

Industrialisasi, Resiko dan Modernitas di Jepang

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Chapter 1

Embodiment in the Technoscientific Imaginary: Emerging Forms of Life in Japanese Anime and Environmental Discourse

Background: Japan in the Postwar Period

In a summer day of 1959, Sugimoto Eiko, a fisherwoman living in Minamata town, received a heartbreaking news from the hospital that her mother, Sugimoto Toshi, had been diagnosed with “manganese disease.” The news quickly spread in the town and changed the life of the Sugimoto family. They were forced to stay at home and had to close all windows and doors, otherwise people would throw anything to the house. When Sugimoto Eiko managed to go out to take care of her boat, people hurled rocks at her as she was walking along the shore. For some time, the family lived under constant terror from the surrounding community, what they could do was staying inside the house. People believed that the disease was contagious and had isolated the sick people

from the community. At that time, without she realized it, Sugimoto Eiko and her father had also contracted the disease.¹

The Sugimoto family was not the first victims of the disease. In 1956, Tanaka Shizuka (5 years old) and her sister, Tanaka Jitsuko (2 years old), who lived in Minamata town also exhibited symptoms believed to be caused by unidentified contagious agents. The girls were hospitalized at Shin Nippon Chisso Hospital and examined by Dr. Hosokawa Hajime, who, on May 1956, concluded that the disease was due to heavy metal poisoning from an identified source. The Tanaka sisters were the first documented case of a “strange disease” (奇病) that affected humans. Before the girls fell ill, people in Minamata region had observed the outbreak of “dancing cat disease” (猫踊り病). Cats were said to have consumed polluted fish that would cause them to “dance” and eventually die, their mouths foaming.

Japanese public health authority and medical experts believed the Manganese disease was caused by consuming fish and shellfish contaminated by manganese (Mn). However, after the Food Hygiene Investigation Committee organized by the Japanese

¹ Testimony by Sugimoto Eiko can be read at http://www.soshisha.org/english/message_e/sugimoto_message_e.htm. Accessed December 1, 2015.

Ministry of Health and Welfare (厚生省) concluded its investigation in 1959, mercury (Hg) replace manganese as the primary source of the pollution and the disease. But it was not until 1968 did the Japanese government officially acknowledge the connection between the disease and mercury pollution discharged by the Chisso Company.

The Minamata case uncovered the role the Chisso has played as a strategic chemical company in Japan with a long history that dates back to the Meiji period. In post-World War II period, the Chisso developed into an industry that had survived the war and contributed to the process of industrial reconstruction. Lacking sufficient natural resources and forced to embrace the defeat and reclaim its national pride, the country set a priority to rebuild its industrial sector. The US occupation period, which officially lasted from 1945 to April 28, 1952, opened up the chance for the Japanese industry to benefit from the technological assistances offered by the US and its allies in strengthening the capacity of the Japanese firms in mechanical, chemical, and construction sectors. As demonstrated by the Minamata case, this process came with a heavy price. When the Japanese government postponed an official acknowledgement until the late 1960s despite research carried out since the late 1950s had indicated

Chisso as the company responsible for the pollution, it speaks of the political significance of the case when in postwar time the government was trying to protect its strategic industries.

The 1950s to 1970s witnessed a critical and anxious moment before the Japanese economy eventually took off in the 1970s and the country transformed into an economic giant in the 1980s. The destruction of Hiroshima and Nagasaki sent a painful and traumatic reminder to the Japanese that the progress of modernity they had experienced since the Meiji Restoration had meant nothing to the Western power. The unrelenting fighting spirit largely believed to have rooted in the *bushidō* (武士道) spirit of the samurai had shattered to the point of humiliation when the Japanese people were forced to listen over the radio to the Emperor Hirohito's admission of defeat. Although different groups had reacted differently to the admission of defeat, the sense of a humiliating loss had proliferated in the public until the Americans came to complicate the feeling of loss by offering promises and hopes to the Japanese for chances to partake in the modern life.²

² John W. Dower. *Embracing Defeat: Japan in the Wake of World War II* (New York: Norton, 1999)

As Japan was reconstructing the nation, a suppressed question returned, the question that had surfaced following the Japanese imperial ambition for southern expansion in the late 19th century. The Southern Movement Doctrine (南進論), while allowing economic and military expansion of the Empire to the South Sea, had challenged the Japanese to reflect on their cultural and racial identity as they were encountering tribal communities in the southern islands. It was during this time the Japanese scholars and politicians put forward the idea of Japan as a unique cultural and racial entity. The rapid modernization in the Meiji (明治), Taishou (大正), and early Shouwa (昭和) eras strengthened the idea that the Japanese people and culture was exceptional. Scientists in the era believed that the Japanese people possessed physical and cultural characteristics different from those of other ethnic or racial groups. The scientists attempted to resolve the question on “Who are the Japanese?”, and the Meiji modernization in industrial and war technologies had juxtaposed the question of selfhood on the imperial ambition for a military expansion. However, western power overcame Japan and western technology defeated Japanese war machines, rehearsing the anxiety over Japanese technological and cultural supremacy. The 1950s and the 1960s reconstruction was, therefore, a reconstruction of the

metaphorical national body and of the concrete, flesh-and-blood, Japanese body.

There is no other media of representation that captures the postwar anxiety better than Japanese *anime*. Disney animation flooded Japanese public culture in the 1950s, and Japanese animators learned animation techniques and drawing styles from the films to produce their *animes*. Osamu Tezuka, a great and pioneering figure in Japanese *anime* production, acknowledged that he was inspired strongly by Disney's Mickey and Mini Mouse characters when developing Astro Boy (鉄腕アトム) *manga* and *anime*. He often watched Disney's Mickey and Mini Mouse films, which inspired him to draw his Astro Boy character with big, rounded eyes. But Osamu did more than a stylistic adaptation of Disney characters in his *manga* and *anime*. The Astro Boy speaks directly into Japan's traumatic memory on how nuclear technology can transform human body and in so doing influencing the life of younger generation. Osamu Tezuka was not the only postwar Japanese animators who addressed the ethical dilemma of war machines. In 1958 Mitsuteru Yokoyama produced Tetsujin 28-Go (鉄人28号), a *manga* and *anime* series that also highlights the dangerous, but enchanting, relationship of human being to war technology. In this context, the Astro Boy and the Tetsujin 28-Go

anime and *manga* series constitute postwar debate over the future of the Japanese people and how science and technology sustain, complicate, or subvert the social imaginary.

Research Framework

This research examines how biopolitics shape the debates over “the Japanese people” (*Nibonjin*, 日本人) as a form of life that emerges in the discourse of selfhood after the World War II.³ As a country that depends on scientific and technological development, Japan has been confronted with a dilemma to situate “the question/theory of the *Nibonjin* (*Nibonjinron*, 日本人論)” in the attempt to modernize and industrialize the country. While Japan in the post-World War II period in the 1950s-1960s had to deal with environmental destructions and public health issues as the result of the war, in the post 1970s Japan confronted the traumatic loss of the Japanese sense of selfhood as the result of rapid modernization and industrialization and the increasing domination of Japanese science and technology in public life. This research explores various scenes and networks of biopolitics to

³ The concept of emerging forms of life comes from Michael M.J. Fischer. *Emergent Forms of Life and the Anthropological Voice* (Durham: Duke University Press, 2003).

analyze how the embodiment of technoscientific imaginaries constitutes the debates over the *Nihonjinron*.

The modalities of embodiment of technoscientific imaginaries in postwar Japan that this study has focused on are the Minamata case and the Japanese *anime* and *manga*. The first modality illustrates the relationship between body and scientific knowledge on chemical substances, the relationship that has constituted or destabilized the emerging forms of life in Japan after the World War II: How does chemical substances, such as manganese and mercury in the Minamata case, and the knowledge about the substances transform social imagination about the *Nihonjin*? How does regulating the chemical substances turn into an event where the future of the *Nihonjin* are debated and constituted? The second modality illustrates the interface between robots and human being as depicted in the relationship between Kaneda's son and the robot in *Tetsujin 28-Go anime*. The robot-human interface denaturalizes the boundary between human and non-human, culture and nature, and in so doing constituting the debates over the forms of life in modern Japan: How does the *Nihonjin's* future depend on the human capability to control robotic technology or live together with the robots as a non-species companion? How does the experience living with robots

constitute new and emerging forms of life in modern Japan, and how would it differ, if any, from the emerging forms of life in postwar Japan? These are the issues that this research has been exploring and will explore more to learn about the embodiment of technoscientific imaginaries in Japan.

