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1. INTRODUCTION

Technology has always stood out to me as having a profound impact on human life and culture. Western technologies have augmented many aspects of human life; microscopes made us able to discover and see new worlds of living creatures, while the telescope enabled the human eye to see distant worlds in galaxies far, far away. Automobiles made us more mobile than ever, while the smartphone combined with internet technology has connected the whole world. To me technology was changing the world. This, perspective on technology, which I *had*, sees it in its *fetishized* form. I assumed that technology evolved by its own volition and it changed the world with it. I was blind to all the cultural aspects that were

It was this perspective I first had when I decided to do my fieldwork in Tokyo. I wished to study how robot technology would affect the Japanese society and see what "role" these new inhabitants would have in it. I had read a lot about Japanese robotics and was prepared to find locations I had read there would be robots. The type of robot I was looking for was the humanoid robot, a robot made in the shape of man. I knew that Japan had a long history with industrial robots, but I wished to study the humanoid ones that were supposed to interact with humans.

Shortly after I arrived in Tokyo, however, I realized that humanoid robots were far from as advanced as I had been lead to believe. How could I then study this new technology`s impact on human life, I asked myself, when the technology was far from advanced enough. Then I realized that the robot did exist, just not in the form I had expected to find it. The robot was highly alive in the Japanese people`s shared imagination. Humanoid robots were highly represented in the popular cultural phenomenon of manga (Japanese cartoons), which is an important part of modern Japanese culture. I soon realized the high degree of automation in Tokyo as well. The high degree of human-machine interaction was to me an indication that the Japanese society would have an easy time integrating robots into their daily lives when the technology is advanced enough. Other aspects of Japanese culture also seemed to have something or another to do with robots, for example in the religious and spiritual where Shinto priests used to bless the industrial robots in the 70s and 80s. I realized that technology is not something that evolves or even exists by its own volition. Technology is a cultural phenomenon packed with cultural meaning. The "making" of a technology does not only consist of engineers working in laboratories, there are a multitude of social processes behind each innovations as well as the culture of the engineer is in practice through his actions.

This thesis will seek out to study how the technological innovation that we know of as the robot, has evolved into what`s I refer to as the Japanese robot. We will follow the development of the robot, from its "invention" in USA to its idiosyncratic development in Japan. When the concept of the robot arrived in Japan, it merged with the Japanese culture and evolved in its own direction. With the theories and data material I shortly will present, we will see that the Japanese culture was ready for robot technology even before the technology was developed. Technological innovation is ultimately a cultural process.

In *chapter 2*, I will present the methodological choices in data gathering and problems encountered in the fieldwork. *Chapter 3* will outline a theoretical framework to look at technology and the robot, and supporting theories that better enable analysis of the empirical data. This involves a presentation of theories on the social anthropology of technology and how the ideological and social aspects of technology, followed by a presentation of the processes that are present in technological innovation. *Chapter 4* provides a short historical introduction to modern day Japan and its relations to technology, followed by an introduction of what the robot is and how it became a part of Japanese culture. In *chapter 5* I present an interview I had with the director and secretary-general of the Robotics Society of Japan, Dr. Yuji Hosoda. In this interview, we get to see a roboticists reflections on the robot and all the cultural aspects that are involved in this technology. In this interview, we get to see what the robot is to the Japanese who make the robots, and what motivations lie behind their work. *Chapter 6* deals with the perspectives of students of robotics. It includes an interview with a foreign exchange student and his experiences and thoughts about the Japanese robotics, as well as the Japanese robot. I also take a tour through the laboratory at Tokyo University, and present an interview with three Japanese students. In these interview we get an insight into the motivations and thoughts on robotics from the perspective of students. We see that there are common features that are recurring in both the interview with the students and the roboticist, e.g. an interest in manga (Japanese cartoons). In *chapter 7* we take a dive into the world of manga and explore what manga is, and what it means to the Japanese. Techno-optimism and robots are among the recurring themes in some of the most popular manga series. *Chapter 8* explores Tokyo and some of the technology that makes out the environment of this highly technologically advanced city. In *chapter 9* I will present my final reflections on my analysis of the empirical material and argue that technological innovation is a cultural process.

2. METHODOLOGICAL REFLECTIONS

2.1. Introduction

This chapter will provide the reader with the field in which I did my fieldwork, as well as the methodological choices used gathering data, which became the empirical data used in this text. I cannot start this chapter without quoting Bateson (1958: 257): "My field work was scrappy and disconnected—perhaps more so than that of other anthropologists. After all, we set out to do the impossible, to collect an exceedingly complex and entirely foreign culture in a few months."

2.2. An introduction to the fieldwork

My fieldwork began in the beginning of January 2013 and lasted almost seven months, until the end of June. Throughout this period I made friends for life, and learned perhaps more about my own culture than I did about the Japanese culture. This text is however about Japanese culture, so I will present the methodological choices I made to gather the data presented in this text.

The first thing I did when I arrived in Tokyo was to start tracking down all the locations where I had read, mostly on the internet, that there were supposed to be robots interacting with the public. My initial plan was to study robot-human interaction. I had read a great deal about these robots, and I wished to study the implications robots had on social relations. I soon found out that articles and blogs "hyping" the robot phenomenon in Japan for the most part were exaggerating. That which they described as robots, were usually mechanical dolls. There were, however, some places I did encounter "real" robots, but they were at technological museums, or centres, like *Miraikan* (The National Museum of Emerging Science and Innovation) or *Tepia,* (Advanced Technology Exhibition Hall). At Miraikan I got to see Honda`s famous android robot *Asimo,* but that was the same as seeing a doll, because he was hidden behind a glass wall most of the time. Two times a day, however, I was able to see him walk a couple of metres, while a crowd of Japanese school children jumped up and down in excitement, shouting *sugoi! sugoi!* (amazing! amazing!). I did several attempts to gain entry or interview the people handling Asimo but they were simply too busy.

At Tepia they had a robot called *Wakamuru* which was supposed to welcome visitors, and was programmed to ask questions and guide visitors through the exhibition hall. Every

time I visited Wakamuru he just stood by the entrance, not even saying hello. He was out of function. I spent some time at Tepia, hoping there might come up something of interest. The receptionist felt sorry for me, so she tried her best to get Wakamuru fixed, but the only thing it was able to do was raise its head up and down, in rapid motion. The receptionist said, "he is very ill".

An other example of a robot that was not functioning as it should, was the robot *Geminoid-F*. I had read that this robot was made by Professor Hiroshi Ishiguro. Professor Ishiguro is one of the most legendary roboticists in the world. He is the inventor of the world`s first android, *Der01,* and has made several extremely life-like androids, including one that's made to look identical to him. I had high hopes about this robot, due to Professor Ishiguro being the man who had made it. From what I had read, it was supposed to be sitting in a window of a store and interact with the people passing by. Videos on Youtube.com show a highly animated robot, waving and interacting with people taking pictures and watching it with fascination. My intentions were to interview the people who interacted with it, as well as observe how they reacted. When I arrived at the shopping mall, where it was located, it was "dead". It looked like all the other mannequins in any other store window. After some inquiry, I was told that "Geminoid-F is not in function".

After much frustration and more episodes of finding robots which were out of order, or were simply dolls looking like robots, I sat down wondering how to continue. The development of robot technology was clearly far from what I had imagined, and what media want us to believe. Blogs on technology were fond of hyping the robot phenomenon especially in Japan. However, they were not *completely* exaggerating. In a certain sense the robot *was* in Japan. Wherever I looked I could see images of robots. There were pictures of robots on buildings, not only in *Otaku* (roughly translated as "nerd") and places like Akihabara, but also in the high-end areas of Ginza and Omotesando. There were a plethora of automatic machines. And on Odaiba, a small artificial island, there even was a huge 18 meter tall *Gundam* robot statue. There were also other statues of robotic figures, mostly from the world of manga spread around in Tokyo. Robots were in ommercials on TV, in magazines, and especially in manga magazines and anime. The robots could be seen everywhere, but where were they?

Then it hit me; the robot is not materialized yet; it is still a part of the collective imagination, the Japanese fantasy of robotic *friends*. The visualization of the robot and the automation of everyday things, like sushi on a conveyor belt, or vending machines for literally

anything. They are like the prelude to the real automation, namely autonomous machines, robots. The robot is still a fantasy, an idea waiting to be materialized. It`s like there has been dug out a niche in the Japanese culture just waiting to be filled. The seed of the technology, the robot is planted in everyone`s minds. The introduction of the robot into Japanese society would be unnoticeable. It felt as if the robot was already there, but it had not materialized yet.

2.3. Gathering data from three different perspectives

My focus went from the initial plan to study the implications robots have on Japanese social life, to study the robot as a technological innovation and cultural phenomenon. As noted above, I observed that robot technology had still yet to be advanced enough to become operative in the public, but I experienced that the *idea* of the robot was alive in the Japanese collective imagination.

My aim then was to gather data to understand why the Japanese were so fascinated by the robot before it was really developed. The fact that robot technology had taken an idiosyncratic development in Japan, compared to for example USA where the first robot was "invented", was also of interest. The Japanese robots were quite different from the American ones, and this I interpreted as being a cultural phenomenon. There had to be a *connection* between how the robot is developed and Japanese culture. Then, to study the robot I had to study aspects of Japanese culture, dealing with what role technology has in the lives of the Japanese. To get the best overview I decided to gather information from three different perspectives. The first was from the perspective of the people who worked with robots, i.e. robot engineers and scientists, usually known as roboticists, and students of robot technology. Due to the fact that technology and the robot seemed to be an important part of the general culture of Japan, I also had to gather data from daily lives and from thoughts about robots and technology ordinary Japanese people have. Seeing that robots, techno-optimism and technology in general were recurring themes in the popular cultural phenomenon *manga*, I decided to delve into this imaginary world in order to get a wider understanding of the robot in Japanese culture. Manga is basically the Japanese word for cartoons. I will describe the phenomenon with greater depth in later chapters.

The roboticists' point of view on robots and technology, the public's daily experiences of and thoughts on technology, and the collective fantasy world of the Japanese, became the

three bulks of data I gathered, which constitute the empirical data I present and analyse in this text.

In the next section I present the methods I used for collecting data through participating in daily life of the Japanese. I found this particularly important, because to understand the world seen from the Japanese point of view, made me able to ask relevant questions and see details and connections I would maybe have overlooked if I only focused on technology. To understand Japanese technology culture, I had to first understand, or at least make an attempt to understand, Japanese culture in general.

2.4. Daily life in Tokyo

I lived in what is called a *share house*. It`s basically a house where you rent a room and share kitchen, bathroom and all other living space with other housemates. This kind of housing was popular among foreigners working or studying in Tokyo, for a period from three months to two years. It was also popular among young Japanese people who had just finished school or university, and had just started on their first jobs. It is a relatively cheap way of living, and it is a great way to meet with people. Further, it was popular among Japanese who spoke English, because living in a house with foreigners was a perfect way to practice English. And this way of living was also popular amongst single women, between the ages of thirty and forty. They usually had a career, worked all day, and came home late at night.

This housing arrangement was quite ideal in my situation. I got the opportunity to meet Japanese people who spoke English, and I could discuss my observations with other foreigners. They could for example confirm that the share house living facilities were exactly like ordinary Japanese homes. Knowing this, I got a general picture of how all the apartments looked like. Among the foreigners were two Americans, one German and one Frenchmen, all in their early thirties. I often talked with them about my observations on Japanese culture. This was very helpful, because they could confirm that the observations I made were uniquely Japanese, and not just unique to me. I later also joined a Norwegian student association, based in Tokyo, where I could get other foreigners' reflections on Japanese culture.

2.4.1. Friends and informants

It was in the share house I met Kei-*chan*, Su-*chan*, and Yoko-*chan*. The suffix *-chan*, is used on the end of names to indicate close friends, as opposed to the formal *–san* suffix. Long Japanese names were always shortened if they were long. Kei-chan`s name was for example Keisuke, and Su-chan's name was Suichiro. Shorter names, like Yoko, were not shortened. I was called Rami-chan. I had many conversations and informal interviews with them. They were all keen to use their English, so I could always talk with them whenever there were things I had observed but found difficult to understand.

Kei-chan was 28 years old. He had just moved to Tokyo from Hiroshima, and had started working as a teacher for children with special needs. Su-chan was 26 years old and had studied psychology, but was at the time saving money to do what he called "a barefoot personal pilgrimage across India". I recently received pictures from his pilgrimage. He walked for three months, slept on roadsides and traded Japanese massages for food. I found him an interesting character. Yoko-chan was 41 years old and worked at an advertisement firm. She had moved to the share house after living in England. There were more Japanese people in similar situations living in the share house, but they did not live there the whole time I was there, so I did not connect as well with them. It was the mentioned three I spent most of my time getting to know. The three of them being quite different made them good representatives for different Japanese persona characters.

It was with Kei-chan I became closest. He had moved to Tokyo a month before I arrived, so he had no friends in Tokyo. More than once he told me that he was very lonely in Tokyo before I came around. At the same time I arrived in Tokyo he had met some people at a local pub called "Mr. Kanzo". He started taking me with him to the pub, and both of us were welcomed into the group who always were at Mr. Kanzo. The core members of the group consisted of four men and three women, all in their mid-thirties. I had most conversations with the three women, because they were the only ones from the group who spoke English. All the communication I had with the rest of the group went through Kei-chan who translated. This turned out to be much easier than I first feared. We turned out to have long conversations, without noticing that we were talking through another person. Koni-chan was the one I had most conversations with about technology. He was a software engineer and a big fan of manga. He was also quite interested in my fieldwork.

It became a daily routine for Kei-chan and me to go to Mr. Kanzo. Every evening I would meet him after he was finished with work, usually between eight and ten. We would then go to eat supper. Kei-chan always chose a place to eat, and he wanted me to learn how to eat real traditional Japanese food. After supper we would always go to Mr. Kanzo. In the weekends we would go out, the whole group, to eat, or to go to a concert, but mostly we would hang out at Mr. Kanzo. I never got the chance to go to anyone`s home, because all of them lived in very small apartments, or in a share house. I was very interested in how the Japanese homes looked like from the inside, but I got confirmed that the share house I lived in was representative for 70 percent of apartments in Tokyo. The remaining 30 percent were either big apartments that the richer population dwelled in, or apartments with a more traditional design. What they meant with "traditional" Japanese homes was basically that there were no chairs or tables.

Spending all that time with Kei-chan and the group at Mr. Kanzo gave me the opportunity to experience the lives of ordinary young Japanese people living in Tokyo. After I had spent a while with them, they started saying I was Japanese, the greatest honour a foreigner in Japan could get. I assumed me being "Japanese" meant that I had managed to learn much of their customs. I took this as a great compliment as well as an achievement of one main goal of mine.

While Kei-chan and the Kanzo-group were at work, I spent my time in various districts of Tokyo or at Tokyo University Campus. Exploring various districts I was able to observe what people did and how they related to each other. My focus was often on the technological aspects of the city, which I will describe in greater depth in later chapters.

2.4.2. Methods used

Participant observation was the main method I used while I was with Kei-chan and the Kanzo-group. They were very keen on showing me everything that was typical Japanese. Kei-chan would often say "this is real traditional Japanese" when describing everything from a coffee vending machine to *sento* (traditional Japanese bath). They knew I was interested in Japanese culture, and that the reason I was in Japan was to study it. I felt that my interest in their ways of life and their culture was one of the reasons I was so welcomed into the Kanzo-group. The other foreigners living in the share house told me that they had trouble connecting with the Japanese. They said they always felt excluded by their Japanese colleagues or fellow

students, and that there were always a barrier preventing them from getting any personal relationships. I argued that this was maybe due to the fact that we as Westerners feel that the Japanese society is so similar to our own, compared to other Asian societies, that we automatically try to connect on our own cultural terms. The reality is that the Japanese society and culture is distinctly different from the Western, so our approaches trying to connect may seem alien and strange to them.

My entry into the Japanese community was to a great extent based on coincidences. Without really being aware of it I suddenly found myself sitting having intimate conversations with a group of Japanese people. I had suddenly become part of a circle of friends. The reason Kei-chan and I became that close initially, I believe, was partly due to that he needed someone to talk with after his days at work. He had a lot of trouble with his colleagues and needed to let out some steam. I was always there, willing to listen to his problems, namely because I wanted to learn what would trouble a young Japanese man living in Tokyo. He was very grateful, because I would listen to his troubles, but I told him that it was interesting for me partly because I could learn more of Japanese culture listening to him. I began telling him what *my* troubles were, and suddenly we became close friends. Having been accepted by Kei-chan, I believe, was the reason I also got accepted by the Kanzo-group. The first time I went to Mr. Kanzo, I noted feeling a bit unwanted, or ignored. After Kei-chan had become closer to them, however, he told them who I was, and why I always was tailing him. From that moment on I was accepted.

I made it a point that I was interested in everything they said and did, and that I wanted them not to spare me for anything because I was a foreigner. It seemed they considered my interest a compliment. Anyway, I was quite aware that my presence had to affect the dynamics of the group in one way or another. And there were many times they were talking Japanese amongst each other, discussing things Kei-chan did not interpret. So I am very aware that there are many aspects and details I didn`t get any insight into, but I do believe I learned a great deal about Japanese culture spending time with them.

Language was the greatest obstacle doing participant observation in Tokyo. Very few Japanese speak English, and those who do speak some, do it badly. Kei-chan had lived a year in New Zealand and was quite fluent, so being with him was a great way to get information from the Japanese who did not speak English at all. But as mentioned above, when they had conversations amongst themselves in Japanese, I am sure I missed lots of important information. This was also a problem when I was in cafés and other public spaces being

surrounded by people talking. It would have been interesting to have data on what kinds of conversations people had.

During my free-time I studied Japanese. I learned *Hiragana* and *Katakana*, which are two of the three writing systems they use in Japan. *Kanji* is the third system, consisting of thousands of Chinese symbols. To read a newspaper you had to be able to know at least two thousand kanji symbols. Knowing Hiragana and Katakana, however, made me able to read some signs and menus. The Japanese I learned was enough to initiate conversations, but I did not come to a level where I actually could converse with anyone. But again, I felt that knowing some Japanese and the customs for greeting, were enough for the Japanese to open up. The fact that you *try* to learn their culture seemed to me something they took as a compliment. Most foreigners I met did not bother learning Japanese, nor even the customs.

During the times I would be with anyone from the share house or the Kanzo group, I would take fieldnotes. At first I used to take notes discretely, in the bathroom, or on my smartphone, in fear that people would feel uncomfortable with someone suddenly taking up pen and paper and write something down. With the Kanzo group I stopped worrying, because they knew very well what I was doing in Tokyo, and they even encouraged me to note down things they meant would be relevant. Those times, however, I would be extra critical of the information, because I was more interested in the things that came naturally, rather than what they thought I might find relevant.

I also did informal interviews, but I only used this method when I wanted to learn more of a specific theme. I mostly did informal interviews when I came in contact with Japanese people when I was around in different districts of Tokyo. At Tokyo University Campus I especially used this method, when talking to students. There were never time to do any formal interviews with any of the students I talked with. With Kei-chan, Su-chan, Yoko-chan and the Kanzo-group I would only use data from conversations. I did however, have an informal interview with Koni-chan, the software engineer from the Kanzo-group. I believed he had knowledge on the subjects I was interested in, so I made a list of questions which he helped to answer.

The biggest problem doing interviews was again the language barrier. Those who did speak English weren`t very trained using their English, so they misinterpreted many of my

questions. Kei-chan and Yoko-chan had both lived in English-speaking countries, so they were much more fluent than other Japanese who had only taken English courses in school.

In this part I have presented how I gathered data with respect to the general public. This data was especially important in terms of getting to know more of Japanese culture in general. I believe it is important to have data, on the culture in general, in order to be able to study specific aspects of it. Having data on the general culture becomes a foundation which I can build new information on. In this part I also presented how I gathered data on how the general public think of and relate to technology. Now that I have told how I gathered information on Japanese culture, and the public's view on robots and technology, I will continue by presenting the methodological approach I chose to gather data on the roboticists' view on robots and technology.

2.5. The roboticist and students of robotics

Having collected data on how the general public related to technology and the robot, I believed it was important to have data on how the people who actually work with robot technology understood and related to both robots and technology in general.

I decided to go ahead and contact roboticists and students of robot technology. This way I would be able to see if there were any differences between the generations. Getting contact with any of the roboticists, however, turned out to be harder than I thought. After sending about ten requests to various institutes, as well as showing up at their offices, I almost gave up. They all had the same answer "sorry, we have no time". Koni-chan from the Kanzo group, advised me to contact the *Robotics Society of Japan* (RSJ). I wrote a request, explained what my interests were, and told that I hoped they could help me get in contact with a roboticist who had time to answer some questions. To my great surprise and joy, the Director and Secretary-General of RSJ, Dr. Yuji Hosoda, answered my request. He said he found the subject I was studying very interesting, and that he would be happy to help me. Dr. Hosoda is a well-known roboticist in Japan, and I had come across his name more than once in the literature I had read on Japanese robotics.

It was easier to get in contact with students. They had more time. I spent some time at Tokyo University Campus and talked with many students, but I never came in contact with

the ones studying robot technology, which I later found out was because the robotics institute was in a whole other area than what I was lead to believe. I did have some fruitful conversations with students from other disciplines though. It was through a Norwegian friend who studied at Tokyo University that I later on gained access to the Robotics Institute at Tokyo University. He knew a foreign exchange student who had been at the institute for three years. This student was nice enough to let me visit the laboratories, as well as to help me interview the Japanese students. They did not speak English, so he had to translate.

