those activities and bodies of knowledge that we call science; the theme of the "disunity of science" is nowadays a familiar one. . . . And yet little has been done about it."[24] Dear questions "are we concerned with the history of science or with the history of "science?"" and his answer is that he should work on the second type of science history, by tracking an "ideology." Dear continues, "[t]his ideology presents the appearance of unity where none truly exists. A broader vision of the development of this ideology, integrated with some of the more signal examples of the knowledge, activities, and practices that have come to constitute it, may help to exorcise the totalizing ghost of "science" while still telling us what it is."[25]

On the other hand, Charles Gillispie asserted in 1981, in a lecture on "The Coming of Age of American Science, 1910–1970,"[26] that he could not agree to call what "the whole story of 19th-century American science" had produced, "their [Foulton, Whitney etc.] machines and a thousand others," as "applications" while they are "too vigorous to be classified as parasites

[23] Peter Dear, "Science Is Dead; Long Live Science," *OSIRIS*, vol. 27 (2017), pp. 37–55.

[24] Ibid., p. 37.

[25] Ibid. p. 39.

[26] Charles Coulston Gillispie, "The Neesima Lectures I: The Coming of Age of American Science, 1910–1970," in Essays and Reviews in History and History of Science, (Philadelphia: American Philosophical Society, 2007), pp. 199–210.

drawing their vitality from a body of science with its real life somewhere."[27]

At least the axiom posed by August Comte, as Dear too mentioned the name in his paper,[28] "[f]rom science comes prevision, from prevision comes action,"[29] is not applicable to what we have witnessed. Comte is one of the first "scientific" minds who conceived the modern, very "new" historical consciousness toward human knowledge and practices in nineteenth century Europe. Since then, human scientific "actions" have developed to the extent where "the science" is not capable of certain "previsions," while those "actions" should keep making historical outcomes toward the future. History takes plural forms. As such, our historiography should follow this plurality.

---

[27] Ibid., p. 200.

[28] Dear, "Science is Dead," p. 38.

[29] August Comte, *Cours de philosophie positive*, [1830] dans *Philosophie des sciences*, présentation, choix de textes et notes par Juliette Grange, (Paris: Gallimard, 1996), p. 90.