Brief Note on Concepts Applied

This research on technoscientific imaginary draws on the concept of network or rhizome as proposed by Deleuze and Guattari (1987):⁴

A rhizome has no beginning or end; it is always in the middle, between things interbeing, intermezzo. The tree is filiation, but the rhizome is alliance... The tree imposes the verb “to be,” but the fabric of the rhizome is the conjunction, “and... and... and...”

⁴ Gilles Deleuze and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987).

The rhizomatic relation of social governance that emerges after a moment of crisis, such as after natural disaster, industrial disaster, war, or act of terrorism is the first rhizome discussed in this research. The emergent new forms of life that the rhizome creates are the *hibakusha*, the expert panel on pollution monitoring, the emerging domestic and international public health programs, and the new consumer groups and non-government alliances. Our work suggests that the rhizome manifests through superimposing social governance and environmental governance to constitute a “plateau” (Deleuze and Guattari 1987) as a realm of heightened consistency of the anxiety and hope over the future of the *Nihonjin*.

The second concept deployed in this research is the plateau as a place where disparate elements hold together to sustain an intense social imaginary. The constitution of a plateau is obvious in the study of Tetsujin 28-Go and Astro Boy *animes*. The technoscientific imaginary depicted in the *anime* series are an intense and escalating debate over the place of human body in the interface between human and machine. Different trajectories of rhizomatic network comprising of distinct human-machine interfaces have existed, from a detached and instrumental relation of the Tetsujin 28-Go robot with the Kanedas to an absolute

compatibility of the human body and the technology in the figure of Astro Boy. Despite the distinct interfaces, the embodiment of relationship between human and machine holds together the intensity of a platonic moment and shape the debates over the *Nihonjin* in postwar Japan.

Minamata Tragedy: Emerging Forms of Life

The history of the Minamata tragedy dates back to 1908 when Noguchi Jun built a carbide production plant in Minamata. In 1921, the carbide plant bought the technology for producing ammonia from BASF, a leading German chemical company, and in 1932 started producing its own acetaldehyde. To produce the substance, mercury was involved. The company, later named Chisso Company, continued to produce the chemical compound until Minamata inhabitants noticed something wrong with cats living the area.

Around 1956, people in Minamata began to observe cats showing strange behavior, “dancing” wildly, mouth foaming, run berserk, and eventually died. At first, people thought that the cats had consumed something contained in the fish caught by the fishermen. In November 1956, the Scientific Research Team of the Ministry of Health and Welfare Japan suggested that further

step should be taken to investigate the case. No further conclusion was reached as to identify the source of the contaminated fish and the cause of the “dancing cat” disease (猫踊り病). In the same year, two girls from Minamata, Tanaka Shizuka and Tanaka Jitsuko, were hospitalized from showing symptoms that, at that time, had no identifiable origin. The disease was called the “strange disease” (奇病) by the local health authority. Kumamoto University’s School of Medicine investigated the case and concluded later in that year that the “strange disease” could be caused by heavy metal poisoning and was not contagious so people should not worry.

The investigation of the disease continued to identify specific agent that might cause the disease. In early 1959, research conducted by Kumamoto University had suggested that methylmercury might be the agent. People contracted the disease because they consumed fish, shellfish, and water that had been contaminated with the substance. However, the research team did not pinpoint the source of the pollution, and the local health authority in Minamata did not take further step to extend the investigation. In early 1960s, an independent investigation carried out by the Japanese Association of Chemical Industries argued that

the disposal of chemical substance during the war by the Japanese military was the origin of the pollution.

In November 1959, the Japanese Ministry of Welfare and Health conducted research and concluded that heavy exposure to organic mercury caused the Minamata disease. Just like previous research, this investigation failed to mention where the mercury pollution came from, although it was obvious that such a large amount of mercury contaminating the area could only originate from an industrial source. Only in September 1969, ten years after the research, did the Japanese government publicly acknowledge the connection between the Chisso Company and the Minamata disease. The government alleged that the Chisso was responsible for polluting the Minamata Bay.

The Minamata case demonstrated how chemical substance of mercury constitutes the biopolitics. Up to 1956, the management of body and the chemical substance were considered isolated categories, and the symptoms shown by the Tanaka sisters were not taken as indicating any influence of chemical substance on the body. Only later did manganese be identified as the causative substance, which was then revised into mercury as the causative agent. The debate over scientific evidence on the sick body that took place until 1968 demonstrates the role of chemical

and medical experts as the dominant actors producing the categories of life form. But the discourse marginalized victims and consumer groups as they had no knowledge to contest the categories of the life forms presented by the experts. After the government made an official acknowledgement in 1968 and after people establish network with the *hibakusha* (被爆者) of the atomic bomb, however, the Minamata victims and their families get a chance to take part in the debate over the categories of life forms (i.e. the notion of “victim”).

Tetsujin 28-Go: Embodiment of Technoscientific Imaginary

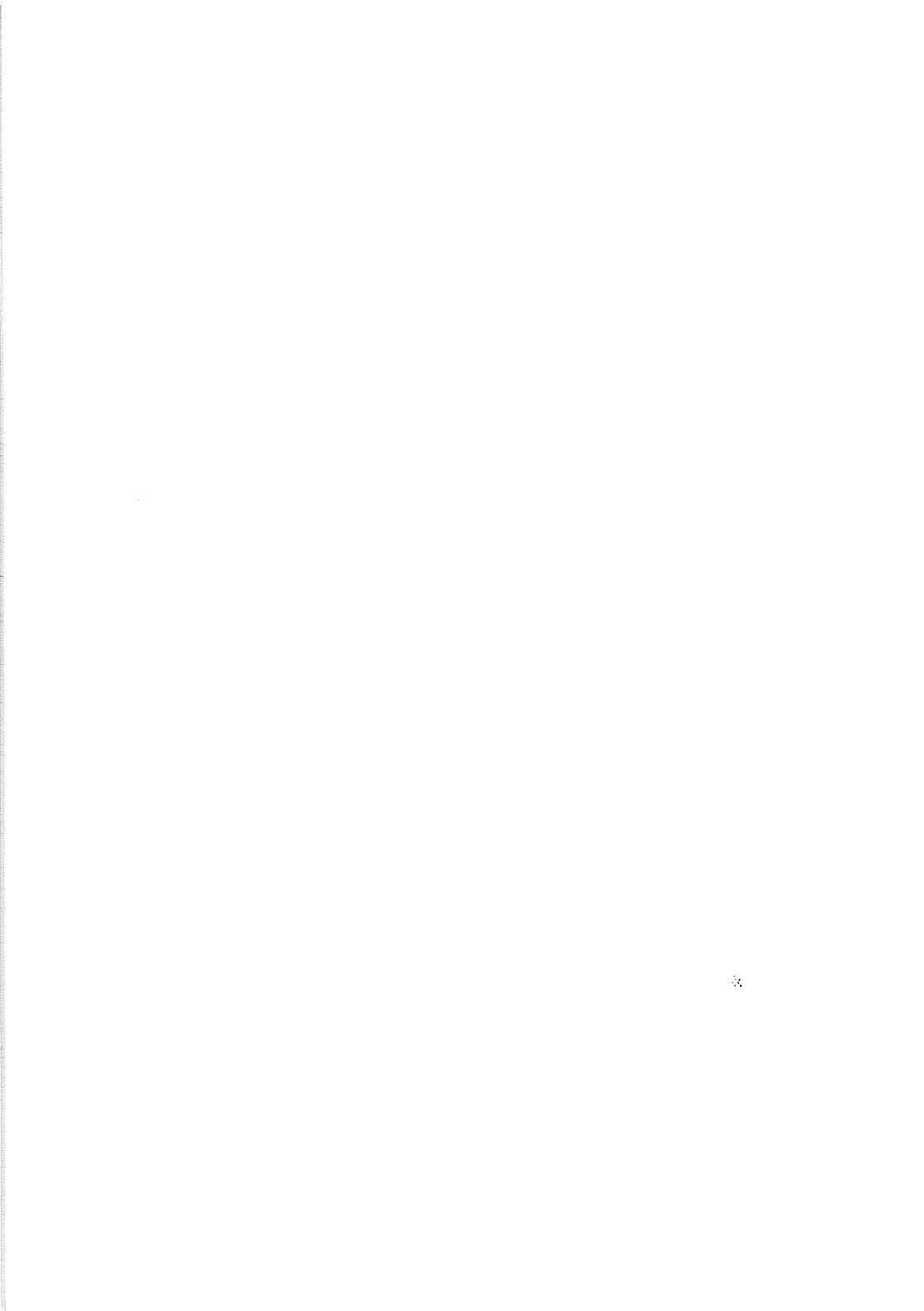
Tetsujin 28-Go *manga* was created by Mitsuteru Yokoyama and first published on Shonen magazine in 1956. The Tetsujin *anime* series was broadcast on television in 1963-1966, 1980-1981, 1992-1993, and was recreated in 2004 and 2013. The *manga* and *anime* is important in two respects: Mitsuteru, its creator, was from war generation, and the Tetsujin 28-Go's story criticizes the war and problematizes the relation between war machine and human being. In other words, the Tetsujin 28-Go was more than a representation of war experience, it questions the meaning of war and conflicts, and calls for people to rethink our dependence on technology and science.