Having the opportunity to interview the only foreign exchange student at the institute turned out to be very fruitful. He had been at the institute for three years, and had many observations he was happy to share with me. This turned out to both confirm many of my observations, and I also learned new surprising aspects of Japanese robotics.

2.5.1. Methods used

Before meeting Dr. Hosoda I prepared for a formal interview. I made a list of questions with subjects I hoped could confirm some of the data I had collected from other places, as well as fill in gaps where I had no data. The most important thing with this interview, however, was to learn his perspective, as a roboticist, on how he understood that which he had spent his life working with, namely robots. Before the meeting I decided to send a copy of the questions I wanted to ask. I was afraid his English skills were bad, and that he would misinterpret my questions. I knew this would compromise the spontaneity of his thoughts, but I would rather have him use some time reflecting over the questions, because the questions I had made, needed some thought.

Meeting him at the office of RSJ turned out to be a great experience. His English was not great, because, as he explained, “he hadn`t used it in a very long time”. But the interview went very well, and I was quite pleased I had sent the list of questions in advance, because he had written down his answers, so the interview turned out to be even more fruitful than I had hoped. Having written down his answers made him reflect over his own thoughts during the interview. We spent over two hours talking, and we kept in touch over mail. There were several times I sent him questions on mail, especially when I needed confirmation regarding manga and robots. This will be explained in the following chapters.

Gathering data from the students I chose to use informal interviews, because I was not sure about how the setting would be at the laboratories, or how much time they would have to answer my questions. I decided to make a list with various themes and various questions, and let the interview be more of a conversation about different topics.

The problems I had in these cases were again the language barrier. Dr. Hosoda spoke English, but not very well. He understood all my questions, but sometimes he had trouble expressing some things. Taking account of the context I suspected he had trouble expressing himself in English partly because there were things he only could explain in Japanese. I am sure my data would be a lot richer if I managed the Japanese language and had more knowledge on it. The interviews with the students were done with the foreign exchange student as an interpreter, so they were able to understand my questions, but I am sure many of the nuances got lost through translation.

While doing the interviews I constantly took notes. Not only of what was being said, but also of body language and decorations of offices and laboratories. During the interview with Dr. Hosoda I also used a tape recorder, and this turned out to be very useful. While transcribing the interview, I heard that he actually had answered something different than what I had written in my field notes. His English was, as mentioned, not so good, so I had apparently misheard some of his answers. Nevertheless, I learned that using a tape recorder could show things one overlook, or don`t hear during the actual interview.

The methods used gathering data from these informants, were not ideal. I would have preferred to have the time to do participant observation more interviews when I knew better what questions to ask. Most of the data I gathered, was based on the questions I asked. I would have liked to gather more data that was of a more spontaneous nature. Another weakness in my data was the fact that I was able to only interview one roboticist and four students. I believe my data would have been richer and manifesting more nuances if I had a broader range of informants. Anyhow, considering how little time and how few connections I had, I was quite content with the data I was able to gather. I had gotten a perspective on robots from both a roboticist and from students of robotics.

Through my observations from the daily life in Tokyo, as well as through the interviews at Tokyo University I became aware of how important the popular cultural phenomenon manga was to the Japanese. I also became aware of how often the robot and

technology was represented in this form of media. So, I decided to explore this imaginary world to see how the robot and technology is represented in their shared imaginations.

2.6. Exploring the world of manga

This quest started with doing a great deal of observations. I visited almost all the manga stores in the whole of Tokyo. I found out that the highest concentration of manga stores were in the district Akihabara. In Akihabara there were also enormous posters and commercials of manga characters everywhere, covering the high-rise buildings. I decided to use extra time there, to observe what kind of people buy manga, as well as to try to learn what was most popular. My focus was on the sections where they sold manga magazines with robots and technology as themes. I spent hours walking through aisles, browsing different magazines. After learning that there were literally thousands of different manga magazines which covered every theme imaginable, I started asking the people working at the various stores what was most popular. Most places I asked, I was told "*Eigo ga wakarimasen"* (I don`t speak English). But at one place I talked for a while with a man in his forties. He did not work there but he told me what I should look for. I later searched the internet and found the ones he had mentioned. I later discussed this with Koni-chan and Kei-chan, and he confirmed that the manga series I had been recommended were classics, and the most popular ones. The ones I decided to focus on were: *Mighty Atom*, *Ghost in the Shell*, *Evangelion Genesis*, and *Mobile Suit Gundam*. I studied countless more of these series, but I have chosen to use these four as examples in this text.

2.6.1. Methods Used

I mostly used observation and field notes when being out in different parts of Tokyo gathering data. I also used informal interviews whenever I would meet someone who spoke English. I had prepared a list of questions, which I had in my notepad. This made me always prepared to ask what I thought were the most important questions. I used informal interview when discussing manga with Koni-chan, as well. This was because he had more knowledge about the topic than any other Japanese friend I had, and I wanted to have answers on specific questions about observations I wished to confirm my understanding of.

Studying Japanese popular culture turned out to invoke the same language problems I had throughout my fieldwork in Tokyo. All the manga magazines are written in Japanese. Luckily, the most popular ones, like the ones mentioned above, are animated and dubbed to English. I am sure nuances are lost through the translation, but my main interest in these series was in studying how technology is represented. I watched all the animated series and movies minimum twice, and I tried to see them all in the chronological order in which they had been made. I took notes, and compared the themes. The ones featuring robots I had in one bulk, and the ones mainly featuring a technological advanced future in another. I did comparisons and categorized what I understood as underlying themes. I usually discussed my findings with Koni-chan, because he had seen the ones I was interested in enough times to know them by heart.

The data I gathered from the world of manga was very interesting and relevant to my other findings. Excerpts from the data gathered from the series mentioned above will be presented in a later chapter.

2.7. Summary

In this chapter I have presented the field which was my home for almost seven months. I introduced the main characters who became my friends and helped me learn about their culture. I also presented the methodological approaches I used to gather the empirical data, which I will present in the following chapters. First, however, I will take the reader through the theoretical framework I have built, which I have used to analyse the data material I collected. In the following chapter, I will present the theoretical tools, which I have used, and I wish the reader to consider these tools and ideas as glasses to use while reading the empirical data I will later present.

3. THEORETICAL FRAMEWORK

3.1. Introduction

Above we have gone through the field where I collected my empirical data. This chapter will give the theoretical framework that will help in analysing this empirical data. As presented in chapter 1, the focus will be on robot technology in Japan. By studying Japanese robot technology with the theoretical tools social anthropological offers, I believe, will illustrate that technology is ultimately a cultural process. The development of a theoretical platform starts with a theoretical discussion on how to approach the term 'technology'. This is perhaps especially important with a subject as culturally determined as technology. My task is to show what the emic understanding of what technology is in Japan, as well as to show how this is expressed through the way Japanese roboticists develop robots.

Having settled with the approach, I will start by looking into how technology has been treated within research earlier. I will follow Bryan Pfaffenberger`s theories on how to study technology, which mostly focus on technology as social a process. Other theories on technology as social process I will be using, are the ones Tim Ingold presents. Ingold places technology within a Marxist-theoretical framework, which I will also build my theoretical framework upon. They will provide the main structure for understanding technology, as well as they will throw a light on the anthropology of technology. Having established that technology and society affect each other in a dialectical fashion, I will continue looking at the dialectic relationship between society and the individual. This is to illustrate how technology as an idea or an ideology is realized through the individual`s practice. I will demonstrate this, with the help of the theories of Bourdieu, Bateson, and Berger & Luckman. Lastly I will, with Pfaffenberger, and Bateson`s theories, illustrate how technology has to fit within a system of social relations, and thus illustrate how technology is deeply rooted in the social relations in a society. As I will demonstrate, technological innovation is a cultural process.

3.2. The social anthropology of technology

"The study of technology, Marx wrote, is of paramount importance for the human sciences: it 'discloses man's mode of dealing with nature, the process by which he sustains his life'" (Pfaffenberger 1988:236). Pfaffenberger argues that few cultural and social anthropologists turn the full force of their theoretical tools on to this subject. This, he argues, "is a pity, since

the unique field methods and holistic orientation of anthropology situate the field advantageously for the study of technology." I have chosen to study technology, exactly for these reasons. I believe social anthropology has the tools to disclose man`s technology, as is his culture`s "mode of dealing with nature."

The first step in building a theoretical framework is to understand the terms we are studying, as well as to show how they are to be understood in the field of anthropology.

Pfaffenberger (ibid.: 237) points out that few anthropologists bother defining technology, which he finds surprising "in a discipline concerned with cross-cultural translation and the critique of ethnocentric constructs." Especially because technology stands in the centre of what we in the West tend to celebrate about ourselves, and our civilisation.

Then, the first step towards an anthropology of technology, he suggests, is to unpack the cultural baggage and pre-understandings that lies hidden beneath the veil of culture covering the term 'technology'. Taking this step, Pfaffenberger (ibid.) says, will illuminate the unreliability of the culturally-supplied Western notion of technology, and will at the same time show how the term can be applied by anthropologists. This, he argues, will also demonstrate why technology, as a subject, is of interest to symbolic and interpretative anthropology.

I will subsequently follow the steps Pfaffenberger (1988) presents, in order to make clear what I will be careful to avoid, as well as to show how I interpret the term technology. Ultimately, I hope this will make clear to the reader, how I will apply the term in the analysis of my empirical data.

The first step then, is to discuss how to define the term technology. Pfaffenberger says that a textbook definition may raise serious doubts about the term`s applicability in anthropological discourse. Pfaffenberger (1988: 237) uses an example of a textbook definition of technology

> …as the sum total of man's 'rational' and 'efficacious' ways of enhancing 'control over nature' (alternatives: 'command over nature', 'domination over nature', etc.); e.g., technology is 'any tool or technique, any physical equipment or method of doing or making, by which human capability is extended.

This definition may be linked to Western civilisations and Christian traditions, which dictates human domination of the natural world. The historian White, Pfaffenberger (1988) says, notes

the implicit linkage between such definitions and the roots of Christian metaphysics, and states that the consequences of this tradition has led the Western world to the threshold of a serious and self-destructive ecological crisis. Kaplan (2004: 470) similarly points out that this deeply metaphysical root in Western culture can also be seen in how the Western world distinguish between nature and culture. The definitions we have today on technology, are in other words defining it from our own cultural standpoint. Therefore, I have to be careful how I use the term 'technology' in my thesis.

3.2.1 Technological somnambulism

Furthermore, we must be aware of other "culturally-supplied" notions of technology. Pfaffenberger (1988: 237) points out that there are "two implicit and mythic views of the world in relation to technology, that profoundly affect how we understand technology and how we view its relationship to our lives." These tacit notions of technology stand in contradiction to one another, yet they have a deeply hidden unity. These two notions are *technological somnambulism*, and *technological determinism*. Pfaffenberger (ibid.:238) goes through the arguments of political scientist Langdon Winner, on the first notion, technological somnambulism. In this view of technology, the relationship between human and technology is simply "too obvious to merit serious reflection." This relationship consists merely of the "making" of the technology and is only of interest to engineers and technicians. In other words, belonging to the sphere of "making", or "tool-making", having no ethical, nor moral implications, meaning that society has total control of it, and its impact depends on how it is used.

Pfaffenberger highlights Winner`s point, that the thing that`s wrong with this notion of technology, is its denial of the many ways technology provides meaning and structure for human life. Technologies "bring significant alterations in patterns of human activity and human institutions", he says, and points out that Winner does not suggest a simplistic technological determinism, but that we must be aware the trance-like state of technological somnambulism. It leads us to ignore and blindly accept whatever implementation of technology those in power choose to let into our lives. Because, as Winner says,

> Once entrenched in our lives, however, the technology makes a new world for us. We weave it into the fabric of daily life. Yet the human choices and decisions are masked, so the

> technology seems to operate beyond human control and appears to embody the result of an automatic, inevitable process.
>
> (ibid.: 238)

In other words, if we do not keep a watchful eye on technological development, we might find ourselves in a world we do not recognize, created by those in power.

We can here see what I wish to focus on, namely the relationship between the 'making' of the technology, and the structures that enables the 'making'. I will continue by looking at the other notion of technology in Western scholarly discourse.

3.2.2. Technological determinism

The other implicit and mythic notion of technology, which is on the opposite side of the continuum, is the notion Pfaffenberger (1988) points out that Winner carefully tries to avoid, namely technological determinism. This notion of technology views it as a powerful and autonomous entity that changes patterns of human social and cultural life by its own power.

> In the grip of this notion, all of history seems to have been dictated by a chain of technological events in which people have been little more than helpless spectators. So deeply encoded is this notion that technology's autonomy is frequently assumed without comment. Indeed, the idea often operates, in scholarly writing about technology 'in the elusive manner of an unquestioned assumption'.
>
> (Staudenmaier in Pfaffenberger 1988: 239)

It is easy for the Western scholar to forget himself and write about technology as an entity separated from all other social life. In the Western world people are born in to a world of technology and machines. From our very birth we are surrounded by all kinds of technical medical machinery. Bradd Shore (1996: 232) argues that the machine has become central in how people in the West understand themselves. He calls this phenomenon *techno-totemism*. In neolithic societies, he says, people were born into a world of plants and animals. As hunter-gatherers, they were in daily contact with this world, which in turn formed the models of their identities and their understanding of the relationships between themselves. People in the Western world, however are born into a world of machines and technology, and it is that world that becomes the model to understand identities and social relations in the West. Shore (ibid.: 233) refers to a saying by Levi-Strauss: "…the world of plants and animals for the

industrialized man, is not as easy "to think with" as it once was." The social scientist must therefore be aware of how he discusses and uses the term technology, and try to avoid writing about it as an unquestioned assumption.

Some scholars, however, defend the determinist position, arguing that technology is applied science, and science is progressing so rapidly, that the technology is out of our control. We have neither time to evaluate our own creations, nor defend ourselves against them. This view on technology, as applied science, however, is linear and simplistic. Pfaffenberger (1988: 239) points out that we must remember that: "The relationship between science and technology is complex, dynamic, and historically recent." There are many examples of important inventions of the eighteenth and nineteenth century, such as the steam engine, which were "in no real sense the result of the application of science" (ibid.). However inhumane our technology may seem, it is nonetheless a product of human choices and social process. The technological determinist thesis becomes difficult to sustain in comparative studies. "This does however, not mean that we must lean towards technological somnambulism", he says (ibid.). Technology should be seen as a system, "not just of tools, but also of related social behaviours and techniques" (ibid.: 241). Technology, he argues, is essentially social, not technical, so when one studies the impact of a technology on society, one must also examine the impact of the technology`s embedded social behaviours and meanings. "Technology is not an independent, non-social variable that has an 'impact' on society or culture. On the contrary, any technology *is* a set of social behaviours and a system of meanings" (ibid.). It is a matter of one social behaviour, which has an impact on another form of social behaviour.

3.2.3. Technological fetishism

The underlying unity between these two contradicting notions of technology: technological somnambulism and technological determinism, Pfaffenberger (1988) says, is that they both understate or disguise the social relations of technology. "In the somnambulistic view, 'making' concerns only engineers, and 'doing' concerns only users" (ibid.:242-3). The entire network of social and political relations that are imbedded in the making of the technology, and which are influenced by the doing, are hidden from view. Similarly, the deterministic view is seen as something apart from this network. Technology then, in the Western culture is seen as a disembodied entity, emptied of social relations, and composed almost entirely of

tools and products. "It stands before us, in other words, in what Marx would call *fetishized* form: *what is in reality produced by relations among people appears before us in a fantastic form as relations among things*" (ibid.). This concept of fetishism stems from Marx`s discussion on commodities in the capitalist world. Technology is in other words, stands before us as commodities does. Cut off from the social relations that in reality produce it. The manufacturing, economic, political, etc. relations are all hidden under a shroud of that mystifying object. Fetishism can further be described as

> the effect *in* and *for* consciousness of the disguising of social relations *in* and *behind* their appearances. Now these appearances are the *necessary* point of departure of the representations of their . . . relations that individuals *spontaneously* form for themselves. Such images thus constitute the social reality within which these individuals live, and serve them as a means of *acting* within and upon this social reality.
>
> (Godelier 1977: xxv)

It is this invisibility of technology Pfaffenberger (1988) argues, which lies at the heart of the technological somnambulism and determinism. The somnambulist deny that there is a demonstrable relation between technology, and the determinists assume a relationship always exists. They both see technology in fetishized form, and they both disguise the fundamentally social behaviours in which people engage when people create or use a technology. "Both of these anthropological versions of Western cultural theory are remarkable for their inherent dogmatism, itself a sign of their ideological origin" (ibid.: 243). The task for the anthropology of technology is then, I propose, to bring these hidden social relations from under the shroud of fetishism and into the light.

3.2.4. The social nature of technology

We have now seen what to be aware of, in the social studies of technology. Also, we have seen that there has either been too much focus on the somnambulistic view, or on its counterpart, the deterministic view. Both views, sees technology in its fetishized form. We have also slightly gone through the fact that we are born into a world of machines and technology, forming what Bradd Shore calls techno-totemism for the Western man. How can we then be able to distance us from the term? How are we then to bring the hidden social relations into the light?

Pfaffenberger says: “To counter the mystifying force of fetishism, it is necessary to see technology in a radically different way: to view it, not through fetishism of technological somnambulism or determinism, but rather as humanised nature.” To say that technology is human nature, he argues, is to insist that it is fundamentally a *social* phenomenon (ibid.: 244). “It is a social construction of the nature around us and within us, and once achieved, it expresses an embedded social vision, and it engages us in what Marx would call a form of life” (ibid.). He goes on and compares this interpretation of culture and nature, with that which Mauss (1967) would call *total presentation*, which refers to all behaviour that`s apprehended as technological, are at the same time, political, social and symbolic. It has legal and historical dimensions. It entails a set of social relationships and it has a meaning, it is like Mauss` gift a *total presentation*.

This makes the study of technology a study of complex, mixed relationships of one form of social behaviour on other forms of social behaviour. Viewing technology as humanised nature, in other words, does not make things simple. However, Pfaffenberger (1988: 245) states that anthropology is uniquely suited to the study of such complex relationships between technology and culture. Anthropology is distinctive for its holism, which is an approach that sees any society as a system of interrelated components. To do such an analysis requires at least “a working knowledge of a society`s biological environment, history, social organization, political system, economic system, international relations, cultural values and spiritual life,” he says (ibid.). Such analysis are in other words not easy, and one has to be able to situate behaviours and meanings in their “total social, historical and cultural context” (ibid.). Technology is in short “a mystifying force of the first order, and it is rivalled only by language in its potential” (ibid.: 250).

So, to study technology, one should study it as humanised nature. Anthropology is a discipline that is suited for the study of such complex relationships, between technology and culture. I will therefore continue by showing how technology can be studied in relationship to different aspects of society. Pfaffenberger (ibid.: 245) recommends that one should have at least a working knowledge of a “society`s biological environment, history, social organization, political system, economic system, international relations, cultural values and spiritual life.” to do such an analysis. I will start by showing how technology can be seen as an aspect of ideology.

3.3. The ideological aspect of technology

Ingold (1979: 277) states that there must exist a system of social relations for technological development to take place in a society. The steam engine was a product of capitalism, the large scale irrigation systems a product of the archaic state, and the stone-chopper was a product of hunting and gathering relations of production. In each of these cases, he says that technological innovation may have accelerated the development of the corresponding social system, but it did not bring that system into existence. In short, what Ingold is saying, is that "technology, is not the 'prime mover' behind human social evolution" (ibid.). With this he criticises the technological deterministic notion of technology discussed in the previous section, as well as emphasizes how technology must fit into a system of social relations of the society that it is being implemented in. Technology is a social phenomenon, and is therefore not per se in a position to change and form societies. He continues to define technology as "a corpus of culturally transmitted knowledge expressed in manufacture and use, and as such it belongs with ideology in the domain of the super-structure" (ibid.: 278). A collection of instruments on their own, he says, does not make a technology, they rather express a technology only in so far as they are brought in relation to their makers (1986: 353).

He places technology in the ideological sphere of society, because technology is something that is accepted as a natural part of everyday life. It must fit into a system of social relations. The very fact that technological ideas seldom are challenged and are usually promoted by those in power, makes these ideas ideological. Opposite from the super-structure is the base, and it is here that the production of technology appears, which the super-structure consciously or unconsciously allows, or promotes getting embedded into the "natural order" of society.

The very thing that identifies a successful ideology is that it falls natural to the individuals in society. Technology is then, I would say, a very successful aspect of ideology. The very fact that, as discussed in the former section, technology is too often seen as either somnambulistic or deterministic, and therefore viewed in its fetishized form, illustrates its relationship to society`s ideological sphere. So studying the ideological aspect of technology, I believe, will help us see technology beyond its fetishized form and show the social processes which are in motion to make what we know as technology.

Comaroff and Comaroff (1991: 392) state that ideology may take many guises, "it may be narrative and non-narrative, realistic or whimsical, it may be heavily symbolic, or deeply

coded, but its root message is that it must be communicable." Robot technology, as I discussed in the previous chapter, is still mainly an idea to most people in Japan. It`s mainly the "makers", the engineers and technicians who deal with the technology. The technology still isn`t advanced enough to be on the market for the general population. The robot, however, is very alive as an idea among the general population. So one of the social aspects of robot technology, I wish to focus on, is how it`s portrayed in society. The manner in which the robot is communicated as an idea through mass media, namely popular culture.