Tetsujin 28-Go tells the story of a giant robot created as a secret weapon to help Japan win the World War II. Tetsujin No. 28 is the 28th robot made by Dr. Kaneda at a secret laboratory in South Pacific, where the imperial Army developed various secret weapons to assist the military in the war. Before Tetsujin No. 28, Dr. Kaneda has made 27 other robots, all of them failed and discharged. The focus of the Tetsujin *anime* and *manga* was on Kaneda Shotaro, the son of Dr. Kaneda, and his postwar experience. Kaneda hold an access to a remote control, the only device that can control the Tetsujin 28-Go robot, which at the time after the war, lay dormant at a hidden location. The remote control is a very crucial device since not only can it be used to operate the robot but also to control the robot's behavior and "emotion". If the one holding the remote has a bad temper, then the robot will behave accordingly. If the human is a nice person, the robot will also show nice and kind gestures. In so doing, the robot's mission will depend on who is controlling the remote. It can turn into a very powerful destructive weapon, but it can also assist peaceful or humanitarian missions.

Mitsuteru wrote the Tetsujin 28-Go to reflect on his war experience and his anxiety over the future use of technology, especially the technology that can be converted into weapons of

mass destruction or can destroy environment. In his view, technology is not more than a tool that relies on human's control and is subjected to human manipulation. This was a popular view in the 1950s when the the advancement of modern science and technology raised a concern that the technology could run out of control and could produce an effect beyond the ability of human to "domesticate" it.⁵ Through his Tetsujin *anime* and *manga*, Mitsuteru argues that if human wants to "make a peace" with the technology, they must be able to embody it, incorporating the technology into human desire and hope as illustrated by the ability of the Tetsujin robot to mimic and extend human emotion. The topic of embodied interface of technology and human being is not only limited to the Tetsujin 28-Go *anime*, it also appears in other Japanese *animes* such as Neon Genesis Evangelion (新世紀エヴァンゲリオン) and Mobile Suit Gundam (機動戦士ガンダム).

⁵ In 1953, a radio broadcast adaptation of H.G. Wells's "The War of the Worlds" triggered a worldwide anxiety whether human being was ready to confront another race possessing more advanced technology. A study on how the radio broadcast could have influenced the production of Japanese *anime* films in the 1950s remains lacking, even though the connection could be a very important part in constituting the *anime* rhizome.



Epilogue: Future Agenda

The question of selfhood has been a latent dilemma haunting postcolonial or postwar societies. The destruction brought by colonialism or war on the national and biological body has foregrounded selfhood as a central agenda in the attempt to reclaim national pride and shape a modern nation in postcolonial time. There are many public settings available to enact the discourse of selfhood and sustain it into a plateau, and the embodiment of technoscientific imaginaries is one of the discursive modalities that links the predicament of selfhood to the biopolitics of the body. In the context of Japan, the *Nihonjinron*, or the argument on who the Japanese people is, has returned to the public discourses in postwar Japan amid the flows of people, idea, and things moving from and to Japan. As this research seeks to argue, the *Nihonjinron* is actually the discourse of Becoming-Japanese as the emerging forms of life in relation to the science of environment and the technology of robotics.⁶

Deleuze and Guattari has argued that Becoming is an event taking place in the rhizome network. Since any rhizome is always

⁶ The next stage of the research will examine this topic of Becoming in relation to microbial entities.

in-between, in-connecting things, therefore the Becoming never turns into an identity. It explains why the question of selfhood, such as the *Nibonjinron* or in the context of *Revolusi Mental*, appears in various discursive modalities that could shape environmental discourse, narratives of *manga*, and visual depiction in *anime* films. However, each event of Becoming-Japanese is different, connects to diverse points, and follows sprawling lines. The *Tetsujin 28-Go*, for example, connects to other *mangas* and *animes* in the rhizomatic network of Becoming-Japanese through the event of living with robots and robotic technologies.⁷ The next study on Japanese visual culture will explore these other “surfaces, portals, and avenues” in Japanese *animes* that “spread and incite desires” on the *Nibonjin* selfhood.⁸

⁷ Compare this to living with animal species companion in Donna Haraway’s *When Species Meet* (Minneapolis: University of Minnesota Press, 2008).

⁸ This perspective has drawn from Anne Allison. *Millennial Monsters: Japanese Toys and the Global Imagination* (Berkeley: University of California Press, 2006).

Chapter 2

Bio-politics of Minamata Disease

Minamata Disease outbreak in 1960s is one of the biggest industrial accident in Japanese history. The heavy metal mercury polluted the Minamata Bay that discharged by Chisso Company caused Minamata disease. The disease destroy nervous system of organism including animal, human, and fetus. The patients and their family struggle to get recognition from the company and government, to live their community, and to get compensation for the company.

Minamata Village and Chisso Company

Minamata is a name of village located in the west coast of southern Kyushu, Kumamoto Prefecture, 1,000 km from Tokyo. Before Chisso company had been established, Minamata was a fishing and agrarian village, and inhabited by 2,542 houses. Minamata Bay surrounded by Shiranui sea was the one of the best fishing ground that had rich natural resources such as a variety of fish and shellfish. The industry in Minamata was characterized by salt-making industry. However, the industry discontinued by the



Government Monopoly in Salt Act in 1910. Livelihood in Minamata had changed after Nihon Carbide factory had been established in Minamata village.

In 1908, Nihon Carbide factory was established in Minamata Village by Jun Noguchi, a young college-educated electrical engineer from Tokyo Imperial University. Noguchi had succeeded to found hydro-electric plant in Kagoshima Prefecture as power source for the gold-mining operation. The plant produced 800-Kw exceeding electricity demand. Noguchi had sought site to build the new carbide production plant that would use the surplus electricity from the hydropower. The leader of Minamata village approached Noguchi to build the plant in Minamata. The village leader provide incentive such as free land for the carbide plant that had been used for the salt production and cost for extending the power line from the power plant to carbide plant. With the incentives, the company decided to build factory in Minamata. The Chisso Company used carbide to produce ammonia for fertilizer. In 1921, the firm bought German patent for producing ammonia without carbide, then it began using carbide and acetylene to produce organic synthetic compounds. The firm began producing acetaldehyde in 1932 from acetylene gas, using mercury as a catalyst. (Yorifuji, et al,).

Since Chisso Company had operated in Minamata village, the village developed into city and the local economy was growing rapidly. The population in Minamata increase from 12,040 people in 1889 to 17,192 people in 1912 and 42,137 people in 1949. The Chisso Company created job opportunity to absorb ex-workers from salt industry and coal mining. In addition, the Chisso Company and its employees contributed more than 50% of amount of tax revenue received by the local government. Due to highly dependent on single company, the Minamata City was known as “the town supported by the company”. Moreover, the relationship between the company and local government was linked by the ex-worker of Minamata who involved in local government. For instance, Jiro Sakane, ex-employee of the Minamata plant, became town manager in 1926, and seven others became members of town assembly. In 1950, Hikosichi Hashimoto, ex-manager of Minamata plant, became Minamata’s Major. As results, the government policy gave benefit for Chisso Company such as construction of seaport to transporting company’s product, license for using sea water, and budget allocation to bury disposal in Minamata Bay (NIMD, 2001:11-13).

An Outbreak of Strange “Minamata” Disease

Since 1950, strange phenomena occurred in surround Minamata Bay. The fishermen witnessed huge number of fish rising to the surface and shellfish dying and emitting horrible stench. The total fish catch by the fishermen decreased sharply from 459,225 kg in period 1950-1953 to 173,305 kg in 1955, and to 95,599 kg in 1956. Occurring strange phenomena urged the fishermen cooperative requested the Kumamoto Prefecture to overcome the problem. The fisheries Division at Kumamoto Prefecture asked the Chisso Company to submit the report of the discharged treatment. The reported stated that the plant used organic mercury in the process of producing acetaldehyde. Five months later, Reiji Miyoshi from Fisheries Division inspected the plant, and suggested to Kumamoto Prefecture to analyze the plant's discharge. However, Kumamoto Prefecture did not conduct further survey, and did not analyze the waste disposal.