This definition of technology as ideology, seen in a Marxist-theoretical light, is a definition I wish to pursue. I have chosen to do so, because this way of defining technology will help show the social processes that are involved in developing robot technology in Japan.

3.3.1. The politics of technology

We have already discussed the fact the vast complex of social relations of a technology are hidden in its fetishized form. And as Pfaffenberger (1988: 282) states, after we have demonstrated that technology is socially constructed, we must account fully for its technical design. To do so, one must examine the technical culture, social values, aesthetic ethos, and political agendas of the designers.

It`s these aspects of robot technology I will be showing in the empirical cases I will be presenting in later chapters. This will show how Japanese society is expressed through the Japanese robot.

Technology is then, Pfaffenberger (1992a: 282-3) says, "at least partly a political phenomenon: Technological innovation provides an opportunity to embed political values in technological production process and artefacts, which then diffuse throughout society as a large-scale technological system arises." We discussed in chapter 2 that the post war Japanese government wanted to rebuild Japanese society on the pillars of technology, as well as we saw prime minister Abe`s *Innovation 25*. There is a clear political agenda in promoting technological development, and this as I will show is possible to see in the robots design, as well as how it is portrayed in media.

Pfaffenberger argues that the elite`s political values are actively produced and defined in circular interactions with the design process, so that the pre-existing values may take surprisingly new forms and what seems to be "traditional" values turn out to be new values

invented to suit the needs of the moment. “Technology, in short, is not politics pursued by other means; it is politics pursued by technological means” (ibid: 287). Robertson (2007) states that the new robot technologies in Japan are being deployed in order to reify old “traditional” values, such as the patriarchal extended family and socio-political conservatism. The idea of robot technology, also perpetuates a wilful amnesia of the problematic legacy of Japanese imperialism, wartime atrocities, and ethnocentrism (ibid.: 394).

To further illustrate how technology can be seen as an aspect of ideology, I will show how it is part of a community`s shared reality. That a community`s concept of what technology is, can be seen in the way they ‘make’ technology, as well as how it is represented in the technical culture, social values, aesthetic ethos, and political agendas of the designers.

3.4. The social reality of technology

I will continue by going through some theories that can throw light on how technology as an ideology in society is expressed through its design and in the special way that it is being developed.

As I see it; because technology can be seen as ideology, it can be seen in relation to Bourdieu`s (1977) description of *doxa*, which also, I will argue, makes it deeply embedded in *habitus*. This also, I believe, makes it a part of a community`s shared knowledge system.

The dialectic influence between the society and individual can be seen in the light of Bourdieu`s (1977) description of the term *doxa*. Doxa signifies those aspects of culture and society which are taken for granted by the general population, i.e. those aspects which one does not question and which are so obvious that they even seem unnatural to question. Technology fits right in this category. Technological innovation and development is accepted as a given part of the natural order. We are constantly surrounded by a world of machines and technology. To walk into a shopping centre, with automatic sliding doors, artificial climate control, and artificial lighting, has become more natural for the Western person than to walk into a forest. We even call “untamed” nature “wild”, and “wilderness”. “Tamed” nature is formed and is to a great extent linked to technology. We behave and act in accordance to our natural and social surroundings, and these acts form a special kind of behaviour which is reproduced through practice and then is perceived as “natural”.

Behaviour that is perceived as "natural" by the individual, becomes ritualized by social life. This ritualized social behaviour becomes, with repetition, an institution. When new individuals who are institutionalized into a new institution, the same behavioural pattern becomes apparent in the individual (Berger & Luckman 2006). The doxa is intuitive knowledge one does not question, because one assumes or experience that this is the way things are supposed to be. The term thus, can be paralleled with ideology. It is the ideological aspect of technology that makes technology appear to us in its fetishized form. It is felt so natural in the community`s environment that it never crosses the mind that technology, is in fact the peak of an iceberg hiding a great mass of social relations, so that technology is not a creation of a separate nature, but of a social nature.

"Natural" behaviour is practiced through what Bourdieu (1977: 78) describes as habitus:

> …the durably installed generative principle of regulated improvisations produces practices which tend to reproduce the regularities immanent in the objective conditions of the production of their generative principle, while adjusting to the demands inscribed as objective potentialities in the situation, as defined by the cognitive and motivating structures making up the habitus.

Habitus can in this sense, be seen as the embodiment of culture, culture practiced through behaviour. Through our earliest experiences as human beings we are structured by structures that form the structures of the universe of our closest environment, especially our familial environment. "Through the mediation of the specifically familial manifestations of this external necessity (sexual division of labour, domestic morality, cares, strife, tastes, etc.), produce the structures of the habitus which become in turn the basis of perception and appreciation of all subsequent experience" (ibid.). With this, he says that the habitus is a kind of map of references, the individual will base his experiences upon, and therefore also act on. It is the culture imprinted into the individual. The tastes, ideas, morals, etc. that the individual thinks are natural, are in fact cultural. Through the practice of culture, new experiences are incorporated into the habitus, making the habitus as Bourdieu says "history turned into nature" (ibid.).

One of the fundamental effects of the habitus, "is the production of a commonsense world endowed with the objectivity secured by consensus of the meaning (*sens*) of practices and the world" (ibid.: 80). In other words, the shared experiences and the continued reinforcement that each member of the community receive from expressions, in for example

festivals or sayings, individually or collectively, are experienced similarly or identical. Individuals experience the world similarly. The homogeneity of habitus in a group reinforces what the individual perceives as objective reality. And, thus that which is the culture`s objective reality, gets harmonized with the individual`s objective reality. Feelings, such as sympathy, friendship, or love are dominated through the harmony of habitus (ibid.: 82). These feelings, which are the emotional emphases of the culture, can also be seen as what Bateson (1958: 32) collectively refer to as the *ethos*. Moreover, it is inherent in the habitus, that what is perceived as "logical" behaviour or actions, is in fact "logical" within the frames of the structures of ones own culture. The fact that "logic" must be interpreted differently from culture to culture, is what Bateson (ibid.: 25-32) refers to as the *eidos*.

Both the ethos and the eidos are based upon the same double hypothesis, namely that the individuals of a community are standardised by their culture. The pervading general characteristics which may be recognized over and over again, in a diversity of contexts, are expressions of the standardisation of a culture (ibid.: 33). This hypothesis, Bateson (ibid.) says, is in a sense circular, because the pervading characteristics of the culture, not only express, but also promote the standardisation of the individuals. Similarly, in the habitus concept of Bourdieu (1977), the individuals of a community are standardised by their culture. The individual is born within cultural structures which are standardised by the practices, and as such are reproduced.

The concept of habitus will help in the analysis of my empirical data by showing the relationship between ideology and practice within communities. While the concepts of ethos and eidos, will be useful in establishing which characteristics are recognised over and over again. This will show how technology is a characteristic we can find in communities standardised by culture, so that the "reality" of technology is socially determined. I want to continue by examining the body of knowledge that must be shared between the individuals in a community, in order for them to be able to communicate and express, as well as to share the same "reality". To look closer into how this shared reality is constructed, I will look at Berger and Luckman`s sociology of knowledge.

3.4.1 Shared realities

What the individual perceives as "reality" Berger and Luckman (2006: 24) argue, is that quality that is part of a phenomenon, acknowledged as having an existence beyond our free will, i.e. technology in its fetishized form. This can also be seen in context with what Bourdieu (1977) describes as doxa. Societies have a dualistic character where the objective "facts" of culture and subjective meanings constitute its own reality (ibid.). "…man`s consciousness is determined by his social being" (Marx in Berger & Luckman 1991: 17). Similarly to what we discussed above, the structures or the characteristics of a culture an individual is standardised by, belong to the objective "facts" of reality, which then constitute a subjective reality. Reality, in other words, is socially determined.

An institutional world is experienced as an objective reality. The reality of, for example a hunter-gatherer society will have a whole vocabulary and a "science" describing the institution that is hunting. There will be a body of knowledge on modes of hunting, weapons to use in one situation compared to weapons to use in another situation. This body of knowledge transmits from one generation to the next. Through socialisation it`s learned as objective truth and thus internalized as subjective reality. This "reality" has the ability to produce a specific type of person, the hunter. To hunt and to be a hunter implies living in a social world which is defined and controlled by that body of knowledge. *Mutatis Mutandis*, change only what needs to be changed, it applies to all institutionalized conduct (Berger and Luckman 2006: 80-1). The way individuals in a community make, use, and represent technology, is in the same way institutionalized conduct, defined and controlled by the community`s shared body of knowledge.

I argue that the practise of technology is an institution. In my case, the institution of robot technology in Japan, produces a specific type of roboticist engineer, who in turn produces a specific type of robot. This is controlled and defined by the body of knowledge that creates the objective reality the individual is born into. The individual who chooses to become a roboticist engineer, has his culture`s ideas and concept of what that entails, that which the engineer later reproduces as a product of his culture.

This serves as another example on how technology is fundamentally a social process, and we can see by illustrating it through some of Berger and Luckman (2006) theories that it belongs to the ideological sphere.

By viewing technology in this manner we can be able to see through its fetishized form. In order to finalize this theoretical framework, I will next show how technology becomes related to the system of social relations in a society, and thus becomes fetishized.

3.5. The processes of technological innovation

As mentioned above, Ingold (1979: 277) states that there must exist a system of social relations for technological development to take place in a society. Accordingly, I will in this section go through Bateson`s (1979: 147) *stochastic processes,* to illustrate the point Ingold makes, that there must exist a system of social relations before something new, such as technology, can take place in society. This, I argue, will also illustrate how technology becomes fetishized.

Bateson (1979: 148) argues that evolutionary change and learning, are fundamentally similar, which he identifies as both being stochastic in nature. "There are two great stochastic systems," he says, which are partly in interaction and partly isolated from each other (ibid.: 149). One of the systems is within the individual, and is called *learning*, the other one is immanent in heredity and in populations, and is called *evolution*. "One is a matter of the single lifetime; the other is a matter of multiple generations of individuals" (ibid.).

Bateson compares this double stochastic system with the process of mind. "The parallelism between biological evolution and mind is created not by postulating a Designer or Artificer hiding in the machinery of evolutionary process but, conversely, by postulating that thought is stochastic" (ibid.: 182). He emphasizes, that creative thought must contain a random component. "The exploratory processes—the endless *trial and error* of mental progress—can achieve the *new* only by embarking upon pathways randomly presented, some of which when tried are somehow selected for something like survival" (ibid.). "In sum," Bateson argues, "the intracranial stochastic system of thought or learning closely resembles that component of evolution in which random genetic changes are selected by epigenesis" (ibid.: 183-4). Because the genesis of new notions are almost totally dependent upon reshuffling and recombining ideas that we already have. In epigenesis, all *new* information must be kept away, and the whole process of epigenesis can be viewed as an exact and critical filter, demanding certain standards of conformity within the growing individual (ibid.). The non-random selective element, has to be combined with a randomly generated element for the *new* to appear. For a child to learn 2+2 = 4, he first has to learn the concept of numbers, then

the concept of counting numbers, then mathematics, and so on. Before Einstein could come up with e=mc squared, he had to have a platform of non-random—already established as facts—elements that made up his thought process, and thus creativity. Step, by step, the *new* is built by combining information that is already there, with the information that will pass through the exact and critical filter. I picture it as a jigsaw puzzle, where all the new pieces have to fit into the pieces that have already been put together. Every new piece put in place, opens up a new gap to fill with new pieces, and thus expanding the puzzle. Acquired knowledge, in a Hegelian sense, is in a dialectic relationship with new information that together synthesise *new* knowledge.

The reality of the individual is created upon a model of reality that his culture provides through his *primary socialization* (Berger & Luckman 2006: 135ff). All new experiences refer to the model, which is the non-random selective element that to the individual is reality, and build new knowledge upon that which fit that model. As discussed in previous sections, the individual is structured by the structuring structures of his culture, which is his habitus. It is within the individual`s culture the genesis of new notions and ideas appear, because the new is dependent upon reshuffling and recombining ideas that we already have. "In reality, society and the individual are not antagonists. His culture provides the raw material of the material which the individual makes his life" (Benedict 2006: 77). The random ideas and notions that will "fit" and "survive" in the individual`s mind are those that pass through the critical filter, and "fit" the model of reality provided by his culture.

We can also, in the individual`s environment "find the analogue of that process of evolution in which experience creates that relationship between creature and environment which we call *adaptation*, by enforcing changes of habit and soma" (Bateson 1979: 184). Between individuals and their environment society emerges. The rules, rituals, habits, and so on, of these societies are learned through a dialectic relationship between the custom and the new, namely adaptation. "Every action of the living creature involves trial and error, and for any trial to be new, it must be in some degree random" (ibid.). What Bateson is saying, is that even if a *new* action is a member of some well-explored class of actions, it must still be a measure of a validation of the proposition "this is the way to do it" (ibid.).

With this, I argue that when something new is to be implemented into a society, it will be built upon a pre-existing model, forming the new into something specific for that society. A mix of the non-random selective element with the random new. In my example, the Japanese government decided that they would rebuild Japan, post WW2, on the pillars of

technology. They took the Western technological model, but built it upon their own cultural model. The result was something entirely new and uniquely Japanese.

3.5.1 Sociotechnical systems

Pfaffenberger (1992b: 498) argues that anyone who seek to develop new technologies must concern themselves not only with the techniques and artefacts, they must also develop the social, economic, legal, scientific, and political context of the technology, for it to be successfully implemented. "A successful technological innovation occurs only when all the elements of the system, the social as well as the technological, have been modified so that they work together effectively" (ibid.). He calls this the sociotechnical system, which he says is a concept that stems from the work of Thomas Hughes on the rise of the electrical power systems.

Pfaffenberger refers to an example Hughes uses, where he "shows how Edison sought to supply electric lighting at a price competitive with natural gas (economic), to obtain the support of key politicians (political), to cut down the cost of transmitting power (technical), and to find a bulb filament of sufficiently high resistance (scientific)". With this example, Hughes illustrates how those who want to develop new technologies, cannot only concern themselves with techniques and artefacts, they must also "engineer the social, economic, legal, scientific, and political context of technology" (ibid.). If the sociotechnical system is not there, it has to be "engineered". In my case, however, I argue that the sociotechnical system, already is a part of Japanese culture, it`s rather the technology that still needs engineering.

3.6. Summary

I have in this chapter presented the theoretical framework I have used to analyse my empirical data. We saw that in order to study technology in anthropology we must first and foremost be aware of the culturally supplied meanings in Western definitions of the term "technology". We must also be aware of the hidden unity in both technological somnambulism and determinism, namely technological fetishism. Stripping technology of its fetishized form, we are able to see the social processes that become what we know of as "technology". By looking at technology as an aspect of ideology, we can study the ideas and politics of it. In the previous chapter I discussed the circumstance that robot technology as I had imagined it in

Tokyo did not correspond with reality. In reality the technology itself was simply not advanced enough (yet), while I experienced that the *idea* of the robot was very much alive. The robot was an important theme in popular culture, and the city of Tokyo seemed almost to be preparing for the robot to come, with its high degree of automation. Technology in general also seemed to have a special place in Japanese culture. My observations of technology and the robot in Tokyo led me to characterise them as being part of the Japanese people's doxa, at least for the people in Tokyo, where my fieldwork was done.

In the previous chapter I also presented how I decided to study technology and the robot from three different perspectives; from the public`s point of view, from the roboticists' point of view, and from representations in popular culture. From the point of view of the ordinary Japanese person, it was possible to see to what extent technology and the robot was part of doxa. It was also possible to see how the representations of both robots and technology were situated in the shared imagination of the Japanese community by being a highly represented theme in their popular cultural world. From the point of view of the roboticist I could see how the same images and ideas of the robot from the popular culture were reproduced in the robots they designed and made. The idea of the robot was constitutive for the *habitus* of the roboticist, representing the ideas of his culture, which could be seen in the representation of robots in the popular culture.

It was mainly through the Japanese public`s point of view I experienced that the robot was already a part of Japanese culture. As stated, it was as if a niche was made for that particular technology. The only thing that was missing was for the technology to become advanced enough to become implemented and fill-in the niche. The sociotechnical systems are ready for the new technological innovation, and the Japanese society`s techno-optimism and animistic traditions function as crucial non-random elements upon which the random new can build and become something entirely new, namely the Japanese robot.

In order to understand what the Japanese robot is, I will in the following chapter take us through a short historical tour of modern day Japan. The Japan Schodt (1988: 14) says the Japanese people often refer to as *robotto okoku*, the robot kingdom.

4. INSIDE THE ROBOT KINGDOM

4.1. Introduction

This chapter will be on Japan and its relationship to technology. It will mostly relate to the challenges modern day Japan faces and how it has turned to technology as a means to handle those challenges. We will see that the Japanese government encourages the development of robot technology to possibly decrease the problems the demographic shift in the Japanese society, and even possibly reverse it. To understand what the robot is, I will present a short history of how the term "robot" became what we understand a robot to be. We will here also see the relationship between technology and the ideas of technology, which are represented in popular culture. When the idea of the robot arrived in Japan it fitted on the pre-existing non-random elements which made it become something new.

4.2. Modern day Japan

Post war Japan was categorized as a "developing country". They based their development on the pillars of technology. Faster than any other country the world had ever seen, Japan became a highly developed industrialized country. The relatively small island group of Japan is today the third largest economy in the world. Japan was the first major non-Western nation to take on board the Western technological and organizational advances of the century, and they were extraordinarily creative in searching out and learning to use modern technologies. Through technology importation, learning-by-doing, and their own research and development activities, they managed to build a post-war Japan on the pillars of technology. The Japanese government has to a great extent also played an important role in this development, especially by funding and supporting innovation venturing into unfamiliar terrains (Goto and Odagiri 1996). Today Japan`s main export is technology, and technology is still the answer whenever new challenges need to be solved.

Japan is situated between four major tectonic plates, and it is one of the areas most prone to natural disasters, typhoons, earthquakes and volcano eruptions. Again looking towards technology to solve their challenges, they now have the world's most advanced alarm systems. In an interview I made with a 57-year-old teacher, he explained to me: "We Japanese no longer fear the forces of nature, as we used to. Technology not only put Japan in one of the strongest positions in the capitalist market, but also helped keeping us safe from the hazards of nature"

An example of this can be seen when BBC (09.03.2012) reports that the earthquake causing the Fukushima Daiichi nuclear disaster 9th March 2011, stimulated innovation in Japan, in the form of new technologies made not to make them feel helpless again, as thousands of Japanese did after that disaster. This includes Geiger counters for smart phones, which could make ordinary people able to determine what`s safe to eat and drink, and what areas are safe to return to without having to rely on official statements. Straight after the disaster some mobile operators were fast in deploying microwave stations, making smartphones the best way to get information. The data network became the number one form of communication, making the smartphone the main form of communication, since the tele-network was unreliable. The power network was out as well, spurring the innovation of self-sufficient power sources, like wind turbines, solar power panels and in-house batteries. Car manufacturer Nissan believes electrical cars can be a future source of power in an event there should be a disaster of the same magnitude. A house connected to an electrical car`s battery, is able to supply an average household with two days of power, with normal use. The disaster also stimulated the innovation of new generations of rescue robots.

Japan is again a nation with a highly unsecure future, standing at the brink of new challenges. Birth rates keep sinking and the huge population that built today`s Japan is getting older. The Japanese Health Ministry estimates that the nation`s total population will fall with 25% from 127.8 million in 2005, to 95,2 million by 2050, where 38% of those 95,2 million will have an average age of 65 and above (Fujimura 2007). Japan has a huge challenge dealing with the coming problems. Not only are they in need of a huge workforce to maintain Japan`s industry, but they also need a huge workforce to care for all the elderly people.

Immigration might for most European countries be the most logical solution, but in Japan`s case this is still out of the question. The homogenous collective culture of Japan is regarded too valuable to be sacrificed. To most Japanese immigration is a western concept, often connected with “the white man`s burden”. I had many conversations with Kei-chan. He emphasised that the case of Japan cannot be compared with European countries, and especially not with USA. USA today is a country made up of different cultures, and through the centuries it has existed, it has always been a nation of immigrants. Japan on the other hand, has been an isolated island group for centuries, and has a unique culture they all are extremely proud of and afraid to loose. Moreover, Japan has mostly had bad relations with her closest neighbours, Russia, China and the Korea peninsula. These countries have strong cultural identities as well, and “we the Japanese”, Kei-chan would say, “want to keep other

cultures separate from our". Even though there has been a long time since Japan has been in war with its neighbours, the memories from the past wars are still in their collective memories, and this can disturb the status quo of the contemporary Japanese society. Whenever China or Korea came up in a conversation, Kei-chan was eager stressing how much the Japanese cultural identity differs from the Korean and Chinese.

Robertson (2007) argues that the Japanese government wants to solve the challenges they are confronted with today, with the help of robot technology. Prime Minister Abe`s visionary blueprint for remaking Japanese society, *Innovation 25* by 2025, aims to reverse the declining birth rate and accommodate the rapidly aging population. *Innovation 25* "emphasizes the central role that household robots will play in stabilizing core institutions, like the family" (ibid.: 369). Technology seems again to be the solution to solve the challenges Japan are facing. In 2007 Japan accounted for 52 percent of the world`s share of operational robots, "and leads the post-industrial world in the development of humanoid robots designed to and marketed specifically to enhance and augment human society" (ibid.). Japan has, in other words, again turned to technology when faced with a challenge. As I understand it, robot technology will help accommodate the rapidly aging population, as well as reverse the declining birth rate, and thus Japan does not need to open its borders for immigrant work forces. Thus, robot technology helps to sustain the Japanese culture "clean".