Other strange phenomena appeared in fishermen communities. In 1953s, their cats showed strange behavior like dancing wildly, tearing themselves, and foaming at the mouth after eating fish that contaminated by mercury from the Shiranui sea and Minamata bay. Minamata's household raised approximately 121 cats, of which 74 had died by 1956 after showing same symptoms. The

fishermen was annoyed by the increasing of mice that destroyed expensive nylon net. Thus, they had to borrow money for buying new net nylon. For them, net was the one of the largest capital investment of households; like fishing knowledge and local customs, the fishing equipment would be bequeathed through generation (Walker, 2010: 146).

This strange occurrences were an omen what would happen next to human. In March 1956, a girl aged five years and 11 months, Shizuka Tanaka, had pyrexia. Then, she had difficulty in walking and speaking; unsteady on her feet and slurring the words. She could not wear her shoes and hold chopstick. On April 17, 1956 she was examined in Shin Nippon Chisso Hospital (Chisso Hospital). Her little sister, Jistuko Tanaka, aged two years and 11 months showed same symptoms. On May 1, 1956 Dr Hajime Hosokowa, a Chisso Hospital Director, visited Minamata Public Health Center and reported the finding disease of unknown cause. This day marks as “official discovery” of Minamata disease (NIMD 2000). Public Health Center suspected that the disease was contagious disease, and they moved the patients to isolation ward. Moreover, Public Health Center also sprayed disinfectant to prevent spreading of the disease. Tanaka family did not only suffer from the strange disease, but also other community ostracized

them. Public believed that the disease was contagious illness that the only lowest class would be suffered it. Shizuka died on January 2, 1959. Her parents and grandparents also died due to mercury poisoning. Jistuko barely able to communicate; still lives in the care of her older sister, Ayako Tanaka. Dalam buku the Rowing of Eternal Sea, Ayako described her experience in the early outbreak of Minamata disease. She said that:

“We were ostracized by the villagers. When we went shopping, we couldn’t hand over our money. The shopkeepers would take it with chopstick or a bowl. People pinched their noses and held their breath as they ran by our house. No one would speak us. When other villagers showed symptoms of mercury poisoning, they tried to attribute their sickness to different causes. Only the Tanaka family has “kibyō”, the strange disease. We have reached the bottom. We cannot be brought down any further.”

Like Tanaka family, the patients of strange disease and the family members were discriminated by their neighbors. They fear that the disease was possible infectious. The fishing family had difficulties to sell the fish if other people knew that they were patients of strange disease. Therefore, some patients were not

admitted suffer from strange disease. Social relation among the household in the village was broken. Although the disease at that time only found in certain village close to Minamata bay, the public assumed that that the disease spread all over Minamata City. Moreover, other families boycotted the families of the patient because they were difficulties to sell the fish (NIMD 2000: 34).

On May 28, 1956, the Minamata City Government found Minamata Strange Disease Countermeasure Commission to investigate outbreak of strange disease (kibyō). The commission involved Public Health Center, Chisso Hospital, Medical Association, Municipal Hospital and Public Health Section of Minamata City. The commission researched the health record of the patients and for the dead. The review indicated that patients from fishing family had same symptom with the both of the girls. In the end of 1956, there were 54 patients of strange disease and 17 of them already died.

Finding the Cause of Strange “Minamata” Disease (1956-1965)

On August 24, 1956 Kumamoto University School of Medicine established a research group in response request of the Minamata Strange Disease Countermeasure Commission to

investigate the disease. On November 3, 1956, the group reported that the disease was not contagious, but it caused by consuming poisoned food like fish containing heavy metal in Minamata Bay. It also reported that factory's disposal was considered the cause of contamination. The group recommended prohibiting fishing and applying Food Sanitation Act as basis for the government to take action against food poisoning such as prohibiting sale and distribution of food. However, the Government of Kumamoto Prefecture did not apply the Act, and people in Minamata City continued consuming contaminated fish. The local government considered that if applying the Act would cause the Chisso Company responsible for paying compensation for the patients and their family. On the other hand, the corporation financed the local government by paying tax (Yorifuji. 98).

Researchers and institutions had investigated strange disease by using various research methodologies. In the period 1957-1962 some investigations on Minamata disease concluded that there were causal relationship between the wastewater discharged by the Chisso Company and the Minamata Disease. The chemical substances in fabric disposal caused sea products such as fish and shellfish were poisoned. However, the

Government of Kumamoto Prefecture did not make effort to stop the pollution.

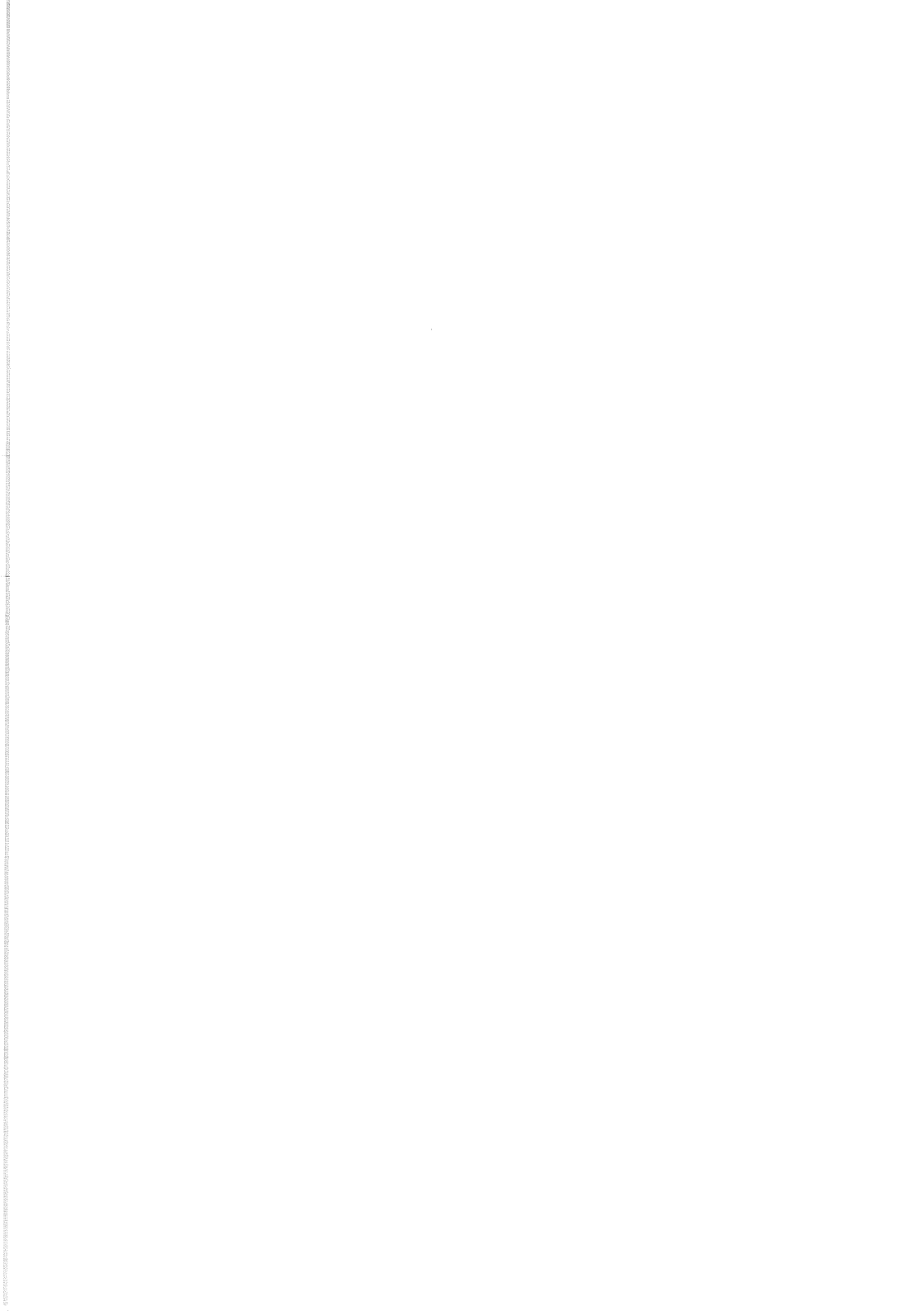
The research group identified various possible etiological agents of Minamata disease such as manganese, thallium, and selenium that contained in plant's disposal. However, the plant manager of Chisso Company, Nishida Eichi, argued that the research group could not verify that the disposal containing organic mercury. In 1959, the director of Chisso Hospital, Dr Hajime Hosokoawa, succeeded in proving that the organic mercury used by Chisso Company in the production process as etiological agent of Minamata Disease. He got the evidence after feeding waste water from acetaldehyde production to the cat number 400 for 78 days (Yorifuji, etc). However, the Chisso Company asked Dr. Hosokawa to keep the information from public and prohibited him to conduct further research. In April 1962, Dr. Hosokawa resigned from the factory without being able to make the result public.

Although the Chisso Company had known that organic mercury used as catalyst in the production process as etiological agent of Minamata disease, the company made efforts to cover it by several strategies. Chisso Company cooperated with Association Chemical Industry and the Ministry of International

Trade and Industry (MITI) now its called METI to support certain researchers to counter the researches that blamed the plant. Chisso Company also provide a lot of fund for Kumamoto University in 1961. Then, Kumamoto University under Dean of Masachika Kutsuna joined Tamiya Committee to conduct experimental research Minamata disease. On the other hand, the clinical research on Minamata Disease was prohibited by the Dean. He argued that clinical research was not research but rather work conducted by the activist. In addition, the dean apologized to Chisso Company after the Kumamoto University's researcher, Katsuro Irukayama, publishing his research on extracting methyl mercury chloride from the acetaldehyde production process in the factory. His research finding supported the previous investigation result that the organic mercury contained in plant disposal caused the Minamata disease.

Investigations of Minamata Disease

Year	Name of person/ organization	Research Result
November 3, 1956	The Research Group on Minamata Disease, Kumamoto	The disease was not contagious but rather a food poisoning incident resulting from intake of fish



	Univeristy of School Medicine	contaminated by heavy metal in Minamata Bay.
November 1956	The Scientific Research Team of the Ministry of Health and Welfare of Japan (MWLH)	The disease might be induce by contaminated fish in Minamata Bay. The factory and its disposal should be investigate to explain the disease's mechanism.
July 7, 1958	Masayoshi Yamaguchi, Chief of the Public Health Bureau of MWHW	He reported to other ministries and local government that Minamata disease was caused by consuming of contaminated fish and shelifish. The disposal from Chisso Company was believed as the source of poisoning.
September 1958	Douglas Mc Alpine (A neurologist).	He visited Minamat aand 13-14 March 1958, and examined 15 patients. His research result indicated that the disease was caused by consuming fish caught from Minamata Bay that containing chemical compound from disposal of Chisso Company. In addition, he stated that methylmercury identified as source of disease.

March 1959	Tadao Takeuchi, Kumamoto University	He suspected that methylmercury as etiologic agent of the disease.
July 22, 1959	The Research Group on Minamata Disease, Kumamoto Univeristy of School Medicine	The research group concluded that mercury as the etiological agent of the Minamata disease based on the clinical characteristic and animal experiment.
August 5, 1959	Nishida Eiichi, Plant Manager of Chisso Company	The company refuse the organic theory yang dikemukakan oleh Research Group dari Kumamoto University karena dalam penelitian tersebut disebutkan beberapa jenis logam berat yang diduga menjadi penyebab penyakit Minamata seperti manganese, thallium and selenium. In addition, the company argued that there was absence similar disease at other factories.
October 7, 1959	Hajime Hosokowa, the Director of Chisso Hospital	He succeeded membuktikan bahwa methylmercury adalah penyebab penyakit Minamata berdasarkan eksperimen pada kucing ke 400. The animal that had been given

		waste water form acetalhyde production daily for 78 days. He reported the result to the company, but the company asked him to keep the information and prohibited to continue his study. He resigned from factory in April 1962.
November 12, 1959	Food Hygiene Investigation Committee organized by MWHJ	The committee announced that organic mercury was caused Minamata disease based on the research conducted by Research Group on Minamata Disease, Kumaamoto University. However, the Committee did not mention that the Chisso Company was source of the contamination.
December 8, 1959	Leonard Kurland, National Institute of Health, USA	Published aricles and newspaper to support Kumamoto University conclusion that organic mercury was a source of Minamata disease. He discovered methyl mercury in seafood samples from Minamata
1960	Kumamoto Prefecture Institute	Investigated mercury concentration in hair samples of 1.645 healthy

	for Health Research	fishermen surround Shiranui Sea. The survey indicated that there were higher concentration of mercury in people's hair living in Minamata than other areas. But the study was not follow up by the Kumamoto Prefecture.
April 1960	Tamiya Committe	
April 1960	Prof. Kiyoura Raisaku, Tokyo Institute of Technology	He claimed that mercury concentration in Minamata Bay were not higher than those in other areas.
	Takeji Oshima, the Executive Director of the Japanese Association of Chemical Industries	He stated that the disease might be caused by explosive dumped into Minamata Bay by the Japanese Military
1961	Tokita Kikuji, a pharmacologist at Toho University, supported by Kiyoura Raisaku, Takeji Oshima and Chisso Company	He argued that consuming rotten fish containing amines caused the disease.

1962	Prof. Katsuro Irukayakama, Kumamoto University School of Medicine	He succeeded in extracting methyl mercury chloride from the Chisso Company's disposal.
January 1965		Food poisoning causing "Nigata Minamata Disease" occurred in Nigata. It was caused by methyl mercury yang terkandung dalam limbah pabrik yang dibuang oleh Perusahaan Showa Denko.
September 26, 1968		The Japanese Government finally agreed that there was causal relationship between waste discharged by Showa Denko and Chisso and Minamata Disease.

Sources: Yorifuji T, Tsuda T, Harada M (2013), NIMD (2001), Mooksuwan. W. (2013)

The knowledge contestation on finding the caused factor of Minamata disease occurred for decades until the similar disease outbreak in Niigata in 1965. Spreading of Niigata Minamata disease proved that methyl mercury as etiological agent of

Minamata disease. It urged the Japanese Government recognizing officially that Minamata disease was caused by methyl mercury contained in Chisso Company's disposal and Showa Denko's disposal. Recognition of Minamata Disease by the Japanese Government before the outbreak of Nigata Minamata Disease caused the victims and the families living in uncertainty situation. One of the Minamata disease sufferer and the activist, Sugimoto Eiko, experienced being isolated and discriminated by her community. Sugimoto born in Modo Village, Minamata City in 1938. Her father was a boss of the local fishery, and she was his only child. She was expected to carry her family business. One day in the summer 1959, she returned from fishing trip, and found her mother confused and unable light her cigarettes; the matches scattered around her. Her mother hands were trembling, and her health worsened.

"This is terrible," said my dad, and he took her to the hospital. That night neither my dad nor my mom came home. All of my relatives were supposed to gather at our house that night, but no one came. I heard that there was an announcement on the evening news. "Sugimoto Toshi (my mother) has contracted the manganese disease." The woman next door came over just long enough to tell me, "Your mother has manganese disease," and left. The next day,*

before we could even figure out what was happening, we were told, "You mustn't open the door." If we opened the door even a crack, rocks were thrown at us. We had no idea what was going on -- we could do was stand indoors and shake. When I walked down to the shore to take care of our boat, stones came flying at me. Trying to escape being hit, I slipped and fell down the slope, becoming covered with cuts and bruises. I went to a neighboring house for help, only to have night soil flung in my face. My cuts were smarting, and I was in pain. Or, should I say, more than pain, I felt mortification".
(http://www.soshisha.org/english/message_e/sugimoto_message_e.htm)

The community believed that the disease was contagious disease. Moreover, they blamed the patients of Minamata disease for unsalable of fishermen's fish catch in Minamata City. Thus, Minamata disease patients including Sugimoto and her father hid their disease to avoid discrimination by their neighbors.

"Actually, by that time my father and I had also contracted the disease. But we didn't go see a doctor because we were afraid. If we were treated this badly with mother ill, what would become of us if it were known the entire family was sick? It was frightening. I think

that every single member of my village used to be a fine person. But, all of a sudden they turned into tormentors”.

Determining of Minamata Disease Criteria (1965-Present)

After the Japanese Government accepted the causal relationship between Chisso Corporation and Minamata disease in 1968, public's attention shifted to accreditation system to categorized as Minamata sufferer. It was important for patients to apply compensation from Chisso Factory. An accreditation system had changed gradually influenced by aspects of social, economic, politics, law and medical. In general, the accreditation system can be categorized into four types. First, *mimaikin* or sympathy money was paid by Chisso Corporation. Second, the accreditation system was stipulated by the Japanese Government in 1971. Third, the accreditation system was implemented in 1977 that more strict to prevent the raising number of compensation claims. Fourth, accreditation system through political settlement has conducted since 1995 until now.

Initially, Chisso Corporation had given *mimaikin* or sympathy money of ¥1,500 to Minamata Fisheries Cooperative Association (MFCA) in 1926 because damage sea environment as result of sea reclamation and waste disposal of Chisso Company.