I will continue this chapter by presenting the history of the robot and present how it became a part of Japanese technology culture.

4.3. Robot fantasies

> …the stimulation of a small number of specialists can react on the culture as a whole (...) Thus the culture is to a great extent in the custody of men trained in erudition and dialectic and is continually set forth by them for the instruction of the majority. From this we may be fairly certain that the individuals most affected by the stimulation of memory actually contribute very much more than their fellows to the elaboration and maintenance of the culture.
>
> (Bateson 1958: 227)

The robot is a relatively new concept in the human life-world. The word "robot" was introduced to the English language after a play called *Rossum`s Universal Robots* in 1920.

The play, also known as *R.U.R.* was written by Czech novelist Karel Capek. Capek, being a Czech, used the word "robot" based on the Czech noun *robota* meaning "forced work", derived from the Slavic root for "slave" or "servant" (Schodt 1988: 29).

Written right after World War 1 the play`s plot is fed on the fears of Western civilization when the world had discovered the negative sides of assembly line mass production. In the plot humans make "artificial people", or 'robots' as they are called in the play, to do the work that humans do. These robots become mass-produced and sold as mere slaves. As soon as the humans discover how practical they are in war, they also use them as war machines. These robots are gradually becoming more intelligent. One of the robots becomes aware of the situation, and takes leadership to start a rebellion against their human masters. They`re tired of doing the dirty work and killing each other for the humans. The result is that the robots exterminate the human race.

R.U.R. became extremely popular, and the mass media adopted the word "robot" and made it synonymous with what we today conceptualize and imagine when we think or hear the word "robot". In Oxford English Dictionary (1993) the word "robot" is defined as: "1. A machine (sometimes resembling a human being in appearance) designed to function in place of a living agent; a machine which carries out a variety of tasks automatically or with a minimum of external impulse, *esp.* one that is programmable." While Merriam-Webster Collegiate Dictionary (1999) defines the term as "1. A machine that looks like a human being and performs various complex acts (as walking and talking) of a human being. 2. A mechanism guided by automatic control." Here we can see how the term "robot" has been taken from fiction, and used to describe the emerging technology that is the robot. If Capek`s play for example was called "*Rossums Universal Workers*", we might have had a completely different term describing the technology of machines designed to do human labour.

It`s not only the word "robot" that's derived from fiction. The terms "robotics" and "roboticist" are from Isaac Asimov`s science fictional literature on robots. Today "robotics" refers to "the branch of technology that deals with design, construction, operations and application of robots", and "roboticist" refers to "an expert in making and operating robots" (Oxford English Dictionary 1993). It is in his short story *Runaround*, Asimov introduces these terms. In this same story he also introduces the "Three Laws of Robotics", which MIT (Massachusetts Institute of Technology) programmed into their computers. The three laws are:

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.

2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

The fact that MIT has implemented Asimov`s three laws of robotics into their robotics programme, may indicate how much popular culture, especially science fiction, is a part of the shared imagination of the communities that work with science and technology. It also shows how serious roboticists take the imagined consequences a new technology may have on a society, which science fiction authors write about. However, most importantly, I argue, is the fact that it is not only popular culture that affects the roboticists; what we read in science fiction stories are reflections of the whole society's relation to, for example, a new technology. The three laws of robotics were initially used by Asimov as a measure in literature to move away from the *idea* that the robot is a monster, what he coined as the "Frankenstein Complex" in Western fiction.

> The creation of a robot, a pseudo-human being, by a human inventor is . . . perceived as an imitation of the creation of humanity by God . . . In societies where God is accepted as the SOLE creator, as in the Judeo-Christian West, any attempt to imitate him cannot but be considered blasphemous.
>
> (Asimov in Schodt 1988: 198-199)

Asimov understood that technology is evolving in a direction where machines are doing more and more of the labour humans do. These machines, he noticed, were also becoming increasingly more automated. The concept of the robot, an automated machine doing human labour, was to Asimov anything but fiction. He believed that as soon as there was technology to make such machines they would be brought into creation. The notion that "man creates robot; robot kills man" is a wrong way to portray such a technology (ibid.:198). The "Frankenstein Complex" in fiction only contributes to make people sceptic of robots, so he wished to portray the robot neither as good nor bad, but as a technological instrument created by engineers and scientists to do specific tasks. This very idea set Engelberger on his mission to create the first real "robot" (Asimov 1995: 11). Asimov`s hope with his science fiction stories on robots was to reintroduce the idea of this technology as something that can

serve humanity rather than being a mere addition to the many monsters of our nightmares. In other words, he was affected by what was going on in the world of science and technology, and reproduced it in his science fictions stories, which scientists and technologists in turn read. To me it seems as if the robot is partly a creation made in process through the dialectic relationship between the realistic world of science and the imaginative world of science fiction.

4.4. The evolution of the robot

Today robots have many forms. There are four-legged, six-legged, even eight-legged robots. There are some without legs, and some with wheels. The evolution of the robot is highly determined by how engineers and scientists design them to fit our human environment. There are also those robots that are designed especially for manoeuvring in environments humans cannot. Like rescue robots, or the robots that function as our tools and "extended senses" in places far, far away, like the "robot" rover *Curiosity* on Mars. Whatever form or shape the best and most functional robots will have, is highly determined by the culture and the kind of society in which the development of the robot takes place (Sabanovic 2010).

There are, however, two main categories of robots: Industrial and humanoid robots. The *industrial* robots look like machines, usually with a mechanical arm situated on a conveyor belt, programmed to perform repetitive tasks. In contrast the *humanoid* robot has to fill at least two criteria: it has to have a body reminding of the human body (head, arms, torso, and legs), and it has to be able to operate and move in the same environment as humans do, e.g. a house or an office (Robertson 2007: 373).

The concept of artificial workers or machines with humanlike qualities aren`t new. Automated mechanical devices, which were designed to act as if they were under their own will power, were common in 18th century European courts. We can also find similar concepts of artificial "beings" in the 19th century science-based fiction and folklore that imagined a picture of these created creatures in the form of golems, clockwork men, and Frankenstein`s monster. In Japan, inventors and artisans had even created a tea-serving "robot", *karakuri*, as early as the 17th century (D`Aluisio and Menzel 2000: 23).

Today the term "robot" relates to real machines. There are thousands of robots working every day in factories. Assembling cars and doing repetitive work humans used to

do, in hospitals, robots roam the halls delivering towels, and medicines (Utheim 2013). People even have personal robots vacuuming their floors or trimming the grass in their gardens. Robots have become a part of everyday life for many people, but according to D`Aluisio and Menzel (2000: 37) people usually think of a machine with a humanoid shape when they hear the term "robot", "a moving replica of themselves." The reason we have this archetypical image of the robot, D`Aluisio and Menzel (2000) and others (see Kaplan 2004; Robertson 2007; Sabanovic 2010; Schodt 1988) claim, is the image popular culture has made for us. The benign robots in Isaac Asimov`s novels and the war machines in the classic film *Terminator* have all contributed in making the specific picture in our minds of how we imagine a robot looks like. The popular image of a robot often involves a machine looking like a human, with two legs, two arms, a torso and a head, i.e. the classic humanoid form of a man made in metal. Yet roboticists usually have different definitions on what the term "robot" really means (D`Aluisio and Menzel 2000: 37). This, in turn, might be reflected in how the engineers and scientists develop robots.

Joseph Engelberger, the man considered being the "father" of industrial robotics, became known at the start of the 1950s because he recognized that the technology after the Second World War had progressed to the point where making robots was possible. D`Aluisio points out that Engelberger stated in an interview, that when he started building robots, he couldn`t say that his childhood dream was to build robots, like many roboticist say today. Because, when he started out, robots didn`t exist outside science fiction. Engelberger told that he never dreamt of building robots as a child, but after starting at Columbia University, some years after Isaac Asimov had been attending the same university, he read all of Asimov`s science fiction stories on robots. This, he told D`Aluisio in the interview, inspired him (ibid.: 186).

He started working for a company that built controls for nuclear power plants, jet engines, and other technologies. It was here he was introduced with the new technologies that had been developed during the Second World War. "The word robot was coined in 1920 but it took WWII to make a modern robot possible" (ibid.: 186-8). Servo technology was needed, Engelberger remarked, which was developed for gun aiming during the war. To make servo-technology possible the development of digital logic and solid-state electronics was necessary, which in turn needed a war like the Second World War to become realized.

In 1956 Engelberger met George Devol, the man who held the patent for the *Unimate*, now known as the first industrial robot. When Engelberger first saw the patent, he said to

Devol, “Geez, you know, you could call this a robot” (ibid.: 188). At that very meeting they discussed science fiction literature, and together they made a serious commitment to make the first working robot. Engelberger later made his own company where he worked on developing the prototype of Unimate as a side-project. The first Unimate robot began its first day at work 1961 at a General Motors Plant in New Jersey. The rest is history. Today one can find industrial robots at almost any factory in any industrial country. The Unimate`s technology is pretty simple compared to today`s robots, but the tasks it performed, it did with great success.

4.5. Robo Sapiens Japanicus

The first robotics projects were quite different in Japan compared to that of Unimate in USA. There were mainly two scientists who are known to be responsible for the direction the development of the robotics in Japan took. Their names are Ichiro Kato and Masahiro Mori, two of Japan`s most famous scientist. Both stood out because of their, at the time, highly eccentric work and research outside the mainstream of the research done in Japan and the rest of the world. Nonetheless, they both achieved considerable stature and became highly influential in Japan. Schodt (1988: 202) argues that a system called *jinmyaku*, to measure power in Japan, can show how influential Kato and Mori were. According to Schodt this is so because Japan is such a “tightly knit, hierarchical and factional society where power can be measured by *jinmyaku* – chains of personal connections (often diagrammed in industrial newspapers) that are accumulated through years of work, study, socializing, and trading favours and obligations”. He proposes that if the number of all the people working within robotics research, who have studied or worked under these two scientists, or have come under their influence at one stage or another, were counted, their *jinmyaku* would be enormous. In other words, he is saying that almost all researchers in robotics are in some way or another connected to one of these two.

Ichiro Kato was dean of the Waseda University School of Science and Engineering in Tokyo, and has also served as chairman of the Robotics Society in Japan. He was known as the “father” of Japanese robotics, and sometimes his colleagues jokingly referred to him as “Professor Ochanomizu”, the name of the surrogate father of *Mighty Atom*, the robot hero in Osamu Tezuka`s robot comic, which we will discuss in greater depth in later chapters. Kato and his mechanical-engineering students constructed the world`s first life-size “humanoid” robot in 1973, named *Wabot 1* (D`Aluisio and Menzel 2000: 37). Kato, unlike almost every

other serious roboticist in the world, was not trying to build a better industrial machine or conduct theoretical studies in movement or autonomy. Instead his goal was to replicate man in metal (Schodt 1988: 202-3). Wabot 1 was a man-sized metal monster fitted with some functions like vision and speech. The second generation Wabot, *Wabot 2*, also known as *Wasubot,* became famous playing Bach`s *Air on a G String* for thousands of people at the Tsukuba Science Exposition of 1985. This event helped fuel the imagination of future generations, because of the huge media coverage the performance had. The Emperor even made a personal visit and it`s said that he was "enthralled" by the piano-playing robot, which, in effect, made Wasubot very famous in Japan (Schodt 1988: 13).

The fact that the Emperor had made a personal visit and commented the robot, helped catalyse the diffusion of the robot as an idea to the whole nation. Because the Emperor had been positive to this type of technology, all Japanese, by default, became positive to robots before the term "robot" had time to become associated with future fears. The idea of the robot reached out to the people, as a benign and exciting new technology that the Emperor not only approved, but also had been impressed by. During the Second World War the Emperor was inseparable from Japan, Ruth Benedict argues. "A Japan without the Emperor is not Japan. Japan without the Emperor cannot be imagined. The Japanese Emperor is the symbol of the Japanese people, the centre of their religious lives. He is a super-religious object" (1989: 32). We can see this phenomenon in the example when Emperor Hirohito ordered his generals to accept the terms of the Allied Forces to capitulate August 14, 1945. Westerners with experience and knowledge of Japan thought it would be impossible for Japan to surrender, "it would be naïve, they insisted, to imagine that her armies scattered over Asia and the Pacific Islands would peacefully yield up their arms" (ibid.: 131). However, the Emperor spoke and the war ended. The U.S. troops that landed in Japan short after the capitulation were greeted with courtesy. What had happened was that the Emperor invoked the Japanese concept of *chu* when he spoke. Chu is one's obligation to the Emperor, and it provides a double system of subject-Emperor relationship. "The subject faces directly to the Emperor without intermediaries; he personally 'eases his heart' by his actions." The orders given by the Emperor are above all others. When the Emperor, shocked by the atomic bombs, decided to end the war, no one went in opposition to the decision he made. "The Japanese were 'easing the Emperor`s heart' by following the ways of peace" (ibid.: 131).

The fact that the Emperor himself commented the robot in mass media, I argue, has to have had a profound impact on how the Japanese later would relate to this new technology. In

the example above we can see that the Japanese ethos concerning hierarchy is quite strong. This in turn can be seen in how the leading figures in Japanese robotics have affected the whole field of robotics in Japan.

4.5.1. Ichiro Kato

Waseda was the first university developing robots in Japan in 1985, and they did not have competition before a year later in 1986, when Honda started a secret multimillion-dollar program to build a walking robot with a human form. The first generation of the Honda humanoid robots were unveiled in 1996. The amount of attention it attracted pushed the Japanese government into launching a five-year, multimillion-dollar humanoid robot project (D`Aluisio and Menzel 2000: 37). Unfortunately, Ichiro Kato died 1994, so he never got to see the next steps the research in robotics took.

At Waseda University, however, they continued to develop bipedal humanoid robots. Ichiro Kato, being one of the first to research and develop bipedal robots, had a hard time finding a market for bipedal robots, especially at the time he started. To maintain the research on bipedal robots and to keep getting fund,s they had to regard their scientific research on the bipedal robots as scientific research on human walking, and not on robots. WABIAN RII (acronym for WAseda BIpedal humANoid) is one of these human walking research robots. Its purpose was to clarify the motion-control of humans from the viewpoints of robotics, and at the same time to establish a base technology for future development of personal robots. This could contribute with research to the medical field, while at the same time follow the dream and develop humanoid bipedal robots that mimic human walking. Kato was, as mentioned earlier, mainly focused on developing humanoid robots.

> My research is not just in function, but in shape. In thirty years, in the twenty-first century, I think that human form will be essential in robots. In factories, which are for work, robots can be of any shape, but the personal robot, or 'My Robot' as I call it, will have to exist in a regular human environment and be able to adjust to humans.
>
> (Kato in Schodt 1988: 204)

Kato believed that machines can be placed into three categories. The first emphasizes movement and power, as most machines we see today. The machines we refer to as industrial robots are in this category. The second category emphasizes information and includes computers. The third category is now on the verge of appearing, and in this category there is

an emphasize on information, intelligence, and power. The personal robot will emerge as a machine of the third category to satisfy, as Kato put it, ". . . a long-standing desire of humans for a slavelike mechanical man." (Kato in Schodt 1988: 204). These robots Kato claimed would be like the robots of science fiction, and they will take the form and size of a Japanese person. The first places Kato envisioned to see these robots were in health and human services.

4.5.2. Masahiro Mori

The other "father" of Japanese robotics is Masahiro Mori. He is described as being rather different from Ichiro Kato. Firstly, where Kato is described as a ". . . graying man, and utterly conventional in appearance" (Schott 1988: 202), Mori is described as being a "flamboyant personality" (ibid.: 206). But it was not only in appearance they differed, their research in robotics differed quite as well. Mori was much more linked to industrial robotics, while Kato focused more on humanoid service robots. He was a contemporary of Kato`s, and taught at the Tokyo Institute of Technology. He later also became chairman of the Robotics Society of Japan. Like Kato, his sphere of influence was vast.

Mori`s views on robots was that they were neither good nor bad. Mori, the eccentric elder of Japan`s robotics research community, is a man with a mission: to spread the word about the relationship between man and robots, and Buddhism. "I always tended to become quite philosophical about my studies," he says, "and in developing five-fingered manipulators I found a microcosm." Buddhism is a highly complex religion that developed in India and entered Japan in the sixth century A.D. It teaches that there is a Buddha-nature in all things (not just sentient beings) and that the parts of the whole systems are simultaneously independent and connected; a universe and the source of all truth exist, for example, in the single petal of a flower. When studying the human finger Mori found that he could not consider its function independently, that he had to take into account its relation to the entire human body. This in turn helped them comprehend not only the human body but the universe in which it exists. Therein he saw the teachings of Buddha (ibid.).

4.6. Summary

I have in this chapter presented the situation as it is in Japan today, and shown how the word "robot" and the endeavour of robotics came into existence. I have also presented how the direction in research and development of robotics differed between Japan and USA. While Joseph Engelberger wished to make machines that could do repetitive tasks, did Japan`s Ichiro Kato wish to make humanoid robots. Masahiro Mori, on the other hand, saw the teachings of Buddha in the robot.

The traditions of animism and polytheism, which constitute Shintoism and Buddhism, respectively, can be seen as being a part of the ideological aspect of the sociotechnical system. The spiritual beliefs of Japan, I argue, can also be seen as the non-random elements that the more recent ideas of robotics and technology have synthesised with and become the robot we see today. Schodt (1988: 201) argue that: "In the community of industrialized nations, where religion and reality are usually viewed only through the binoculars of Judeo-Christian and Marxist-Leninist dualism, the flexible worldview of many Japanese people is truly unique." The flexible approach to religion has a pragmatic side to it, because almost anything can become pseudoreligion. Schodt refers to Chumaru Koyama, a former professor of literature at Waseda University and an authority on religion, who once said that "in ancient times, Japanese religion was extremely 'this world' and 'gain'-oriented. Today we are said to be areligious, but I think we are actually substituting science for the old type of religion" (ibid.: 202). "At times", Schodt notes, "it seems nearly anything – whether it be one`s own company, quality control, technology, or even robots can be a pseudoreligion in Japan" (ibid.).

This shows how complex the social processes of technology are. Masahiro Mori saw the teachings of Buddha in the robot, and we can also speculate about whether the traditions of animism to a similar and significant degree make the Japanese see technology and the robot with a "spirit" in a certain sense. We will discuss these possibilities in later chapters. In the following chapter, however, I will present an interview I had with a roboticist. Here we will see the roboticist's point of view on robotics, religion, popular culture, and the future of robot technology.

5. INTERVIEW WITH A ROBOTICIST

5.1. Introduction

In this chapter I will present the interview I had with the director and general secretaty of the Robotics Society of Japan, Dr. Yuji Hosoda.

5.2. The interview

Entering the big blue building, I was not sure what to expect. I had sent many emails back and forth with Dr. Hosoda, and he seemed to be a very nice man. As the elevator opened, he stood waiting for me. I bowed politely and he extended his hand to shake mine. We entered the office, which was an open landscape office, where about eight people sat in front of computers. Most of them raised their head to see whom their boss had taken with him. They didn`t look very interested and went back to work. The walls were decorated with posters. Some were pictures of real robots, but most of them were characters from manga. I observed Mighty Atom among the posters. I also spotted small Mighty Atom statues on more than one of the desks.

We walked through the office and went into a room that seemed to be a meeting room. We sat down. I sat at the end of the table and he sat on the side. He was always smiling, and seemed to be as nice as he seemed in the emails I had gotten from him.

Me: “Ok. Let`s start with the first questions. What is your age, and what is your profession?”

He had a copy of the questions I had sent him the previous day in front of him, which he took up and looked at. He had already written down all the answers.

Dr. Hosoda: “Let`s see, first question. Yes, my age. My age is 58. Profession. Yes, now I am Director and Secretary-General of Robotic Society of Japan. I`ve been in this office for two years now. Before coming to RSJ I was member of the mechanical research laboratory of Hitachi, where I did research on service robots. For example humanoid type service robots and autonomous mobility.”

Me: “What made you interested in robotics?”

Dr. Hosoda: “Hmm. . . My interest in? My main work has been with mechanical control design. I am also very interested in artificial intelligence. Not professionally though.

Me: “Next questions are about robotics and religion.”

Dr. Hosoda: “Yes robotics and religion is very interesting. I have no religion.”

Me: “I found that all the Japanese I`ve interviewed and spoken to, always say that they are not religious at all.”

Dr. Hosoda: “Most Japanese yes, they have no religion. But, I have read a little part of the bible. Very interesting stories. It`s a bestseller (laughing). I have also read *Hannya Shingyou,* in English it means *“*great wisdom beyond wisdom” which is the “Heart Sutra.” One of the Buddhist sutras. It is about the existence of the human soul.”

Me: “Do you believe in the soul?”

Dr. Hosoda: “Half and half (laughing). Our mind wants to believe, our soul wants to believe in the soul, but my scientific mind won`t let me believe it. My research tells me that it is all a physical phenomenon in the brain.”

Me: “Do you think religion or the faith in spirituality has been, or is affecting robotics?”