The company gave *mimaikin* to fishermen on the condition they would not sue for destruction of sea environment (NIMD, 1999:17). The company gave *mimaikin* to fishermen when the Minamata disease, called *kibyō* or strange disease, outbreak in 1959. *Mimaikin* was present of company's sympathy provided the fishermen would not claim permanently on the company. The money was not compensation as company's responsibility for the degradation of sea environment. The company gave *mimaikin* to the fishermen after they had met the criteria as Minamata patients that stipulated by the Screening Committee for Minamata Disease Patients.

The Board was consisted to experts appointed by the National Government. Under the agreement, Chisso Corporation gave *Mimaikin* to 79 patients in 1959, and 9 patients in 1960. The company gave *Mimaikin* of JPY 300,000 for each deceased victim, and annual stipend for surviving victim (JPY 100,000 for adults and JPY 30,000 for children (Minamata Disease Museum, 2007:18). In period 1964-1965 there were no Minamata patients who recognized the by the board, therefore the company did not give *mimaikin* in that period.

Chapter 3

Science and Technology, and Memory of Wartime Japan Represented in “Tetsujin 28” Anime

Anime in the Japanese Populer Culture

As one of popular culture in Japan, *anime* (Japanese animation) and *manga* (Japanese comics) have drawn attention around the world. *Anime*, for instance, play an important role in the Japanese society which is very visual (McWilliams, 2011). According to Sugimoto (2011), *manga* was top-ranked for publication in Japan in the period of the 1940s. For more than two decades, *manga* accounts for approximately 40% of the total print publications, which is most of them are story *manga* with a specific plot and story line. Many of those *manga* was later adapted as *anime* (Japanese animation) along with the development of animation technology in Japan at that time. *Anime* in Japan has been existing since 1917 in form of two to five minutes short film, mostly about folktales at that time (Tsugata, 2013). Anime continues to grow until the airing of Tetsuwan Atomu (Astro Boy) during 1963 to 1966 as the first anime TV series in Japan that also play a major role in the development of anime in the future. The fact that

Japanese society upholds the conformity in front of others (*tatemaè*), and also the flow of modernization following the World War II allowed *manga* to be the best media for most Japanese *mangaka* (manga artists) to express their thoughts by creating story *manga* which is later widely adapted as an *anime*.

Since the 1960s, Japanese animated films and television series have produced some of the most memorable visions of the war. Several works of manga and anime associated with the memory of war and the development of science and technology in Japan include *Gojira* (Godzilla, 1950), *Tetsujin 28-go* (Iron Man 28, 1956), *Uchu Senkan Yamato* (Space Battleship Yamato, 1970), and *Hadashi no Gen* (Barefoot Gen, 1983). Previous research on memory of war (Napier 2006) suggested that anime could be a medium which allows history and memory to transform into myth and even into fantasy, ultimately creating for the viewer an experience which allows for a working through of what might be called historical trauma. Science-and-technology themed *anime*, on the other hand, have also gained popularity among public in Japan and even in the neighboring countries.

By focusing on one anime depiction, *Tetsujin 28* which was originally created by a *mangaka* from wartime generation Yokoyama Mitsuteru, however, this paper will explain the memory

of crisis that took place in Japan during the devastated period of the 1950s which was represented in Tetsujin 28-go anime, as well as any form of new technology developed at that time. Furthermore, the paper will also elaborate the way the anime represents the period of postwar Japan, and then the way socio-political background of the period shapes the artist's memory of the crisis period that presented through anime, and finally the way science and technology could be represented in the whole anime that eventually provided some socio-political contexts during modernization era in postwar Japan.

In this context, the Astro Boy and the Tetsujin 28-Go anime and manga series constitute postwar debate over the future of the Japanese people and how science and technology sustain, complicate, or subvert the social imaginary.

Tetsujin 28 Anime

Tetsujin 28-go (鉄人28号 / Tetsujin Nijuhachi-go / Iron-man 28th, then written Tetsujin 28) is a famous manga written by Yokoyama Mitsuteru. Since first published in 1956, the manga has been adapted as several *anime* in Japan. Tetsujin 28, which literally means *iron-man no. 28* is a superpower robot invented by Dr. Kaneda as a secret weapon to support Japanese military win the

World War II. In the anime, it is said that the Japanese military had a secret laboratory facilities where research, development, and production of various military weapons were carried out on an island in the Southern Pacific. Dr. Kaneda as project leader received an order under ambitious project *Tetsujin Keikaku* (Tetsujin plan) to create superpower robots, including Tetsujin 28. Tetsujin 28 is a model robot Tetsujin 28th made after robots previously experienced failure and refinement as much as 27 times. By taking the time setting of postwar Japan, the manga focuses on the adventures story of Shotaro Kaneda, a 10-year-old boy who controlling Tetsujin, and various conflicts around him. In addition, various forms of development of science and technologies occurred during the 1950s can also be seen in this manga and anime. The focus of the Tetsujin 28 was on Kaneda Shotaro, the son of Dr. Kaneda, and his postwar experience. This anime focused on Shotaro's pursuit to control and fully understand Tetsujin capabilities, while encountering previous creations and scientist from the Tetsujin Keikaku. Kaneda hold an access to a remote control, the only device that can control the Tetsujin 28-Go robot, which at the time after the war, lay dormant at a hidden location.

Tetsujin 28 manga that was first published in Shonen Magazine in 1956 is one of the most popular robotics-themed anime, besides *Tetsuwan Atomu* (Astro Boy) and *Gundam* (Mobile Suit Gundam). Like most popular manga in Japan, Tetsujin 28 was later adapted as several anime series, such as those broadcasted in 1963-1966, 1980-1981, 1992-1993, 2004, and 2013-present (2015). While *Gundam anime* focuses on cyborgian interface of Gundam robots and their pilots, the Astro Boy speaks directly into Japan's traumatic memory on how nuclear technology can transform human body and in so doing influencing the life of younger generation. In contrast with them, Tetsujin much highlights the dangerous, but enchanting, relationship between human being and war science and technology.

This paper will specifically examine Tetsujin 28 *anime* which is directed by Yasuhiro Imagawa consisting of 26 episodes and aired on TV Tokyo in April 7 – September 29, 2004. The series is chosen for these following reason: (1) this is the first anime TV series of Tetsujin that have used modern technology which allows the viewer get better image and understanding of the memory of the World War II represented in this anime, (2) the series was produced and widely aired when Japan has just begun the Cool Japan policy to introducing popular culture to the world, and (3)

the series was published in many countries, including the United States and Britain, under its original name Tetsujin 28-go. This makes it the first time a Tetsujin has not been localized to Gigantor in America or other English speaking nations. There are no many differences with the original manga version or the other anime series. In the 2004 series, there are some key characters besides the figure of Tetsujin itself, namely: Dr. Kaneda, Shotaro Kaneda, Dr. Shikishima, Kenji Murasame, Dr. Franken, and Dr. Dagnet.

Tetsujin 28 was a giant super robot that was originally created as a secret weapon to strengthen the Japanese military in World War II. In the anime's opening song, Tetsujin 28 is depicted as a very powerful robot with a booming voice, and invulnerable to bullets and a variety of enemy attack, but there are times when Tetsujin is defeated by its enemy, such as the robot Gilbert. As a robot, Tetsujin in this anime has no soul and emotion, and can only be operated using a remote control box. The remote control is a very crucial device since not only can it be used to operate the robot but also to control the robot's behavior and "emotion". If the one holding the remote has a bad temper, then the robot will behave accordingly. If the human is a nice person, the robot will also show nice and kind gestures. In so doing, the robot's mission

will depend on who is controlling the remote. It can turn into a very powerful destructive weapon, but it can also assist peaceful or humanitarian missions. The story about this Tetsujin began after its resurrection in 1955 or 10 years after the war, the same period as when the manga was first published.

Dr. Kaneda was a great scientist, creator of Tetsujin 28 in the period towards the end of World War II. Under the Tetsujin Keikaku project, Kaneda and his colleagues worked in a secret lab in Southern Island in Pacific to create and develop Tetsujin robots. The story of this project begins when Kaneda received an order from the Japanese Empire to lead a secret war project to develop some robots as weaponry to support Japanese Military on the war. Kaneda's wife, who at that time was pregnant, was left on the countryside, while Kaneda and his colleague stayed at a secret facility in the Southern Pacific. During the war, the countryside was destroyed by a bombing, and Kaneda's wife was killed. Fortunately, the child, later known as Shotaro, was still alive, and later adopted by Dr. Shikishima. On the other hand, Kaneda who basically hate the idea of war, created Tetsujin robots with hope the robot can be useful for human. He treat Tetsujin robot like he treat his own son, therefore, he named the missile "Shotaro", the same name with his son.