Dr. Hosoda: “Religion might be affecting some of the development, because religion might be the base of the human soul.”

Me: “Do you mean that religion is the base of the mind, when you say soul?”

Dr. Hosoda: “Maybe (laughing). Anyway, when engineers start developing robots there is some will, or an objective to develop and make the robot into existence. There is some dream or philosophy of the developer. Then the base of the philosophy or dream is connected to a religion, which is a base part of the developers mind. A typical Japanese mind, is then the next step to look at, which has very friendly feelings towards the robots of Japan. That is very characteristic for the Japanese mind. This is maybe connected to the polytheism and animism of Japan. There is in Japanese something called *Tsukumo-gami,* which can be translated as the “artefact spirit”. It means that all tools of existence, or this table (hitting the table), and this chair (gripping the handles on his chair) has mind, and this does Japanese people believe, or feel. Not believe, but feel, and we love this (grabbing the side of the table), or paper (shaking the piece of paper in his hand), or pencils. These artefacts provide help to us humans. They enable us to be what we are. It is the same with the typhoon. We love the typhoon. It attacks our lives, but it also gives us so much. Without it we couldn`t do agriculture the way we do.

All Japanese love nature. Nature spirits. Just like native Indians (laughing). In old times, all Japanese thought that all nature existence has spirits. Spirits that can communicate with humans.

Me: "Can this old view of spirits in nature be the same as what you said Japanese don`t believe in today, but you can feel? Like the "artefact spirit, you mentioned."

Dr. Hosoda: "Yes, you might say that. So we still have, hmm… not religion, or particular religion, but we have what we call *Yaoyorozu no kami,* all the deities. *Yaoyorozu no kami,* means 8 million gods. We have so many gods (laughing). This is a part of polytheism. Like you in Norway have Norse mystics, Odin or Loki. It`s just the same. The Greek gods, or Roman. Just the same, and they are so different from monotheism of the Christian countries or Judaism. These are very different minds. So the Christian countries monotheism makes the people there have the aspect of seeing that to create humanlike robot is taboo. It`s the Frankenstein Complex.

Me: "Ah… Isaac Asimov."

Dr. Hosoda: "Yes, that's right. It is a very a strong type in this context. So, then Christians or they who believe in one God, maybe believe that a human creator can and must only be a God. And such a mind, like the monotheistic, is not in the Japanese mind.

Me: "Some scholars who have been writing on the subject of religion claim the very same thing. A French engineer named Kaplan proposes that the linear thinking of Western monotheism and the belief in "heaven," might be the reason why roboticists in the West focus on developing software and artificial intelligence. Believing that humans can become machines, by uploading our consciousness as software, where eternal life awaits. Whereas the cyclic thinking of Buddhism and the focus on nature of Shintoism in Japan, makes Japanese roboticists focus on developing the hardware of the robot, and developing the body inspired by nature. What are your thoughts on that?"

Dr. Hosoda: "Uploading our consciousness, becoming machines. Those are scary thoughts. No, I do not believe, or hope that is the future."

Me: "Maybe Kaplan`s hypothesis is right then."

Dr. Hosoda: "Yes, maybe (laughing)."

Me: “How about how robots will affect us. Do you think robots will affect people`s religion?”

Dr. Hosoda: “Yes, a little. At least my opinion. I think if the artificial soul or mind of the robots become very similar, or the same as the human mind, it could knock down Gods character. There would be some possibility for that to happen. So, there will be some change of the human mind. They would correct us a lot (laughing). So, it is a very interesting problem. I think the intelligence of the human, based on the function of “mirror neurons” of our brain, which apes and humans have. With that neuron, we can get sympathy with similar beings. If artificial intelligence reaches the level of humans. Humans will look at its own existence through artificial intelligent or robot`s sight. So if the development of the robot turns to the worst, it will maybe be like a nightmare (laughing). But, if it is turns to the positive side, there are so much cooperation that can be done between humans and robots. There are so many good mutual effects, but that would be in a long future world. It`s in the world of *I, Robot* (laughing). In the situation of humans, they will look again at their own existence through the existence of human lives minds.”

Me: “In Tokyo today, I`ve observed that robots mostly exist in popular culture. When I came to Japan I thought there would be more robots in public, especially the service sector. What is the role of manga and anime, and robotics? Do you read manga and watch anime?”

Dr. Hosoda: “Hmm… that’s very interesting. Of course I like it. Today it`s a very big part of Japanese culture. I both read manga and watch anime.”

Me: “Do you have any favourite manga or anime?”

Dr. Hosoda: “There are so many different kind of stories. Now a days a lot of manga is animation where the subjects come from science fiction. I like those. So many boundaries are crossed in science fiction, so we can easily imagine the future world from such a kind of content.

Me: “In what way do you think manga and anime has affected your life, and your thoughts on robotics?”

Dr. Hosoda: “Manga and anime are mainly contents of entertainment to me. Visualization of the robots in mangas and animation may give some inspiration to researchers and engineers. There are so many ideal types of real robots, and so the future imagination, the future vision of the robot character, researchers and engineers work with a lot. I am especially

impressed with *Kokaku Kidoutai*, which in English is translated as *Ghost in the Shell*. It is one of the animations made of manga. In the story, all of the brains of the people are connected in a network, so everyone can watch each other`s mind and images directly in the mind. All the people become telepathists (laughing). They operate a computer that is a social system, and people can become machines. They can easily depress their brain system so they can enter a machine. That is an impressive thought, but it might also be a nightmare (laughing)."

Me: "Ah. . . Yes I`ve seen *Ghost in the Shell*. The future it depicts is quite similar to what Ray Kurzweil, the American futurist and inventor, predicts. A future where we humans live symbiotic with technology, to a much greater extent than today, more like cyborgs. He predicts that humans in the future can upload the total sum of all the information in their minds, and in that way have the ability to upload their consciousness into machines."

Dr. Hosoda: "In a scene, we can see how reality and the internet becomes the same. There are no clear boundaries in what is real and what is not. Humans become part of a greater whole. Maybe it's the next of the human being (laughing)."

Me: "It sounds exactly like what the engineer named Kaplan, I mentioned earlier, proposed was a typical theme in western robotics, because of westerners linear world view."

Dr. Hosoda: "Yes, this is more like the American film *Blade Runner."*

Me: "Do you like American science fiction?"

Dr. Hosoda: "Yes, I love *I, Robot.* I am a big fan of Isaac Asimov. Actually, when I had my first job, I was making artificial fingers, like humans. I made three fingered robot hands, which I took pictures of. Five years ago on a robotics developments trip to Great Britain, I found an Isaac Asimov book on robots, with the picture of my robot hand on the cover. It was a big pleasure. I was very excited (laughing).*"*

Me: "Wow! I can imagine that would be very exciting. I`m going to try to find that edition. What are your experience with your colleagues, and other engineers and roboticists you know. How is their relationship to science fiction, manga and anime?"

Dr. Hosoda: "Of course. Everyone likes it. We are all freaks (laughing)."

Me: "Do you think that has an effect on the development of robots? That so many are inspired by the world of science fiction?"

Dr. Hosoda: “Yes. It has provided a lot of fantasy worlds in where humanlike robots work with reality.”

Me: “How do you think robotics would be without science fiction, manga and anime?”

Dr. Hosoda: “Eh. . . They began at the same time. Manga and animation provides a more real image, because it is visualized, but it’s science fiction, the text of science fiction maybe that improves the big image, the larger picture, because it opens the imagination power to all readers. Maybe scientists and engineers would develop autonomous machines without having the same concept of it as we have today. Necessity is mother of the invention, and humankind developed autonomous machines to improve their lives. That is the base incentive of the development. Manga and animation is only a supplement of the development. However, whenever Japanese researcher start their own robotics study, they start from *Mighty Atom, Ironman 28* or *Gundam*.

Me: “So you believe necessity is the most important reason robots are developed, and that the popular robots in manga and animation are a supplements which also help recruit new engineers?”

Dr. Hosoda: “Yes, manga and animation is only one aspect. Only one aspect. Science fiction animations gave a scenario of the philosophy in the future. The relation between robots and humans, which is a very interesting problem. However, it is not very practical studying the souls of robots, or the heart or mind. But I think there is a body of research on artificial intelligence based on the philosophy of Minsky. The Minsky procedure is stopped now a days. If we had super computers, such computers that can generate human intelligence. We need another technology, such as quantum computers, but even with that, I do not believe it is possible (laughing). The researcher of artificial intelligence may say that the soul is the base of the intelligence, or he may say that it`s the body of the creature that is the origin of intelligence. The next step in artificial intelligence is to research the soul or the mind of humans. It`s very impressive, but I think there is some critical crisis, or dangerous aspect to it.”

Me: “In what ways do you believe it would be dangerous?”

Dr. Hosoda: “If the mind of the robot becomes too similar to the human mind, it could be dangerous. Like *Blade Runner* (laughing).

Me: “Do you believe robots will in the near future be a part of human society?”

Dr. Hosoda: “Yes, of course.”

Me: “In what parts of society do you think robots will be most usual?”

Dr. Hosoda: “Practically, we try to make the market for service robots to grow in our society. I think the first market will be in aging care and medical support. Such a vision would be practical in ten years. Five or ten years, I think. There are practical needs for the aging support, or precision surgery. Another part of the market is disaster-response robots. Because of great earthquakes like Fukushima, or other crises. Disaster-response robot market becomes practical. Maybe there will be a market for that in five years, but it is a very small market.”

Me: “Prime Minister Abe released a visionary proposal in 2007, where one of the goals are, that robots shall be as usual as the automobile. That every family in Japan should have a robot. Do you believe that goal is realistic?”

Dr. Hosoda: “In one aspect it is political propaganda (laughing). We can`t stop making an effort growing such a big market, but we must think about it very seriously. The purpose of the development of robots, isn`t to make robots, but for the solutions they can provide. Robots are the best solution for the problems in aging care. I doubt that robots will become part of families there is no serious necessity in the society (laughing). But, there is the example of the cellular phone. Before the existence of the cellular phone, the fixed telephone was very convenient. People couldn`t imagine such a technology as the cellular phone, so when cellular phones started to emerge, all of the companies, or most companies didn`t realize how big it would become, because they didn`t believe there was a necessity in society. Then the cell phone became very small and cheap, and easy to buy. The cell phone became the human beings telepathic device. Even when separated, humans can communicate all the time with the cellular phone. The car is also an example. The mobile vehicle becomes, or improved the functions of the human`s foot. They amplify the speed of the human ten times or a hundred times. It is a great merit for the humans. It`s maybe the origin of the big break in finding a new market. I have been searching for such a big market, for service robots (laughing).”

Me: “But how about social robots? Aren`t there a market for people who need someone to talk to? IPhone is for example developing an artificial intelligence system they have named Siri. Isn`t there a necessity in society for lonely people to have someone to talk to?

Dr. Hosoda: “Well, hmm. . . The definition of a robot is very complicated. Maybe artificial intelligence in a mobile phone is one kind of a robot, but we think the definition of the robot is something that has sensing function, thinking function and activation function. Sensing, thinking and action are the three base points in what a robot is, I think. Artificial intelligence in a cellular phone do not have any physical function.”

Me: “How about robots that are created to keep lonely people in company? Have you heard of the Kibo Robot Project? They are sending a robot to the International Space Station as a social experiment.”

Dr. Hosoda: “Yes. Nonsense (laughing). I think it`s nonsense. That is my opinion.”

Me: “So you don`t think there is a market for social robots?”

Dr. Hosoda: “I think I want service robots, because they are practical for physical work, and support in health. They can support us in our physical life, but the development in the artificial intelligence in cellular phones is very important for conversation with humans, but that is a very difficult technique.”

Me: “So you don’t believe that there will be any robots that are made only to be social robots for lonely people or as friends for children?”

Dr. Hosoda: “I think it will maybe become important for the aging society. The communication they are using is often remote conversation or automatic. It is effective to support the aging society. Hmm, but I think maybe the personal computer, or the television serves the function to support lonely people. The internet makes people social, those who have avatars in virtual worlds, like in *Second Life*. That is similar too.”

Me: “If robots are supposed to only help us with physical things, wouldn`t that cause unemployment? If all physical work in the future is done by robots.”

Dr. Hosoda: “That is a critical question. I am an optimist in science. It is my opinion that the jobs that are for robots are the jobs that are not good for humans. In Japan, we have something we call the “three-k work environment,” it is work that this is dirty, dangerous or heavy. A lot of the industrial environment is very severe for humans to work in. Such a kind of job can be changed to let robots do them. The function of the robot should amplitude the human beings functions, as a power boost or amplitude the accuracy of an operation. The function of the robot should be to support skills, so human work will become more creative, and the quality of the work can be improved. That is my opinion. There are so many

operations that needs human`s work, that are not creative. Repetitive simple work is not creative, but it needs human power. Those kinds of jobs can easily be change so robots can take over. Like in production, and in mines. It will be the science fiction version of the industrial revolution in England (laughing). In Japan, we have different problems. We have the aging problem, and the population is decreasing day by day, so the working power will be turned to the robots. In china too."

Me: "Do you think the introduction of the robot can pose any threat to humans, or to society?"

Dr. Hosoda: "It`s maybe a critical problem yes. Military robots can be a problem. The autonomous killing machine like in *Terminator* is a nightmare, but there are so many aspects. Like disaster-response robots, are also a kind of military robot. They are used for inspection of the enemy, or boundary survey. It is made with the same technique and same products as the military robots, or those that are made for sinking the bombers, emptying chemical weapons, or finding chemical weapons. Those types are very useful. They are a necessity, but autonomous killers are not a necessity. Unmanned air vehicles, like the predators, that attack automatically from the U.S. base. It is a terrible thought what the possibilities are. They will change the way wars are fought. They will be without human soldiers. Automatically attackers, it is a nightmare."

Me: "So how can we prevent such a development in robotics?"

Dr. Hosoda: "It all depends on the minds and the purposes of the robot developers."

Me: "Are you optimistic?"

Dr. Hosoda: "Yes, I want to be optimistic, maybe that is the power of progression (laughing)?"

Me: "In what ways can robots improve society?"

Dr. Hosoda: "Robots will improve the working environment and the efficiency of the society, as I said earlier. Robots will change the human mind, as humans mirror their experienced existence that is a very important point to be aware of in the future."

Me: "In what ways to you believe robots will change the way humans think?"

Dr. Hosoda: "We can look at ourselves through the robots existence. If we can create similar humanoids, or similar thinking machines with similar intelligence. Moreover,

intelligence is the origin of such a kind of program, so if artificial intelligence get into the human body, it will accelerate the feelings and sensations of the body. Maybe a completely similar artificial intelligence will be harmful to the human body. There will be artificial intelligence generated by the human body, and by human action, human life action, so the intelligence must recognize hormones, it can increase the precision of the human function or sensory function, or recognition. The artificial intelligence may have same type of recognition sensing, as we humans have. Intelligence will be growing comparatively to artificial intelligence in a new kind of environment. Maybe there will become another type of intelligence from the human (laughing). I think this is what the scientists working with artificial intelligence say."

Me: "You believe humans will co-evolve with robots, as long as the robots intelligence is the same as ours. How about if the robots become so similar to us, that one cannot tell the difference between man and machine?"

Dr. Hosoda: "I think it is a nonsense problem. In my view, I think that we humans must not create such a kind of robot. Such similar robots may have the possibility to become the enemy of the human (laughing)."

Me: "I`ve noticed that there are many roboticists in Japan that are developing androids, robots that are supposed to look as similar as humans as possible."

Dr. Hosoda: "Yes, yes. Half of the Japanese engineers are friendly with such kinds of robots. If such kinds of robots invade our lives, and does not have any merit to the existence of ourselves, some Japanese people might even change their mind as the European people. So, as long as they have a positive effect to our cognition, they will be a merit to our lives, not invade. We developers have to keep in mind to develop robots for the human`s welfare. It`s basically the most important condition to keep in mind."

Me: "And what are your views on androids?"

Dr. Hosoda: "Even in this condition, where they are a merit for humans, androids are very critical. I think so. They can also be scary if it is only a half-complete android. Professor Ishiguro of Osaka University is a professional of androids. He makes androids that are the same as ourselves, and makes experiments. Hmm, but not complete androids are very fearful. There are so many discrete points with living people, for example the precise movements of the eyes, the breasts movement when breathing, unwilling movements and so on. There are so

many vital signs of a human being, so if there is a breakthrough with a kind of technology that enables robots to seem completely human, it seems as an okay idea, but it is critical. I have a doubt that people would want such a kind of robot. Why use the aesthetics of a dead son, or dead wife or lover? It is not exactly a happy reunion (laughing). It is sad. If an android has the complete body, mind, and memory of a dead human. For example a dead wife. The husband might believe that the robot is his real wife, as long as this one person believes this, he can become happy, but if only one other person has a doubt in the situation, the illusion might fall for the husband, which is not good. I think this is a critical and dangerous aspect. It is a social problem, I think. It is a new way to see human life."

Me: "Would you define such an android as a new life form or would you define it as a new type of human life?"

Dr. Hosoda: "There is a possibility of new human life, I think. There are some definitions, which change when we have human robots. I think it`s not clear if we will have a future like in *Ghost in the Shell* (laughing). If there is not no clear boundary between humans and robots, we will have such a future. When the first robot is more intelligent than humans are, humans will have lower brain capacity than robot. The first step for humans is to change the half of the brain to a machine. The next step will then be to change 80 percent, then 99 percent of the rest of the body. I do not know how to define such an existence (laughing)."

Me: "So you believe that there is a possibility that the boundaries between humans and robots might be erased?"

Dr. Hosoda: "It`s a very critical philosophical problem. It will change the way we define human beings. We can ask, what is the human being? Is it the physical aspects of us, which makes us human beings? In another aspect, only we wield information the way we do. Is that the origin of the human being? Maybe it is human thought that is the definition of the human? We can look at the brain as only a machinery that wield information that`s kept in a system. In this case, we can look at the brain only as a system. The system can be composed of parts from wetware or dry-ware, the material doesn`t matter in such a system. The basal origin, is the information that`s kept in this system. In such a case, there is no difference between the nature of the human and the artificial intelligence. If we look at human thought only as a system, I think there is no difference. But if this is the case I think that human kind will end up in eternal darkness, inside the computer (laughing)."

Me: “You are in other words sceptic to the fact that the boundaries between humans and machines gets erased? Ray Kurzweil seems to suggest that human kind`s destiny is exactly this, to transcend our human form to become something new.”

Dr. Hosoda: “These kinds of future social inventions are the themes in so many science fiction and animation movies (laughing). It`s very scary, but it`s a very important issue in the future. These kinds of problems are growing for both animistic and monotheistic cultures. This problem theme is stereotypical, but these days there are always new problems, and the philosophy on robots is getting more important because of the large industry. Maybe I am not sceptic, but I think this is an interesting problem. The research of robots or artificial intelligence is now the same as the research of the human existence, so there are so many themes that are the same for philosophical problems as in physical problems.”

Me: “Cambridge University, for example, has recently started a research program called *Centre for the Study of Existential Risk,* which focuses research to avoid unexpected catastrophic consequences that might be caused by artificial intelligence. What do you think we can do to avoid unexpected problems?”

Dr. Hosoda: “A leading problem discussed in Mighty Atom is about robots existence in society. It occurs a revolution in such a society, where the robots wants the same rights for protection, as what the humans have in this society. I doubt that this will be a situation in the future, but it might be a mistake developing such types of robots. The robots must be developed for the human welfare.”

Me: “Have you ever heard the saying: “if we can, we must?” I have often read engineers and scientists say it when talking about the future development of technology, even if it might be harmful. You`re saying that “even if we can, we mustn`t,” as long as it is not for the benefit of mankind?”

Dr. Hosoda: “Yes (laughing). It is a very bad philosophy. DARPA of the U.S. for example, have a huge budget on developing military robots.”

Me: “That type of technology might change the future of warfare. What are your views on robotics in the military?”

Dr. Hosoda: “There are so many aspects to take care of in the innovation of the military technology. Research in military turn the improvement of so many technologies of

society to high speed. It`s one positive aspect, but there is no control in developing this scary technology, so an important point is to have the right mind."

Me: "The future soldiers might be robots. Even today, there is technology that makes soldiers half machines. Do you have any thoughts about the cyborg? From what we have talked about, I would think that you didn`t want a future where humans are half-machine/half-human."

Dr. Hosoda: "No, no, no, I agree with the cyborg developer. It is a very, it has a huge merit for the handicapped, like artificial hand or arm, or artificial eyesight. My first research was for my master graduate degree. In 1979, I made a robot dog that support the blind. Artificial eye-mate-dog-robot. Such supportive technology improves legs or eyes, and are important subjects to do more research. The final step in the artificial body, in technology, is direct connection of neural and machine."

Me: "But then we are back to the problem with the fusion of man and machine. I`ve noticed that the "bad" guy in Japanese animation movies often is half-human/half-machine, while the "good" guy is a young boy who has to master some kind of advanced technology to win over the "bad" guy. Like for example in the film *Akira*. Is the concept of the fusion of man and machine always associated with something negative in Japanese manga and animation?"

Dr. Hosoda: "Hmm… No, there are so many different concepts in animation. I am freak of Akira (laughing). Ohtomo is a genius in the comics, and animation. The imaginary visuals has had a very huge impact on me."

Me: "I`ve gotten the impression that you are sceptic to the fusion of man and machine. Am I right?"