Shotaro Kaneda, the main character of this anime, was a 10-year-old boy, son of Dr. Kaneda. Much like his father, Shotaro who was famous as a young detective in Tokyo was well educated and very intelligent. As a young boy, however, Shotaro's emotion often feels like still unstable, including when he was controlling Tetsujin 28. Basically, Shotaro loves peace and hates war. Having perceived the story behind the production of Tetsujin robot by his father, Shotaro started to develop strong emotional bond with the robot. This anime showed inner-conflicts experienced by Shotaro because of the development of new technologies, as well as the reasons behind the creation of the robots.

Dr. Shikishima was an assistant to Dr. Kaneda, also involved in Tetsujin Keikaku. He was the man who raised and took care of the baby Shotaro since the death of Dr. Kaneda and his wife during World War II. He told Shotaro the dark history behind Tetsujin robot project. After the war, he initiated the development of *Shikishima Juukou* (Shikishima Heavy Industry) as the production site of iron and metal for shipbuilding and construction, including the robot, which was said to have an important role in Japan's economic booming at the time. Dr. Shikishima was also one of the scientists who contribute to the spread of robot technology in the postwar period. In this anime,

he supported the development of robot technology, as long as it's for good purposes. He also continued to reassure Shotaro that what he had done with Dr. Kaneda in developing robotics technology in the past was not a bad thing. He believed that in the future, robots will eventually be useful for the humankind.

Kenji Murasame was the man who since the beginning strongly disagreed with the idea of war. As a former Japanese military personnel, he had bad memories and experiences to have involved in World War II, but on the other hand, he basically had good personality and loved peace. In the 2004 series, Murasame's brother, Ryuusaku and Tatsu, were killed by Tetsujin 28 when they wanted to protect Murasame from Tetsujin 28's attack which at that time was being out of control. This is one of the reasons that leads Murasame hated the existence of Tetsujin. It brings back dark memories of the war, especially when the robots are under bad guys' control, as when the American gangster hands the remote control.

Dr. Franken is a great Japanese biologist during the war. He created a *jinzou ningen* (人造人間), namely "artificial man" (a kind of hulk and zombies), created using the corpses which were resurrected by injecting special cells. In his experiment, he used the corpse of his son who died during the war. In addition to creating

jinzou ningen, he also created a super robot Black Ox. Dr. Franken created both of them as an opponent to Tetsujin 28 which is created by his colleague, Dr. Kaneda.

Dr. Dagnet, a cyborg-scientist who was also a colleague of Dr. Kaneda and Dr. Franken, come from Japan's allies during WWII. In contrast to both his colleagues, Dr. Dagnet created a Super Human Kelly or Kerri Chouningen (ケ ッ リ 超 人間). Kelly is the first super-human created by Dr. Dagnet in collaboration with Dr. Kimura. Kelly is an American whose body is used as a media experiment. In this anime, *chouningen* term is used to refer to the human whose entire body organs, except the brain, is replaced by machine to make it has super strength. Unlike the robot, the superhuman still has emotions as a human being, while at the same time he has very strong super powers like robot does. After creating a Super Human Kelly, Dr. Dagnet created Gilbert, the robot that will be used for space exploration in the future.

Tetsujin 28 and the Wartime Memories

Tetsujin 28 is one example of anime representing postwar memory. Yokoyama Mitsuteru, the original author of Tetsujin 28, comes from the wartime generation who was living in the shadow

of wartime crisis, such as when he experienced the Kobe City bombing as five years old boy. Although the anime explained in this paper is the 2004 version created by Imagawa, the version was created based on the original version of Yokoyama in 1956. As a producer of robotics themed anime, Imagawa knows how to make the viewer feel what was happened during World War II without many changes from the original version. Topics and issues in these 24 episodes of anime are actually not the light one. One of things to point out from this anime is that modernization is basically inseparable from the development of technology, while technological developments are likely to bring new forms of risk, so that the human readiness as a user of the technology become essential.

There are many scenes in this anime that will bring the viewer back to the time of devastation. The anime was opened with visual images of Tetsujin 28 under Shotaro's control fighting his enemy. The capital of Japan, Tokyo, was also made up with European-style buildings and construction, as well as the suburbs that are designed for industrial area. Time of the post-WWII period could be felt by the strains of the musical arrangement mars wartime which is very tempestuous. The story begins with a narration describing the situation of Japan in 1955 or 10 years after

its defeat in World War II. Japanese people, at that time, were filled with optimism and hope as economy continue to grow following the end of the Allied occupation in Japan in 1952. In many episodes, Tokyo is described to have economic development and modernization in various fields. Tokyo residents are no longer wearing traditional clothes, but *yōfuku* or Western-style clothes. Tokyo Tower is under construction. The central energy plant also began to build in many locations in Japan, as well as some new technological developments, such as television and the invention of instant noodles.

Even though 10 years have passed since World War II, however, still there are several projects related to the war that continued to develop in spite of the peaceful condition following the war. One of them is industrial robot project initiated by Dr. Shikishima through *Shikishima Juukou*. Ten years following the world war, Shikishima Juukou did not only pay attention on the iron and metal industries for shipbuilding and constructions, but also on developing robotics technology (*kikai de tsukurareta ningen*). Japan at that time was experiencing what Michael Fischer (2003) referred to as the hype, a historical conditions in modernity involving the human-technology interface, that in turn form the working space of social and cultural imagination through

technology. Development of robotic technology by Dr. Shikishima is inseparable from his experience earned from engagement with Dr. Kaneda in developing secret weapons project in wartime era. As technological hype, the development of iron and metal industries was followed by another technological development, or in the context of this anime, is the development of robotics technology. At that time, the rapidly growing post-war economy is believed to be followed by the development of robotic technology. This robot technology, in turn, will pave the way for other forms of new technology and new interpretations on social reality.

Back to the time when Japan was under the shadow of war, the military resources, especially soldiers and weaponry, were becoming important variables during the war. Overshadowed by the urge to win World War II, Japanese military started a large-scale and ambitious project called Tetsujin Keikaku to create super giant robots used as weapon to win the war. However, by the time its development, until the prototype of Tetsujin 26, the project was always failed. These robots were not accurate in targeting the enemies and could not be as strong as expected. Until ten years after the end of World War II, under the direction of Dr. Shikishima, Tetsujin 27 continued to be developed and is almost completed and ready to be activated. However, when the

activation of Testujin 27 was being processed, Tetsujin 28 was also re-activated inadvertently. Tetsujin 28, which had 10 years buried in the missile, was resurrected and drove to the city of Tokyo. Tetsujin 28 destroyed everything in front of him, until Shotaro find a remote control box which was eventually lead him to chance to control the robot.

The people of Japan, especially to Tokyo City residents, who at that time were in a peacetime era, were suddenly disturbed by the existence of Tetsujin 28, which will be followed by the emergence of other robots. These robots are indirectly bring back the dark memory of wartime era to everyone, recalling the times of war that is strongly related with destruction, death, and so on. For viewers, this anime can be considered as one of the media to understand most of the events occurred in Japan during WWII and the period thereafter. One of the combination between imagination of scriptwriter of manga/anime and factual data from history is the scene of the train accident that occurred in 1949. In this anime, there is scene showing an electric train accidents caused by the robots standing in the middle of the rail line. This incident was then connected with a real incident in 1949 when the two major trains got into accident because of sabotage. The first one occurred on July 15, 1949 at Chuo-sen (Chuo Line) near Mitaka

Station. The following incident occurred in the Tohoku-sen (Tohoku Line) on August 17, 1949. This event is later known as Mitaka-Matsukawa Jiken, and up to today remains a mystery of what is the cause of the incident. This is an example of the memory representation of the post-war period, demonstrating that the new technology will be followed by a new form of risk, or in this context is the electric train technology that has been used widely in Japan, followed by the emergence of a train accident risk.

Representation of Science and Technology in Tetsujin 28

It has been discussed that modernization is usually followed by the development of technology, while technological developments will also likely bring new forms of risk. Therefore, human as user of the technology becomes much important. Fischer (2003) argues that modernism paved the way for developing a "new forms of life" through the mediation of science and technology. Modernism, on the other hand, also increases the opportunities of developing such new risks brought by science and technology (Beck 1992).

In this anime, scientists and researchers who are expertise in science and technology were described to have a strategic role, both in time of war and after. During the war, they are involved in

research and manufacture of military weapons, whose effects actually emerging in the aftermath of the war, ten years later. This anime shows that scientists are not always in the lab, struggling with their research, but they are also involved in government and military projects. Shotaro, the main character on this anime, experienced various conflicts and problems brought by the new technologies, including Tetsujin 28.

Post-war Japan in this anime was full of hope for peace and prosperity. Japanese people, especially Tokyo, started to move on from the dark memory of wartime toward a peaceful and prosperous Japan. Television has been publicly used by the people of Tokyo. The increasing need of energy consumption also requires the availability of sufficient energy supply, therefore, energy issues have also been emerging at that time. While out there, the world was still in high tense. The Cold War made some tension between two world super-power, the United States and the Soviet Union who is competing to show off their technology, e.g. the launch of space satellite by the Soviet.

Japanese people who at that time were prosperous and modernized were brought back to the memory of wartime when they see how the giant robots were destroying the city which was intensively being rebuilt from the destruction after the war.

Resurrection of Tetsujin 28 becomes the starting point of the emergence of other robots, such as the Black Ox, Tetsujin 27, Gilbert, etc., which were not always on Gilbert's side. As a robot, they were designed not to have emotion and power to control themselves. They were subject of human control. In the case of Tetsujin 28, he could only be operated by remote control box. When the news about Tetsujin 28 spread wider to the world, many parties e.g. the gangsters of America who wanted to control the robot were trying to steal the remote control. When they succeed in controlling Tetsujin 28, they used it to commit a crime, robbery, and so on. This shows that the technology basically depends on human who create, develop, and use it. As expressed by MacKenzie (1998), that progress in science and technology is not a natural development, but the development is happening because of the political selection process, consideration of value, and even interest groups or individuals against one type of technology. This robot technology development can not be separated from the scientists who are involved since the beginning.

During World War II, a group consists of some great scientist: Dr. Kaneda, Dr. Franken, and Dr. Dagnet received order under the Tetsujin Keikaku (Tetsujin Project) to develop military weapons. At first, they worked together, but when it came

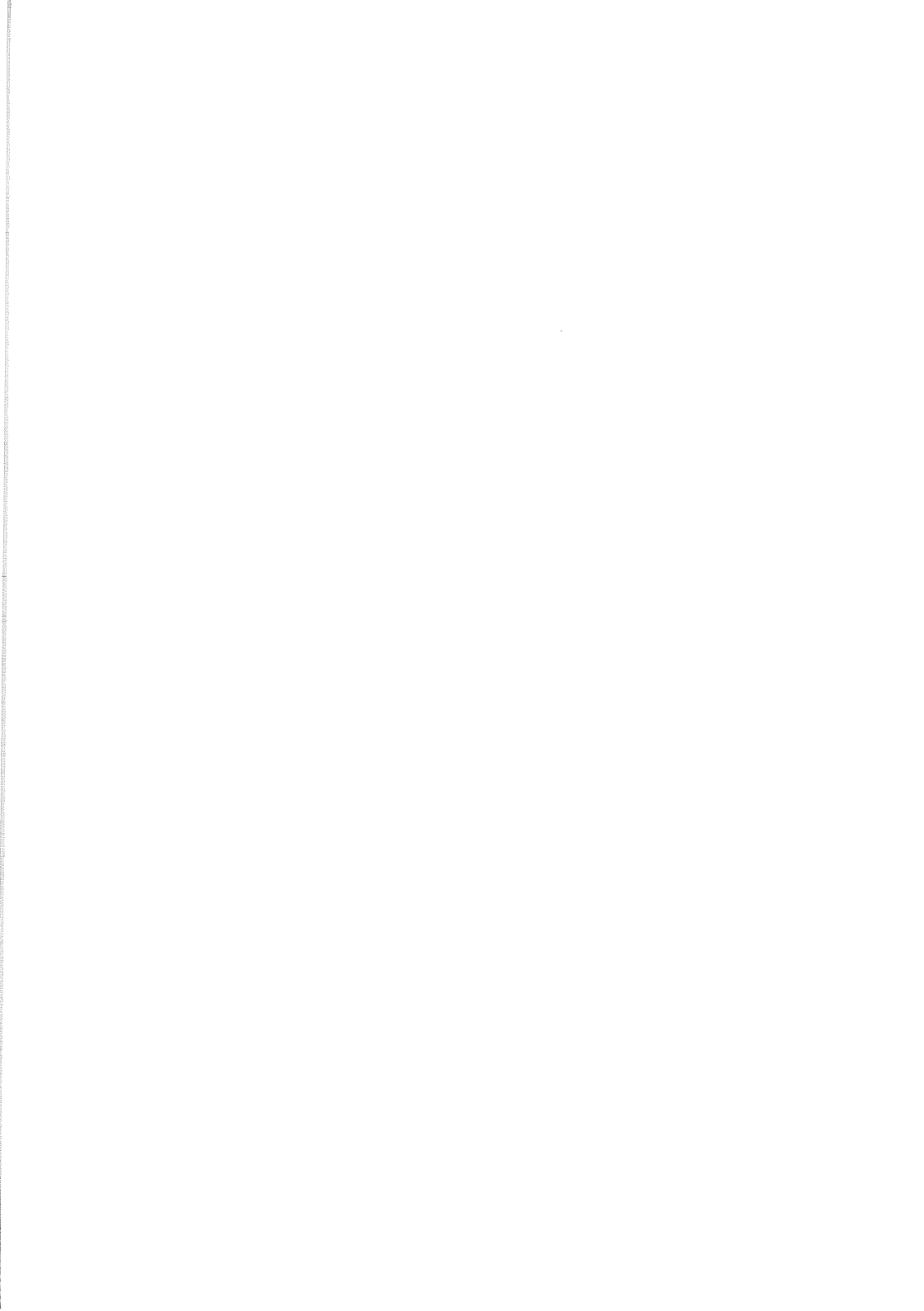
to different views on the use of robotic technology in warfare, they worked separately. Dr. Kaneda refused to create Tetsujin as a weapon of war, which in turn will cause casualties. Dr. Franken and Dr. Dragnet who were not Japanese national, developed a "creature" of their own. As a biologist, Dr. Furanken created a *jinzou ningen* (artificial humans). *Jinzou ningen* is the name for an artificial human being similar to a monster / 'hulk', which is created by injecting special biological cells into the dead body. He has monster instinct while its human emotion is still remained. With all his ability, he did many times of experiments by using many corpses, until he found the body of his own son who had died due to war. After a long experiment, he finally succeeded to create a jinzou ningen using his son's corpse, but the result was not as he expected. On the other hand, Dr. Dragnet created a prototype robot, but always be failed. When Dr. Dragnet was almost desperate, an American named Kelly volunteered to donate his body as experimental material for the production of *chouningen* (human robot). *Chouningen* is a super-human whose human organs are replaced by machines, such as hands and legs are replaced with steel, therefore, it developed superpower than a normal human has. Chouningen is designed to be able to swim in the water, run

fast, and fly over the air. However, the human brain is still maintained. He also still has feelings and logic as a human being.

Here we can understand three forms of new technology that appear in this anime: (1) *robotto* / Tetsujin (robot / Tetsujin), (2) *jinzoningen* (artificial humans), and (3) *chouningen* (human robot). A striking difference of the three forms of the new technology are included on the persistence of the human element (*ningen*: human being) in *jinzoningen* and *chouningen*, which also indicates a new relationship between body shape with science. On the case of *jinzoningen*, the dead body is defined as an entity that can be recycled into something useful, or by using the context of this anime, it is expected to be a super soldier to support Japan in the war. Human corpses that are no longer useful are engineered to be revived. For *chouningen* case, the human body is defined as an entity that can be combined with the machine. Here, there is a shift in meaning between man and machine that actually were two different things, to be one thing that can be combined. In the second case which shows the relation between science and this body, it gives new meaning on "life" and "death". Life can be recreated from the bodies of the dead. The human body can also be engineered to incorporate elements of robotics into the human body are still alive.

Conclusion

The development of Anime with its long history in Japan, can not be separated from Japanese popular culture today. Tetsujin 28-go is one of the many anime adaptations of the popular manga, which is the theme of the development of science and technology in Japan during the post-war world II. Like most Japanese anime in general, Tetsujin 28 theme goodness vs. crime, but the way the story is complex and always spiced with narrative relating to the use and development of science and technology in the context of history. Tetsujin 28 can be seen as anime representing the memory of crisis period during WWII as well memory of the modernization period in the following the war. Furthermore, it can also be seen as an anime which represents the utilization of science and technology in the context of modernization. Science and technology, as well as the modernization is very related with the risk. Modernism can serve as the opening chance of developing a "new forms of life" through the mediation of science and technology (Fischer, 2003), but on the other hand, as expressed by Beck (1992) modernism also increases the opportunities of developing such new risks brought by science and technology.



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