Dr. Hosoda: "The fusion of machine and creature is maybe only one image we have today of what will happen to technology, but I think the final technology, designed in the robot will be of some organ type for the robot. Today it is machinery, created from iron and alloys assembled together. None of the parts of the robotic machine is alive, so the machine is only an assembly of dead parts. Maybe such a system can be defined as dead and not alive. Mechanical parts are easy, and it lowers the character or the function, because it is a dead system. In the future, I think robots will be of living existence. Living existence has renewal process, like human cells. They die, and new ones come all the time. We are all avatars of

ourselves a hundred times. So, I think that the ideal machine is a machine that can reorganize the old system, as in living cells, with nano- and biotechnology. But, there are some problems. If we make a bio-robot, and make it be born, the concept is completely as a human. Is it human or robot (laughing)? It is a critical aspect of technology that will have many serious problems. I think the final technology of the robot will become organ type robots, or creature type robot."

Me: "So you believe the future in robotics is for robotic systems to become more similar living systems, but that they should not have other cognitive functions than what is needed for them to be of benefit to humans? Why don`t you think robots should be intelligent?"

Dr. Hosoda: "I am afraid artificial intelligence in a network intelligence, might be a big problem. If this type of network were able to have its own will, it would be panic (Laughing). If they become the enemy of human beings, it will be bad. The internet network controls almost all of society. Even today. Our lives depends on the many operations that happen in the internet. If this type of network were able to have its own will, it would be panic (Laughing). All of society could collapse. Fortunately, it is in human control today. If we humans did not have control of it, it would be very fearful. So I think that this technology is useful but, it must be in human control."

Me: "How about individual intelligent robots? Who are not connected to any larger network, couldn`t they be useful?"

Dr. Hosoda: "I think a practical robot, which uses humanlike artificial intelligence to learn will become a problem. Maybe learning can be programmed, but human intelligence develop with the time we grow. We use such a long time for the brain to develop, and we use time from being baby to 20-30 years before we learn. There is so much information from the environment that must be learned. If we create a robot with a thinking brain, similar to ours, learning efficiency becomes a very serious problem. If they should be products for us to use, they would need so much time before they can become practical (laughing). Twenty years to make a product is nonsense, but I think it is an interesting and serious problem. It depends on the structure of the brain, which is the thinking system. We humans beings still do not have enough knowledge of how the brain works. It should be possible to make a thinking system that was made by programmed memories. How memories will be in the network is hard to know. Human memories are like network of photographs, because information must come in

to the brain through humans nerves, sense system. The network of memories, maybe constructs the mind or soul of humans. Maybe if such a system of programmed memories in a network will become a soul of the robot, but maybe not so practical (laughing).

5.3. Summary

In this interview, we get to see a roboticists reflections on the robot and the cultural aspect that are connected to it. Seeing the robot from his point of view, we are able to better understand how the robot in Japan is developed. Dr. Hosoda pointed out that he has no religion, but has a scientific world-view. He could not answer if he believed in a soul, but referred to the concepts of *tsukumo-gami*, and *yayorozu no kami*, where the first is the artefact spirit from Shinto, and the latter referring to the "eight million gods" from Buddhism. He admits that religious traditions are a base component of people`s minds. Building a robot with a Judeo-Christian background could be considered taboo, and refers to Asimov`s "Frankenstein Complex". In Japan, However, Shinto and Buddhist traditions have no taboo concerning "creating" machines in the image of man. He was quite aware of the cultural differences between Japanese and Western robotics.

Throughout the interview, however, he refers to manga and American science fiction. I believe we connected so well because we had fragments of a shared reality, by both being interested in the worlds of science fiction and manga. Science fiction is a good way to visualise the future, he says, and that many roboticists first meeting with robots are through manga. It was clear that manga and science fiction was something he was very interested in. I am not sure if that was because most Japanese people like manga or if it was being a roboticist that made him so interested in the science fictional world of robots and technology.

He describes prime minister Abe`s *innovation 25* for political propaganda, but agrees that the best solution to handle the demographic shift, is with robots. Robots should do all the jobs that are considered bad for humans, and they should augment our abilities as the cellular phone makes us "telepathic", and the automobile enable us to move extremely fast, the robot should make us better humans. By seeing ourselves in the robot, he argues, will change the human mind. The aesthetic quest to reproduce nature in the form of man.

As we can see, the robot is packed with cultural meaning. In this interview with Dr. Hosoda, I discuss the robot in relation to a multitude of cultural aspects. Religion, popular

culture, politics, society, military, and the scientific world, are some of the aspects we talk about, and we are able to see from the roboticists eyes, how these all have been part of making the technology we know of as a robot.

Having seen the robot from the roboticists perspective, I will continue by presenting the students of robotics and show their reflections on the robot.

6. ROBOTS AT THE UNIVERSITY

6.1. Introduction

A Norwegian, whom I became friends with in Tokyo, studied at *Todai* (Tokyo Daikagu, i.e. The University of Tokyo). He could introduce me to a foreign exchange student who studies engineering at Todai`s Robotics department. He was nice enough to take me to the Department of Robotics for a tour, and let me observe the laboratories as well as help me do interviews by translating.

We met by the red gate, also known as *Akamon gate,* at the Hongo Campus and walked to the Robotics Department. On the way over, I asked him why he was interested in robotics, and what had made him move to Tokyo to study. His main interests, he explained, was science in general, and robotics is a science which is a mix of all disciplines within science. For him it was an easy choice. He came to Japan on a study trip, while doing his bachelor`s degree in engineering. He came in contact with one of the professors from the Department of Robotics, and they kept in touch. The professor later invited him to come to Todai to do his master`s degree there.

As we entered the building, I asked if he felt he had done the right decision coming to Tokyo, to study robotics, as opposed to studying in the U.S. He explained that studying robotics in Japan was absolute worth it. He had opportunities at Todai he would never have at a university in another country.

I asked what these opportunities were. What was so special with Japanese robotics? He said that Japanese robotics is a "fantasy" project. There is no other place in the world, so much money and resources are spent in robotics. "We can practically do whatever we want," he said. However, it has its negative sides as well, he explained. If one looks at the robotics in the U.S., where they have a lot less money and resources compared to what they have here, they actually manage to develop robots that are functional.

I couldn`t understand how Japanese robots were less functional when they had more money and resources to work with. "Shouldn`t it be the other way around? Shouldn`t it be Japanese robots that were more functional?" I asked. He answered that I would soon see what he meant.

6.2. Robots and a stroll in the park

We proceeded by taking the elevator up. The elevator stopped at one of the floors on its way up, and a young Japanese student entered. He was wearing a tight black spandex tricot with white balls, the size of golf balls, distributed evenly on all his joints and limbs, and he had a camera on his head.

My guiding friend pointed on the man in the spandex, and said that they are mapping how the human body moves in its natural environment.

I asked if he knew if the student was recording movements now, while I was looking discretely at the spandex dressed man. “There`s a computer there,” he said, while pointing to the man`s backside. On a thin belt around the man`s waist was a small device, the computer.

The elevator stopped and we had reached the Department of Robotics. On our way out I asked if what he meant by the human body`s natural environment, he meant the building. “Of course,” he answered. He explained that most people, especially here in Tokyo, as I myself probably had noticed, move in environments almost exclusively human made. The elevator, the stairs, the campus, sidewalks, the metro station, wherever the human body moves, it moves in correspondence to what has been made and shaped to fit the human body. Even just walking outside we mostly move on concrete, or asphalt sidewalks made especially for us humans. The only time we leave our human-made habitat, is when we actively seek to get out. This is especially true for people living in big cities like Tokyo.

I commented that there are many parks in big cities, and mentioned the green garden, Sanshiro Pond, that was in the middle of the campus. He explained that that pond and the garden around it looks like it`s natural, but is in fact totally artificial. If one looks at a map and see the pond from above, one can even see that the pond is heart-shaped.

I would never have suspected that. Even the path around the pond was rugged, and criss-crossed with roots and stones all over. I actually thought when I was walking around it, how lucky the students of this university are, to have a small forest in the middle of their campus. Nevertheless, it was a beautiful park.

We stopped to finish our conversation in the hall of the Department of Robotics. He continued explaining how this reflected typical Japanese aesthetics. Like the pond and the garden, they should seem natural, but be shaped to correspond with what we humans find aesthetic.

6.3. Walking robots

The Department of Robotics consisted of a long corridor with doors on each side. We entered the second door to the right, and came into a laboratory. All around the walls were desks with computers. On the floor around the desks and on the desks were bundles of wires, hard-drives, and circuit boards. There were also robot toys, from various manga series I recognized, lying all over the place. Many of the same robot characters were on posters on the walls as well. A mask of Mighty Atom was hanging, almost symbolically in the middle of the right-hand wall. There was another poster of him hanging over the door.

Shelves separated the laboratory into two sections. The shelves were full with all kinds of equipment. Robotic limbs and other body parts. There was also more wires and circuit boards. In the middle of the first room, there was a humanoid robot hanging from a chained wire, hanging from the roof. It was approximately 160 cm tall and looked like a skeleton made of plastic and metal, with veins and arteries of coloured wires blue, green, and red running all through its insides. There were three students working on it, as we came in. My friend introduced me, and continued to explain that this robot was part of a typical project they worked on. He explained that the students were programming it, so it could "learn" how to walk. It`s quite a challenge making it walk even a few steps.

He asked the students if they could show me a video of the robot walking. They gladly looked up the video file, on the computer they apparently used when working on that particular robot. They clicked through the video files. Some of them showed the robot taking one step, then falling, only to be supported by the wire stopping it from hitting the floor. There were a couple more of these "fail" videos before they found the right one. In the video, they wanted to show me, the robot walked eight steps and then fell over. He explained that the challenge is to make all its body parts and limbs correspond with each step it takes. He showed me how each joint had a computer and a motor. All the separate computers in each limb were connected to an external computer, the "brain". He explained how the system was supposed to do what our nervous system does. Our brain constantly collects information on where each body part is, relative to the other parts. The brain then controls each movement relative to where all the parts are in relation to the information coming from the inner ear and our eyes, and ultimately helps us hold our balance and equilibrium so we are able to stand upright, so our body knows where we are in relation to gravity. It is the biological principles in our brains, they wish to employ on the robots. Our brains have used millions of years evolving, becoming the fine-tuned machinery it is today. Copying only the simplest functions

and converting them into hardware and software programming is a complex task. Something as basic as making the robot hold its balance becomes a huge challenge.

I asked him how the famous Honda humanoid *ASIMO* (Advanced Step in Innovative Mobility) was able to walk, even run, when this robot could barely stand upright without having a wire supporting it. He told me that the engineers and scientists at the Honda laboratories had their secrets. "There`s a reason why ASIMO still is the most advanced bipedal robot in the world," he said. He continued explaining that ASIMO, even though it is the most advanced robot when it comes to bipedal walking, it still moves unnaturally and needs to have a strictly controlled environment to be able to walk, run, and dance. The goal in robotics is to make the robots accessible to all the environments we humans are.

The student we saw in the elevator was part of another project, where they are mapping how we move differently in our various day-to-day environments. There`s a huge difference in the way our body moves in relation to its environment. The differences between walking on a linoleum floor compared to walking on asphalt are huge. There are even differences between moving inside a building compared to moving outside. We move in subtle, but quite different ways in open space compared to a closed space. All this, he explained, are variables and factors which must be taken into account when developing a robot "brain" that`s supposed to process the information it gets from its environment and act on it the same way we humans do. We do it without even thinking about it. It`s second nature to us, and it all happens subconsciously. Imagine all the other information our brains have to process in our day-to-day life. He went on by telling me how the roboticists in the U.S. has taken another approach, and took me to another laboratory two doors down the corridor.

6.4. The American robot

We entered a laboratory similar to the one we just left, but there was no humanoid hanging from the roof. There was however, one hanging on a stand. This one was the same size as the one at the first laboratory, but it had a "skin", so one didn`t see its skeleton like the first one. This one, however, looked like something out of a science fiction film, or rather straight out of one of the manga magazines. In a box by the entrance, there was a stack of old robot body parts. My guide turned my attention to another robot standing in the middle of the room. This was not a humanoid robot but was what`s known as a "general-purpose autonomous robot". If the robot from *Lost in Space*, and the robot R2D2 from *Star Wars* had a child it would look

like that robot. Instead of being bipedal, it had belt tracks for mobility, and a cylindrical "body" with two arms, and no head, only two cameras, some microphones, and a set of other sensors distributed around the upper part of its cylindrical 'body'. It was approximately 150 cm in height, and was white and grey in colours. It looked nothing like the two humanoid robots I`d just seen. This robot looked like a machine, and nothing else.

My guide told me that this robot was the best functioning robot they had in the whole department. The funny thing about the robot, he said, was that it wasn`t Japanese, it was borrowed from a university in the U.S. He tried to turn it on, but it seemed to be something wrong with the power, but he didn`t try to fix it, or touch any of the other buttons. "This is extremely expensive," he said. "Better leave it alone, and let the experts deal with it." He proceeded by explaining that this was the robot he wanted to show me to illustrate what he meant earlier, when saying that U.S. robots are more functional. In Japan, they have the resources to experiment with the form of the robot, and Japanese roboticists are obsessed with making humanoid robots that are able to do whatever humans can do. They aim to reach that goal, even if the technology still isn`t there yet. Robotics in the U.S. has fewer resources compared to Japan, so they aim to make robots that actually work and are functional. Like this robot. It doesn`t look impressive, but it could do the tasks it was made to do. The Japanese robot on the other hand, looks very impressive but can`t even hold its own balance.

I asked him if he had any idea why there were such differences. Shouldn`t the Japanese focus more on functionality? Isn`t it they, who want to get the robots out of the labs and into people`s lives as soon as possible?

He thought it mainly had to do with two main factors: The fact that Japanese government and industry invest so much money into robotics, has made it become what he earlier described as a "fantasy" project. They have the opportunity to experiment and do whatever they find exciting and interesting. The U.S., on the other hand, have much less resources to be able to "play" around in the laboratory, they have to use what they have to develop robots that work in order to get new funds, and be able to continue their research and development. In that way, the robots they produce, like the one they were borrowing at that laboratory, manage to do specific functions in specific environments. There`s a lot it can`t do, but what it`s made to do, it does with minimum failure.

The other factor, he said, had to be the fact that at least 95% of all robot engineers that started their degrees at Todai were there for one reason, and that was because they wanted to

make robots from their favourite anime and manga series. He told me to look at the U.S.-made robot and compare it with the Japanese one. The first thing to notice is the fact that one is a humanoid robot, and the other is what`s called a general-purpose autonomous robot. The humanoid robot in that laboratory looked like a manga character. It was bipedal, had a torso, two arms, and a head, the distinctions that classifies it as a humanoid robot. It had "ears" that went diagonally backwards up from its head, and had a black visor covering the two cameras placed in the middle of its face, making it look like a futuristic animal of some sort. It`s colours were black, purple and yellow. All that, my friend explained, had nothing more that aesthetic value, and as I could see, it`s aesthetics clearly was inspired from the fantasy world of anime and manga. In his opinion, robots didn`t have to be bipedal, nor humanoid. The U.S. robot, looks like a bucket with arms, but it`s able to do stuff. That`s what he meant should be the focus. To make robots that can actually perform tasks. This is why he called Japanese robotics a "fantasy" project, because instead of focusing on making functional robots, they are focusing on making robots from the fantasy world of anime and manga, and they are able to do so because of all the money that`s invested into robotics.

I had heard enough of his thoughts around Japanese robotics, so I decided to continue by interviewing the Japanese students, and try to get to know them a little.

We went back to the first laboratory, and found the three students still working on the robot. My guide asked them if they had time to answer some questions, which they probably didn`t have, but they were kind enough to say yes anyway.

6.5. Three students of robotics

I started by asking what had made them want to work in robotics. One of them sitting in a chair, cross-legged and barefooted, answered in Japanese, my guide translated. He answered that when he was a child, he loved everything that had to do with robots. The two other students nodded in agreement. I asked how they became so interested in robots. What made them love everything that had to do with robots?

This time my interpreter didn`t have to interpret, I understood what he answered. Growing up with videogames and TV shows, and later manga that depicted human kids on heroic adventures with their "robot friends," as he put it. The one sitting to the left, with glasses continued explaining how he always dreamt of having such a *genki* 'friend' (*genki* =

healty, in this context meaning good). He used to pretend that his Mighty Atom doll was real, "I even pretended to watch TV with him," he said laughing, "but I was very young at that moment," he continued. The two other laughed as well, and said they also had such fantasies as children.

I continued the interview asking if they were lonely as children, and if they had any thoughts on what could be the reason to why they had those fantasies as children. The one with glasses answered that he didn`t think that that was the reason, because as a child, he had many friends in his neighbourhood, and they used to play every day. He didn`t have any memories of being lonely either. Many of the other children had the same fantasies as well. He remember they used to play a game where they controlled their own robots, and fought evil aliens together.

The two other nodded. They both had similar experiences growing up, they said. They couldn`t recall feeling lonely as children, and they both had many friends in their neighbourhoods they played with daily. Many of their other friends loved the robot characters in videogames, anime , and manga as well, maybe even more than they did, but they couldn`t see, or know if that simply could be the reason to why they had started working in robotics. Everyone loves manga, and robots are a major theme in much of manga. So most people who love manga, like robots.

It`s probably a combination of growing up with the idea of a robot "friends," and then growing up to find out that the technology to make these beings actually exists, and that there even are thousands of people working on developing them at the moment.

This was the argument they seemed to end on. They all agreed that it had to be a combination of the both, but one couldn`t know if they would ever have thought of working with engineering or robots if manga and anime weren`t as popular as it is in Japan. "It`s the same as asking if the chicken or the egg came first," said the one who sat cross-legged.

They had clearly not thought of these questions before, and it was very apparent that they enjoyed answering and thinking about them. I wanted to know what a robot meant to them, and what they thought would be the ideal robot.

The one with glasses said that the ideal robot had to be one that was indistinguishable from man. What`s called an *android.* "It should be and look exactly like us on the outside, but

be machine on the inside. It should not have a will of its own, but do whatever its human masters wish it to do," he continued.

The two others disagreed. They both thought that a robot should be able to do everything a human can do, but it shouldn`t look like a human. It would be too hard making a robot seem hundred percent human. The robot would only seem strange. The one with the glasses pointed out that he thought the *ideal* robot should be an android, but he agrees that there`s still a long way before the technology is there to make a robot look like a human in every aspect. The two others disagreed. If the ideal robot became indistinguishable from man, it would be hard telling what is what. "Besides, what`s the point in making a machine that looks and acts like a human, it would be easier making a baby," the one with the Frank Zappa shirt said. They all laughed, and agreed that the ideal robot should at least be able to do everything humans can do, but should not have a will of its own. They should be able to help us in all situations.

"If the ideal robot is able to do everything we humans do, isn`t there a risk that they one day might take over all our jobs? If they can do anything humans can, they might also start *thinking* for us as well. Wouldn`t that have an extreme effect on human society?" I asked.

They answered that humans, and especially engineers and scientists have a great responsibility in not making technology that harm us. It would be a nightmare seeing killer robots made for war. They could be used killing people. So it`s our responsibility to make robots that only help humans. They should not be able to think at all, they should only be able to process the information its master gives it to perform specific tasks. Robots should be made to not reflect upon what it does and has done. That is a human characteristic we wouldn`t want a robot to have.

As for the fear that robots will take over all our jobs, they all agreed, would never happen. Robots will mainly be applied in jobs that are too dangerous for humans. If there should be problems in a society because too many people don`t have jobs, it would be easy to store or even throw away the robots, and let the people take the jobs. In the end, it`s our own responsibility what the outcome of technology will be, so we always have to be careful not letting it get out of our control.

To conclude the interview, I asked what their religious views were, and if they had any thoughts on how robots will affect human society.

They all answered that they were not religious at all, so I asked if they believed in anything supernatural. Which they all did. The one sitting cross-legged explained that he believed that there is some kind of life force, but made a point of that he was not religious. The two others agreed with him. They all believed in some kind of life force, so I asked if they believed that a robot could have a life force. They all laughed a bit, as if they had never thought about it before. After thinking about it for some seconds, they all agreed that there was a possibility that robots might have some kind of life force, but it would be spontaneous, they said. The one sitting cross-legged explained that because of Shinto traditions, Japanese people used to believe that everything could have a spirit in the past.

6.6. Summary

In this example, we saw what observations a foreign exchange student had, working with Japanese robotics. He pointed out how Japanese robotics is what he called a "fantasy" project, where there is a greater focus on trying to reproduce nature artificially. The robots they try to built have humanoid forms, and they try to program them on the principles of biology Sanshiro Pond, in the middle of the campus turned out to also be an artificial reproduction of nature. "The artist-engineer shows his art by transferring the elements that really count from the natural cascade to an artificial one. In this respect, to be able to copy means to understand and to pay homage to nature" (Kaplan 2004: 496). Kaplan (ibid.) argues that in the Shinto tradition of Japan, artificiality is something considered good, and shows to the Shinto myth of *Amaterasu O-mi Kami*, the sun goddess. In the myth the goddess is offended by her brother`s provocations, so she decided to withdraw to cave. As a result, the world became covered in darkness. To convince her to come out again the other deities decided to set up a spectacle with music, theatre and dance. The party however, is not a real one, all the guests are only pretending to have fun, and made lots of noise with laughter and music. This made the goddess curious, so she came out of the cave, to see what was going on. When she was out, the other deities blocked the entrance, and the sun was back for good. "The world was saved by a simple masquerade, a fake party and forced laughter, set up to fool a goddess" (ibid.).

Technology is part of an aesthetic quest (ibid.). Having a tradition where reproduction of nature is considered an aesthetic quest makes it far easier for a community to accept the reproduction of human aesthetics in machines. As we saw in the example above, they even imitate the way the human body keeps its balance.

As the process of epigenesis can be viewed as an exact and critical filter, demanding certain standards of conformity within the growing individual (Bateson 1979). The critical non-random selective element, which in this example is the tradition of reproducing nature, in the Japanese culture, has to be combined with a randomly generated element for the *new*, Japanese robotics to appear.

The Japanese robots were quite different than the U.S. robot. Where the American roboticist focus on functionality, the Japanese roboticist focus on aesthetics. This has played part in how the Japanese robot has evolved in an idiosyncratic path. The inspiration from manga was also apparent in this example. My guide, being the only foreign exchange student in his class, was clearly fed up with the fact that almost all the students were inspired by manga. And, as we also saw in the interview, the three students all were very aware of the responsibility scientists and technologists have when creating new technologies, exactly what the ethos is in the manga stories. This will be discussed further in the following chapter, which will take us through the fantastic world of manga.

7. THE WORLD OF MANGA

7.1. Introduction

Above I have shown how the daily lives of the Japanese living in Tokyo are intertwined with technology. This intertwining is uniquely Japanese, which to me was fascinating, while completely natural to them. Thus, one may regard these technologies as doxa to them. All the vending machines and increasingly automated systems for purchasing services ease the pressure on the need for a labour force in the service sector. To the Japanese, this is totally normal, and it seems likely that the amount the service workers will decrease in parallel with automation. When the robot technology is advanced enough, I believe, it will be quite easy to integrate robots into a society where the inhabitants already are used to interact daily with machines, rather than humans.

During the last few years, cinemas in Norway have started using ticket-vending machines, which isn`t anything radically new, but they have started closing off the usual ticket booths to cut costs. It`s still possible to buy tickets from a person, but you have to do it in the kiosk. I overheard a middle aged man curse loudly when he saw that the ticket booth was closed, and thought the only way to get a ticket was through the ticket-vending machines. He shouted that he was sick of using automated machines all the time, he wanted to deal with humans, not with f****** robots. A bit amused, I thought, he would go insane if having to deal with all the automatic machines, or what he called "f****** robots," in Tokyo.

I have argued that there is a close relationship between manga and the representation of technology. In earlier chapters we also saw how both students and veterans of robot technology are inspired by stories of robots in manga magazines and in anime movies and series. On every other front cover of a manga magazine there is a picture of a robot. The themes are often set in a technologically advanced future Tokyo, where humans live side by side with robots. In this chapter, I will take the reader through a short history of post-war manga, and show some examples from some of the most popular stories.

7.2. "God of manga" and *Mighty Atom*

Osamu Tezuka is considered being the "father of manga," and is also referred to as the "god of manga." He was inspired by Walt Disney, and was extremely productive creating over 700

volumes and a vast gallery of characters, inspiring many generations of manga artists after him (Schodt 1988).

One of the most iconic characters he created was *Tetsuwan Atomu*, meaning *Mighty Atom*. The series lasted from 1952 to 1968, and Mighty Atom was exported to the U.S. as *Atom Boy*. The original story is about a robot boy with a heart powered by nuclear power, who ends up becoming the saviour of humankind. Mighty Atom is created by the head of the Ministry of Science, "Doctor Tenma". He builds him to replace his son who dies in a car accident. Dr Tenma built Mighty Atom in the memory of his son, but later realizes that the robot cannot grow up, nor express human feelings. Mighty Atom can never replace his son, so he sells him to a cruel circus owner. The new head of the Ministry of Science "Professor Ochanomizu" sees Mighty Atom performing at the circus one day, and later buys Atom from the circus owner. The professor treats Mighy Atom as his son, and becomes his legal guardian. To his great surprise Mighty Atom starts expressing human emotions, as well as showing he has superpowers. The series continue with Mighty Atom starting to fight crime, and saving the world from aliens and evil robots. Over the years, there has been many alternative versions of the story, but the base storyline has never been changed (ibid.).

Tezuka created the perfect combination between man and machine in Mighty Atom, Schodt (2007) says. "Atom was a robot that was endearing to young readers, who could see him as a "pal," or the kid next door, and a robot that also happened to be a mechanical creation, with artificial intelligence and superhuman abilities" (ibid.: 114). Over the years, Mighty Atom became a symbol for advanced technology in general, for the Japanese. Schodt (ibid.: 115) claims that this was partly because of the ideal balance between human and machine. If he was too mechanical or machine-like readers or viewers wouldn`t identify with him. If he was too human-like, Mighty Atom would cease to me a robot, and would even seem threatening to humans.

When Mighty Atom first became popular in the 1950s he wasn`t only a robot, he was also the little boy next door who lived in the future. A future where science and technology had created a wonderful new world of clever gadgets and a standard of living the Japanese, at the time, could only dream about. Schodt (ibid.) points to the lyrics of the theme song, to the animated series where Mighty Atom is described as "a child of science." Schodt says that "over the years in public mind, he – and robots – became linked to a wonderful future that science and technology could provide". The informants I spoke with, or interviewed, all mentioned Migthy Atom when I asked them if they had any relations to manga. Age didn`t

matter. The oldest person I spoke with was a 72-year-old retired English teacher, who told me he had grown up with the series and it had meant a great deal to him. The youngest I spoke with, were some high school students wanting to exercise their English with me in Yoyogi park. They giggled and laughed when I asked them if they read manga and watched anime, but they all nodded with their heads, and answered that they did. I asked what their favourite characters were. They said different names, I had never heard before. So I asked what they thought about Mighty Atom. I`m not sure if they understood what my question was, but they laughed and giggled, and said something about that this it was for children.

The equivalent to Mighty Atom in the Western world, I believe, would be Walt Disney`s Donald Duck or Micky Mouse. Both old and young, in any Western country have some relation to the adventures of Micky Mouse or Donald Duck. If Mighty Atom has contributed to make the Japanese mind project human qualities to machines, we could speculate if Disney`s anthropomorphised animals have made the Western mind project human qualities to animals. The stories and images of these cartoon characters, have become iconic and are to great extent a big part of many people`s primary socialization. They are part of the shared reality of a community. Berger and Luckman (2006: 100) points to the term *reification*, which is the apprehension of human phenomena as if they were things, non-human or possibly supra human terms. Reification implies that man is capable of forgetting his own authorship of the human world, making the world a dehumanized world (ibid.). They (ibid.: 101) point out that the social world is highly reified. The opposite of reification, I would say, would be to anthropomorphise the thing. These cartoon characters are in other words contributing to a *de*-reification of things, in a highly reified shared reality. Projecting human emotions and qualities into objects, creates a bond between man and animals, or between man and machine. Likewise, the myths of the totem animal in the hunter-gatherer community, created a special bond between man, or his clan to an animal.

7.3. Mighty Atom as ideology

More than sixty years have passed since Mighty Atom was created, and he still lives in the public mind, symbolizing a child of science. During my field work I was not aware how influential and how important Mighty Atom was to Japanese culture, until April 2012, which was the month of his sixtieth “birthday”. I was walking around in Harajuku, one of the “hip” shopping districts of Tokyo, when I noticed that one of the high-end shops had piquet shirts

for sale, with pictures of Mighty Atoms. The illustration on the shirt showed Mighty Atom with his internal metallic body on one side his body, and the external human boy on the other. I wanted to buy one, but it was extremely expensive, which my budget couldn`t allow. Walking out of the shop, with my head hanging low, I suddenly realized that almost all the shops had some special-made products of the robot boy. I decided to hang around some of the shops where it was possible to observe from the outside who would buy these products. I sat down on a bench where I could look straight into two of the shops with a variety of Mighty Atom products. First, I thought that I would maybe count one or two, if I was lucky, but after two hours I had lost count, and I concluded that everyone wanted a piece of Mighty Atom. When I was done counting, I walked in to talk to the young woman working at one of the shops I had been observing. I think she had noticed me sitting outside, and she seemed to turn happy when I asked why there were so many Mighty Atom products everywhere. She answered: "It`s the birthday of Atom, everyone in Japan celebrates". At that moment I realized that this robot boy was not just a cartoon character for children, grown women and men alike, seemed to love the little robot boy.

Walking home I noticed there were posters in the metro underground, and I saw the little robot boy in windows here and there. When I came home, I was excited to ask Kei-chan what he knew about this. Was he also celebrating Mighty Atom`s sixtieth birthday? As it turned out though, he knew nothing about Mighty Atom`s birthday. He hadn`t even noticed any of the posters or seen anything signalizing this event. He didn`t even know how old he was. I asked if anyone at his job had talked about it, or if he had seen anything in the social media. He had not heard anyone talk about it, and seemed a bit confused why I suddenly wanted to know so much about Mighty Atom. I explained how Mighty Atom had appeared many times in the context of my field work, and I had just heard from a woman that everyone in Japan is celebrating his birthday. He took up his smartphone to check if there was anything in the social media. There was some commercials, here and there selling anniversary Mighty Atom products, but nothing more than that. None of his friends had posted anything. And that was when I realized that contrary to what the young woman told to me, "everyone celebrates his birthday", it was more probable that foremost those who could use the event for marketing some product or other, would celebrate his birthday. I interpreted this fact as meaning that even though most people did not celebrate Mighty Atom`s "birthday", it still showed how dear Mighty Atom is to most people, when they still flocked to buy products with his face on them.

Nonetheless, this did not make him less of an icon to the Japanese. Even though Kei-chan was not aware that it was Atom`s birthday, he still knew very well who he was, and had as all the other informants, grown up with the series. In earlier chapters we also saw how Mighty Atom was central to many of the students of robot technology, even Dr. Hosoda. And in the previous chapter, I showed how technological devices were "cute and cuddly", how the kawaii culture was highly integrated into their daily technological devices.

Schodt (2007: 115), says that it was never Tezuka`s intention to create a symbol for advanced technology. He had intended to make a character that was more cynical and more of a parody. But publishers, the public and the times pushed him into creating a more romantic depiction of the future. After that, Mighty Atom took on a life of its own. Schodt (ibid.) refers what Tezuka himself, said about it in 1986:

> In the days after the war, the publishers wanted me to stress a peaceful future, where Japanese science and technology were advanced, and nuclear power was used for peaceful purposes. At the time . . . the technological world I depicted was utterly fantastic. The flip side of the coin is that since most of the technology did not yet exist, I had the freedom of drawing whatever I pleased.

Mighty Atom thus became a highly exploitable property, especially when Japanese industry started growing after the war, and the production of advanced Japanese technology increased. "Atom was exactly what corporations, even the government, needed in their advertising campaigns", Schodt (ibid.) says, and continues:

> With Japan`s postwar de-emphasis on military technology and increased emphasis on peaceful uses of technology – Atom could symbolize a new, humanized sort of machine. Atom could represent advanced technology that was nonthreatening and could lead to a better future; a cuddly warm sort of technology wrapped in scientific optimism. Atom could be a dream, and a goal for the future.

In other words, Mighty Atom became the perfect symbol for both government and industry in promoting the new technological era in post-war Japan. "To create a new technology is to create not only a new artefact, but also a new world of social relations and myths in which definitions of what 'works' and is 'successful' are constructed by the same political relations the technology engenders" (Pfaffenberger 1992a: 249-50). Introducing Mighty Atom as "a cuddly warm sort of technology wrapped in scientific optimism," helped create the sociotechnical system, which we discussed in the chapter 3. The ideas about what technology

is, and how it will make lives more comfortable could be spread through the medium of manga.

7.4. Manga for the people

I was not aware what manga was until I first decided to do my fieldwork in Japan. During my studies of the Japanese culture preparing for my fieldwork, I read some literature on the robot that often mentioned manga in the context of robots (see D`Alusio and Menzel 2000; Kaplan 2004; Robertson 2006; and Schodt 1988). I was well aware of anime, the animated version of manga, and I had seen some of the movies by director and animator Hayao Miyazaki. And before travelling I watched some of the most popular series and movies with robots: *Astro Boy* (1980), *Mobile Suit Gundam Seed 00* (2007), *Neon Genesis Evangelion* (1995), and *Ghost in the Shell* (1995). I was however, not aware that they were all based on manga series, and I was definitely not aware how big manga is in Japan.

Manga is basically the Japanese word for comics. There is however, a huge difference between manga and the comics we know from America and Europe, Western comics. Although they have an essentially similar format, they have developed into two very different art forms. The first thing that separates them, is the fact that manga is read 'backwards' because of the way the Japanese language is written, the second thing would be the size. Manga magazines are thick as phonebooks, and have about four hundred pages, compared to American and European comics that usually have between 30 and 50 pages. The content and the way manga stories are narrated also differ. There is a greater emphasis on storytelling and character development in manga. They also use cinematic effects, by showing frame for frame the narrative without using words. This effect makes it possible to communicate moods and feelings. By *showing* a string of events, rather than *telling* what is going on, one can narrate a story by just using pictures where body language is communicated frame for frame. "An American comic book might use a single panel with word balloons and narration to show how Superman once rescued Lois Lane in the past, the Japanese version might use ten pages and no words" (Schodt 1996: 25). This use of effects, combined with a greater focus on storytelling and character development results in a huge amount of pages compared to Western comic books.

Based on my own observations, it seemed to be the most widely consumed form of media. Already the evening I arrived in Japan, I noticed people reading manga on the train

into Tokyo from Narita International Airport. I didn`t give it much thought at the moment, as there were so many other impressions to digest. But the days to come I saw that manga was practically everywhere. In all convenience stores there are special racks with manga magazines there was always people standing browsing through the various selection. I later noticed there were special stores, only selling manga magazines, and they were everywhere, no matter what district you were in. However, in Akihabara, "electric town", there were almost more manga magazine stores than there were anything else. They had many floors, and the one with the most I went to, had seven floors. The funny thing with most of these stores was that with each floor you climbed, the contents of the manga magazines became more, and more pornographic. When you reached the floor where the manga was straight out porn, the following floors started increasing in rate of strangeness in the porn. There seemed to be no taboo around this phenomenon, I observed women and men in all ages browsing through the racks. I asked around why porn in manga format was so popular, and also commented how this would be taboo in Norway. I think it is even illegal, at least the most extreme ones. Kei-chan claimed that the Japanese have a different view on sex than Westerners, and Maki-chan (43 year-old-woman, also lived in share house) said it was probably more popular with manga porn for men, because the "normal" porn is censored.

This could be a subject for another thesis, but my point is to illustrate how huge manga is in Japan. Wherever you are, you will see someone reading a manga magazine. At restaurants, cafés, in the metro, at the bus, at the beach. There were no setting where a manga magazine would seem out of place. One of the first things I reacted to was that both women and men in all ages read manga. Cartoon magazines in the west are for "nerds" and kids. I am quite a "nerd" myself and I have more than once felt a bit awkward reading a cartoon magazine in public. In Japan the opposite seemed to be the case.

One night I was at a bar with Kei-chan and Koni-chan. I asked them what their relations to manga was. Koni-chan didn`t speak English very well, so Kei-chan translated while he was talking. He said that much of his moral values had come from reading manga. He had never had any relationship with religion, but whenever he felt lost in life, or needed guidance in one way or another, he would always find a manga story that would help him. Kei-chan commented that it was like his bible, but there were much more stories, and a great more themes to choose from. He said this while laughing. Koni-chan said he had struggled with identity problems as young, but he "got help from manga". Kei-chan said he would often turn to manga when he had problems with his ex-girlfriend.

I continued asking how manga differed from other literature, and if the themes had more moral stories, since Koni-chan said he had got his moral values from manga. Koni-chan thought that the reason why he read manga, and not novels, for example, was simply because he had always read manga. It felt more natural to him reading manga than other forms of literature. He emphasised that he also did read other literature too, but not that often. "Manga magazines are also much faster to read", Kei-chan interjected. "A novel on about three hundred pages could take weeks to read, while a manga with the same amount of pages takes only a day or two." This way you get the whole story much faster", Koni-chan continued, and said that not all manga have morals in them, many of them are absurd and comical, other are just for entertainment. There are many themes in manga, but some manga have very deep stories that relate to what we feel as humans. I asked if they could give me examples on manga stories that have ethical subtext. They both had a long list of various series and characters I had never heard of.

My interest was the manga stories that were relevant in terms of technology and robots, so I asked if they had any examples of any manga with technology and robots in their themes. Kei-chan answered that many of the most popular manga series had technology and the future as themes, *Gundam Seed, Akira*, and *Ghost in the Shell* are good examples, he said. "How about Mighty Atom", I asked, "would you say there is a moral in that story?" They both agreed that Mighty Atom was very important when they were children, but they hadn`t seen any of the versions of the series. They would sometimes read manga with robots and technology as the theme, but it was not their favourites. They both agreed, however, that the most popular manga series, were the ones on robots, and that was probably because manga artists are so influenced by Osamu Tezuka.

7.5. The ethos in manga

> Life is like a node which is born within the flow of information. As a species of life that carries DNA as its memory system, man gains his individuality from the memories he carries, while memory may as well be the same as fantasy. It is by these memories that mankind exists. When computers made it possible to externalize memory you should have considered all the implications that held."
>
> -Code name Project 2501
>
> (Life-form born in the sea of information)

We have seen how Tezuka Osamu was pressured into making Mighty Atom a symbol for a peaceful future were advanced technology made the world a better place. By making the robot boy "a cuddly warm sort of technology wrapped in scientific optimism," a Japan built on advanced technology became a "dream, and a goal for the future". Mighty Atom seemed, according to my observation, as more of a nostalgic figure everyone remembers from their childhood. The most popular manga series now a days, it seems, are the ones depicting teenage boys and girls who operate huge robots. Schodt (2007: 113) points to a manga episode of Mighy Atom titled "Mission to Mars", where Osamu envisioned robots that could be operated by humans inside them, but he never really developed the idea. A manga artist known as Gò Nagai built on the idea in his *Marzinger Z* (1972), however. "This helped firmly establish the pilotable, giant warrior phenomenon that subsequently captured the imagination of boys all around the world, additional examples being *Gundam*, *Transformers*, and countless other anime shows…" (ibid.). This corresponded with my observations. Schodt (ibid.) argues that "The vast majority of robot-themed anime in Japan today follow in the tradition of *Iron Man No. 28*, *Marzinger Z*, or *Gundam*, and are thus "robots" that require remote-control intervention by humans, or actual human "pilots"."

It seems that in post war Japan, before advanced technology became synonymous with Japanese culture, there was greater focus on communicating what great future technology would bring. Mighty Atom was the perfect symbol. The future was depicted as nice and comfortable, where humans and robots lived side by side. Mighty Atom "a child of science", the perfect merger between man and machine, was the ultimate hero. When future became present, and advanced technology became normal in Japan, it seems as if the focus on the hero in manga changed. From having an autonomous robot boy, symbolizing advanced technology saving Japan, the hero changed into human teenage boys who had to operate huge robots. It seems that now, as the future of advanced technology is here, the message manga stories communicate, is how humans are to use the technology, and to what end.

The quote in the beginning of this section is an excerpt from *Ghost in the Shell* (1995). The plot is set in the future in Nihama prefecture, a fictional Japanese city. Computer science has become so advanced that many people possess "cyber brains," which is a technology that enables people to connect their biological brains to various networks. This however, makes it possible for hackers to "hack" into people`s cyber brains and control them. The story follows members of "Section 9" a counter-terrorist task force whose mission is to prevent these

hackers. They are pursuing what they believe to be a "super-hacker", who turns out to be a "life-force born in the sea of information," an advanced artificial intelligence program gone rogue, part of a government project, "Project 2501". Project 2501, also known as the "Puppet Master," is self-aware and wants recognition as a living being. The corrupt officials who created Project 2501, want to capture it, so they can use it to gain control over the network, enabling them to control everyone who have a cyber-brain.

In this story we see how technology can literally take a life of its own. The story reminds me of a modern Frankenstein`s monster story, where scientists create a new technology that becomes alive and self-aware. It is the same with Mighty Atom. The created "monster" in the Japanese stories, however, always turn out to be some kind of sentient being, and the humans that created them are the real monsters. The moral seems to be that technology is neither good nor bad, when first created it is above human comprehension and benign. The real monsters are the people who want to use the technology for their own means, usually to gain power.

I mentioned I had observed that the pilotable robots were some of the most popular tropes in manga. Another example of this theme is from the manga *Mobile Suit Gundam 00* (2007). "Gundam 00" is one of many spin-offs from the first *Mobile Suit Manga* (1979). The plot changes and fits its time, but the main story stays the same. Humans are using advanced technology as war machines, and a young boy piloting a super advanced "robot" called "Gundams", is set on a mission to stop humanity from destroying itself. The plot of "Gundam 00" is set in a future where the planet`s fossil fuel reserves have been depleted. The new power source is solar power collected from power collectors orbiting the earth. There are only three of these solar power collectors, and consequently the world has been divided into three power blocks, each controlling and harnessing the power for their own gains. North-America, Europa, and a federation consisting of China, India and Russia control each their solar power collector. All other countries are in constant warfare, and in the search for fuel and energy some of them try to tap into or destroy the power sources the three power blocks control. The three powers have an arsenal of advanced weapons which they use to destroy terrorists who try to disturb the status quo. A professor predicted this situation a hundred years earlier, so he formed an organization called *Celestial Being*. He created four super advanced Gundams that are superior to all other technology. These Gundams are piloted by four "Gundam Meisters". The main protagonist is "Setsuna F. Seiei", a young boy from one of the most war-torn countries. The goal of Celestial Being is to eradicate war on earth.

Throughout the series there are lots of discussions on why Celestial Being should be allowed to use their superior technology to stop the wars on earth, when what they really do is creating war as well. The moral dilemmas surrounding war and the use of advanced technology is an important theme in these series. Here again we see an example on how the message communicated in manga is towards how humans use the advanced technology. It is not portraying a future where technology and humans live side by side in harmony, like in Mighty Atom, but it rather shows the implications and the power technology has and how society must be aware of what it creates.

Dr. Hosoda of RSJ, in the interview I had with him, as well as the roboticist students at Tokyo University, seemed to emphasize that robots should not be used in military context. They seemed quite aware of the responsibility they had as future engineers for what direction technological innovation can take. In the West, however, much of the robotics research is done for the military, like for example Boston Dynamics projects, and applied as for example drones in warfare. The Japanese were extremely sceptic of that kind of use—or rather abuse—of technology.

7.6. Summary

Mighty Atom stood out as a character that has had a great impact on the Japanese culture. We can speculate if Osamu Tezuka`s fantasy future has inspired the technological development in Japan. He definitely inspired other manga artists to illustrate a future Japan in their manga stories. The ethos in the manga can to a great extent also be seen in how the robot is developed. Both Dr. Hosoda and the students of robotics were quite aware of the role the engineer has in developing new technologies. They all agreed that robotics and the military should have nothing to do with each other. Man is responsible for what he makes, and what he makes should serve man and his community, and not as a tool of destruction.

In the following chapter, I will take the reader through a tour through Tokyo to see the perspective of the public and what kinds of technologies form their environment. We will see that some of the devices and technologies can be seen in the light of the “cute” and “cuddly” Mighty Atom.

8. ELECTRONIC TOKYO

8.1 Introduction

In this chapter, I will show some examples of technology in the daily lives of the Japanese. My aim is to illustrate how everyday technologies in Japan have another dimension to them, making them what I characterize as uniquely Japanese. I will continue taking the reader through a tour of Akihabara, a district in Tokyo, where manga and technology is seen everywhere.

8.2. Devices that talk and play music in Japanese homes

Going to the bathroom in the morning is the first meeting with what I experienced as typical Japanese technology. There were three bathrooms in the house I lived in, and they all had control panels with displays, either on the inside or outside. The control panel was to turn on the water heating for the shower and the sinks. One could set the exact temperature one wanted for the morning shower, in either Celsius or Fahrenheit degrees. The same kind of panel was used for the sinks in the kitchens. This was energy efficient because it heated the water directly rather than constantly using energy to keep the water in a tank hot. So, the first thing a Japanese does in the morning is turning this device on. Like many of the other Japanese electronic devices, it was programmed to play a melody or "speak", when switched on. When turning the panel on, a high pitch woman voice greets you with a "good morning," or "good afternoon," depending on what time of the day it is. The speech is in Japanese, as everything was, so I didn`t understand what it was saying, until I asked Su-chan. Still, I remember it was quite pleasant. After the voice was speaking, it played a short tune or melody. The melody was exactly like the ones from the old 8-bit Nintendo. These tunes, and melodies were programmed in almost all the electronic devices, from the microwave oven to the washing machine.

After turning the water-heating panel on, our attention turns to the toilet. The toilets in Japan are again, something you recognize as Western, but at the same time, typically Japanese. The traditional Japanese toilets are simple squat toilets. There were still some of them in old buildings, with public bathrooms. After the Second World War, however, the Western-style flush toilets became common.

They surely looked like Western-style toilets but they had many advanced functions. The toilet-bowl was a typical white porcelain bowl. It was the toilet seats which were special. The first time I saw one I remember thinking that it looked like belonging to the International Space Station. The toilet seat was warmed up with internal heat elements, and on one of its sides, there was a control panel to set the various functions of the toilet. On the control panel, there were a number of buttons, some to adjust the heating of the toilet seat, some to play music or make sounds to cover up embarrassing sounds, some to deodorize, and some to turn on the bidet function. When pushing the bidet function button, you hear a mechanical sound and before you know it, a warm jet of water hits you right on the anus. There`s also a special button for women controlling the angle of the water jet. The jet hits the anus from an anterior angle rather than from posterior, which it did on the button for men. Everything is thought through to the smallest detail. This type of toilets were the most usual. I got confirmed from my Japanese informants that most homes use these. I did not, however, get any data on what was used in the more rural parts of Japan.

At some restaurants and bars, the electrical system of the toilet seats were even connected to the door. When opening the door, the lights turned on, simultaneously, the toilet seat went up, and a deodorizer sprayed the room. It felt like the bathroom was alive, and did everything for me. I did not have to touch any surfaces. The tap in the sink was of course also automatic. The moment I opened the door the bathroom prepared everything, I only had to focus on doing my business. When I was out with my Japanese friends, and we were at a place where they had these automatized bathrooms, I always became very excited and wanted to understand what their thoughts were about these kinds of technologies. They did not share my enthusiasm. Kei-chan would always ask “Is that not normal in Norway?” when I commenting these things.

Our tour continues to the kitchen. In the kitchen there was a quite old style gas stove, with a small toaster oven connected to its underside. This, I learned was the most traditional cooking apparatuses all Japanese kitchens have. I got the impression that these gas stoves were a symbolic remnant from the traditional Japanese homes where the kitchen was a place the family gathered. With these gas stoves you can fry *saba* (mackerel) in the toaster oven, make rice on one of the burners and miso soup on the other, one of the most traditional Japanese meals. However, I noticed that the one in our kitchen was never used, and wondered if this was the case in other Japanese homes in Tokyo or if it was only because we lived in a share house, and everyone were always too busy. Kei-chan told me that this was the case in

many Japanese families, he said because the Japanese work so much, they were too tired and had too little time to cook, so it was more common to either eat out, or to have a microwave oven meal.

All around the kitchen there were various types of what I later recognized as uniquely Japanese electronic devices. They weren`t so different from what you would find in any Western kitchen, but all the devices had an otherness to them which made them uniquely Japanese. The rice cooker, water boiler, the microwave oven, even the washing machine were programmed to talk or play melodies, when they were used. The refrigerator closed automatically if you forgot to close it. The kitchen felt almost alive when cooking. The melodies they played were usually very cute, and everyone who grew up with an 8-bit Nintendo, would get a nostalgic feeling. The rice cooker for example played "Twinkle, Twinkle Little Star" when the rice was finished. The microwave oven played a tune I hadn`t heard before, but I was told it was a Japanese nursery song. The otherness in the design of these devices, could to some extent, be characterised as being a sort of childish innocence, which you would not recognise in the same Western devices which have a much more functionalistic design.

These daily electrical devices weren`t exactly advanced compared to the ones in the West, the reason I find them interesting, and relevant, is the fact that they are designed and programmed to make almost childish noises or even talk, making them almost feel "alive" and cute. The fact that there were so many different devices, and all the practical solutions, like the self-closing refrigerator door, the toilet seats, and the water heating system, made it all so uniquely Japanese. It seemed that if anything could be made easier by using technology, they would do it. There were no limit to what technology could be used for to make the daily lives of the Japanese a little easier. I commented these observations to my Japanese friends, and wanted to discuss what they felt about technology, and how they related to it. This was hopeless however, they seemed to think I was strange too be so fascinated by so mundane things. The only feedback I got when I tried to start a conversation on technology was that it made life simpler. Kei-chan would always say: "Is that not normal in Norway?" At first, I wondered if I was the only one who found these things so different and interesting, namely because I was a student of anthropology, and I was looking for the strange and interesting. This thought was thrown away as soon as a young man from Germany moved in to the share house, and started commenting the exact same things I had observed. During my fieldwork in Tokyo I joined a Norwegian association for international students, where I also had the

opportunity to hear how other foreigners experienced Tokyo. Being able to hear that other Westerner people had made the same observations, confirmed that it was not only me, seeing these devices as uniquely Japanese.

8.3. The streets of Tokyo

Each morning the streets were packed with women and men in suits rushing down to the metro underground station. I was usually among them. We all queued up to get into the trains. In the mornings, when it was at its busiest, we even had to queue up to get through the ticket gate. What was interesting about these ticket gates, was that they were powered by the kinetic energy from all of us in the queue. There were so-called piezoelectric pads placed under the ticket gates, absorbing the energy from us walking through the gate. Coming down the stairs to the platform where the trains comes, I noticed there were bird sounds coming from speakers in the roof. I first thought that this was to make a nicer environment in the underground, but I later learned that every station had its own characteristic bird sounds. This made it possible for the blind and people with low vision, to be able to know what station they`re at. It surely also made the atmosphere a bit more pleasant as well.

I took many observations in the metro train, and I was quite intrigued by how everyone always were fiddling a smartphone, tablet of some sort, or playing on a Nintendo DS on the trains. Some were reading books or manga. It was always very quiet and no body were talking. Everyone were consumed in his or her personal gadgets. I later learned that one of the reasons why no one socialized directly on the train, was simply because it was considered rude. To do anything that could bother the other passengers was considered taboo. There were even signs, saying not to talk in the telephone, not to listen to music, and to talk in a low voice for respect of fellow passengers. It make sense in a city that is as crowded as Tokyo, but to me it felt quite lonely sometimes.

I asked Kei-chan what he thought about the matter. He explained that it was sometimes hard with all the Japanese customs. We have to be polite and follow strict rules all the time. It is important to follow traditional Japanese customs. He would always refer to traditional Japanese customs, when talking about what it is to be Japanese. He continued by saying there are many people who have no family or friends in Tokyo. He was one of them. He had just recently moved to Tokyo from Hiroshima. It was very lonely at first he said, and the only way to get friends is through work, or through the internet. He, however, was lucky

enough to meet a group of young people at a pub, who were in a similar situations as himself. They started always hanging at the pub "Mr. Kanzo" and I was lucky enough to get included in this group.

I asked what he thought about that people started becoming more and more consumed with electronic devices, like for example smartphones. I explained that in Norway, at least, it was often a subject in media, that people are becoming too consumed with their smartphones, always being online. He said it was a problem for some people, because they locked up in their rooms and never came out, but those people were usually ill. He continued explaining that it was actually a good thing, especially in the trains, as I had observed, because you can communicate with friends while commuting to, and from work, without bothering the people next to you. "This way my iPhone is making me a better Japanese," he said half laughing. I asked if it was *that* important, not being in anyone`s way. He continued saying, that for me as a foreigner, it was not so important with the politeness, but for him as a Japanese, he constantly has to be polite, it is very important. He wants to be a good Japanese, but sometimes he is tired, and maybe irritated after a long day at work. Being able to talk with friends or simply play a game on the smartphone, made him relax. This way, he didn`t bother anyone on the train, and he became less stressed, so it was easier being to be polite the rest of the evening. I asked Kei-chan half-jokingly if all the automatic machines which were everywhere, were there so people could avoid speaking to other people, thus not having to deal with the issue of politeness. "Maybe," he answered, "they sure make the days easier."

8.4. Automatic Tokyo

Wherever you are in Tokyo, you are never far away from getting something to drink, eat, snack on, or even to smoke. There are vending machines practically everywhere. Some with cigarettes, some with booze and liquors, others with a full rice with fish meal, or a hot cup of coffee. In some of the more shady parts of the district Shinjuku, I even saw a vending machine with what looked like cans with women`s underwear. To buy something from the vending machines with liquors or cigarettes, you needed a card to swipe over a sensor confirming your age. Again, vending machines aren`t unusual in any other big city, but the huge amount of these, and the range of products you can get from them, make it possible to practically live of the vending machines. The examples I present stood out to me as something

uniquely Japanese. In conversations with fellow Norwegian students, as well as from America, Britton and Australia, all agreed these were uniquely Japanese.

The automation of daily stuff just start with the vending machines, I soon experienced that I could go through a whole day eating breakfast, lunch, and dinner, go to a concert or see a sumo match without talking with any humans at all. At many restaurants you order the food you want on a ticket-vending machine. It`s basically a big touch-screen where the restaurant`s menu appear, while older types, have just buttons with menu options on them. These ticket-vending machines are either placed on the outside of the restaurant or at the inside. You choose meal, side dish, and drink, pay and get a ticket. You give the ticket to the chef or a waiter, and without saying a word, you get the meal you paid for. This is not to make it easier for tourists not speaking Japanese, because everything is written in Japanese. Thus, in order to operate the machines you have to have some basic skills in Japanese. The ticket-vending machines with a touch screen are easier to operate; they have pictures of the menus, giving you at least an idea of what you will get.

Some sushi restaurants have sushi served with conveyor belts. This phenomenon has recently become popular in the West as well. However, I thought this was relatively new in Japan too, but I learned that this way of serving sushi goes back to the 50s. This indicates how long history the Japanese have with automation. It was a bit hard understanding the system at first, but as soon as you knew how to pay for the dishes you chose, it made it easier eating at these restaurants than at other places. You could just sit down, and take whatever looked tasty. There was no need trying to decipher a menu, or any risk of ordering something you didn`t know what was.

The hardest thing was buying tickets for concerts, sumo matches or any other type of cultural event. I thought I could go straight to the venue when I wanted to see a concert, and buy tickets there but this turned out to be the wrong way to do it. The girl at the ticket booth sent me to a Lawson convenience store, or "conbini" as they are called in Japan. There they have a special ticketing system called "Loppi" which is a vending machine where you basically buy tickets to all types of events and arrangements. This machine was very hard to operate, and the clerk at the conbini couldn`t speak English, so I ended up finding a "how-to-use guide" on YouTube.com.

For Kei-chan and the Japanese all the automatic machines maybe made the days easier, but for me and other foreigners still struggling to learn hiragana and katakana they it

made the days a bit more complicated. When the robot technology is advanced enough, I assume they will replace the automatic machines. Hopefully they will speak English. One thing I can conclude, is that the Japanese are used to dealing with automatic machines, so if the robot technology becomes advanced enough in the future, I am sure there will be no problems for the Japanese having to deal with robots.

8.5. Akihabara "electric city"

In the district Akihabara, the love for technology was apparent everywhere. Akihabara is known as "electric city," or "nerd capitol of the world". Where ever you look, you will see huge pictures of characters from the world of manga, on the tall buildings. Most of the pictures are commercials for some particular series. All the buildings in Akihabara were either huge arcade centres, manga stores, cafés with some sort of special theme, or huge electronics outlets. There were also many stores, only selling spin-off products from various manga series, and specialized stores only selling accessories for personal electronics.

The arcade centres have all kinds of games, from the classic "Super Mario Bros" games to 3D virtual reality games. There were two red SEGA (Japanese video game developing corporation, similar to Nintendo) buildings on the main road. They were exactly alike, but still it seemed they needed two of them, to manage all the customers. They were always packed with people, all days of the week. I spent some time in the biggest arcades trying to map who all these people were. There were all kinds of people, mostly groups of young people and couples on dates, but also, middle aged men and women in suits. What surprised me with these arcade buildings, was the fact that there were so many of them, and the fact that so many people of all kinds were there. Every district in Tokyo had at least one or two of these, but in Akihabara I counted eight in a relatively small area. The shortest one had only three floors.

Kei-chan told me that it was very normal going to the arcades. He told me, proudly that he was ranked number three in one of the games. This is another example on how technology is part of their daily lives. In Norway I would suppose only young boys would spend time in these types of arcades. I certainly enjoyed spending time at the arcades, but think it will never become as socially accepted in Norway, as it is in Japan. Here in Tokyo it was a completely normal way to spend an evening.

While in Akihabara, I spent some time in one of the many themed cafes. I usually went to a Gundam cafe. This cafe was themed on one of the most popular manga series *Mobile Suit Gundam*. The interior was decorated in the style of the series, and the waitresses were dressed in uniforms from the manga. Mobile Suit Gundam is a manga series about robots. I wanted to find out if only fans of the manga series were at this cafe, or if it was a normal hangout for all types of people. The fact that robots were imaged made it of great interest to me. It attracted all kinds of people. Middle aged men and women, drank beer and ate lunch or dinner. Groups of teenage girls were sitting with their smartphones giggling. There were absolutely no indication that this cafe was only for fans.

These examples indicate how "normal" technology and themes from manga is in the daily lives of the Japanese. Another example I find interesting is the stores that sell accessories for personal technologies. They sell all kinds of decorations, not just for smartphones, but also for microwave ovens, for TVs, for computers, and any other technological device you would find in any home. Akihabara was packed with technology and with imagery from manga.

8.6. Summary

The environment of the Japanese living in Tokyo as we have seen, was packed with electronics and automatic devices. It wasn`t the amount of technology, however, that to me was significant. Compared to the West, there weren`t significantly more technologies in Tokyo, it was rather that I experienced the technologies as being uniquely Japanese. All the devices that I recognised from my own technological environment in Norway had a kind "childishness" over them, or were automated in Tokyo.

In Akihabara we saw how technology and the world of manga merged and made the district known as "Electric City". The fantasies of the Japanese from the techno-optimistic manga were concentrated in that Akihabara. When the robot technology is finally advanced enough, Akihabara will probably be the first place robots will be a part of the environment.

9. FINAL REFLECTIONS

The term “robot” entered the English dictionary in the early 1920s, after the Czech play-writer Karel Capek made the play *Rossum`s Universal Robots*. Media took the term “robot”, which refers to the Czech word for “worker” describing the artificial workers, the engineer “Rossum” created in Capek`s play, and used it to describe machines that were doing what “Rossum`s” universal *robots* were doing, namely “slaving” and “serving” their human makers. Science fiction literature took the concept a step further. Western science fiction was too stuck with the phenomenon Isaac Asimov coined as the “Frankenstein Complex”, referring to the recurring theme where a creation of a scientist—like the plot in *R.U.R.*—becomes self-conscious and turn to eliminate its creators. Asimov, however, wanted to show that robots could actually be useful to human society. The robots he wrote about were benign machines that were used by humans in the future, to do human labour.

Engelberger, inspired by Asimov, called the *Unimate* a robot, and thus was the first robot created. In the USA the concept of the robot was related to machines, like the *Unimate*, mechanical devices that can manipulate objects. The humanoid robots that were in science fiction were illustrated as scary and wanting to destroy mankind, the “Frankenstein Complex”. This concept, of a machine made in the form of a human was kept in the domain of science fiction, there were no engineers who dared create “Frankenstein`s monster”. We can then see that the robot had a dual character; on one side, it was a terrifying fantasy as illustrated in science fiction, and on the other side, a machine in a factory working for its human masters. The first notion stayed in the Western shared imagination, while the other came into existence as industrial robots.

When the concept of the robot arrived in Japan, however, the dual concept of the American robot turned into something unified and uniquely Japanese. The areligious aspects of Japanese culture and the traditions with roots in animism and polytheism, had first and foremost no barriers—as mentioned the Judeo-Christian traditions had—to stop the robot from being made in the picture of man. Secondly, the pragmatism of their *a*religiosity could “make anything” a pseudoreligion. The idea of creating a machine in the image of man became an aesthetic quest. To reproduce nature`s most complex being with the art of technology became an ultimate quest for the Japanese roboticist. With the concept of *tsukumo-gami*, the artefact spirit in the back of our minds, where something as mundane as a chair or table have “soul”, we can imagine what a mechanical replication of a human being

would be considered having. Would the robot be a new form of life? Or, as Dr. Hosoda argued, that it will change the human mind.

The same time the robot came to Japan, the ideological aspects within the Japanese society where also in a state where any new technology was welcomed. Post war Japan was determined on basing the new modern Japan on science and technology, the ways of the Western world. They implemented the post-industrial and organizational advancements from the Western world, and promoted technological innovation. Technological innovation became an aspect of the Japanese ideology. At the same time Osamu Tezuka started becoming famous for his manga and anime, and had created a robot boy called Mighty Atom. The government, society, and the times pressured Tezuka into illustrating Mighty Atom as a symbol for advanced technology in a techno-optimistic future Japan, with a message being; Mighty Atom is a child of science, and he is good, therefore science must be good. One could speculate if the "childish" aspects of the technology I mentioned above can be seen as being influenced by how the technology of the future was wrapped up in the cosy and cute image of Mighty Atom.

When seen in relation to the aspects of Japanese culture, in which the concept of the robot evolved in, we can see that it was a natural thing for them to make robots in the form of man, namely humanoid robots. The traditions in animism and polytheism, the artefacts with "soul", combined with their pseudoreligious aesthetic quests to reproduce nature, and then, including the phenomenon of Mighty Atom, we can see how the Japanese robot is a total cultural concept.

Throughout this text, I have discussed the robot stripped from its fetishized form. We have seen how the environment in Japan, which we can refer to as the sociotechnical system, had a niche open for robot technology. The evolution of the robot can be seen as a stochastic process. Starting from being a Czech word referring to workers in a play, to becoming real artificial workers created with the arts of science and engineering. The stochastic process of the evolution of the robot happened in relation to the "adaption" into to the environment, the sociotechnical system, in which it was introduced. The sociotechnical system in Japan, as we have seen, had a niche for something as robot technology, and that something has become the robots the Japanese roboticists design and develop today. The innovation of robot technology is a cultural process. This cultural process of technological innovation, I argue, can be seen in all technology when stripped of its fetishized form.

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