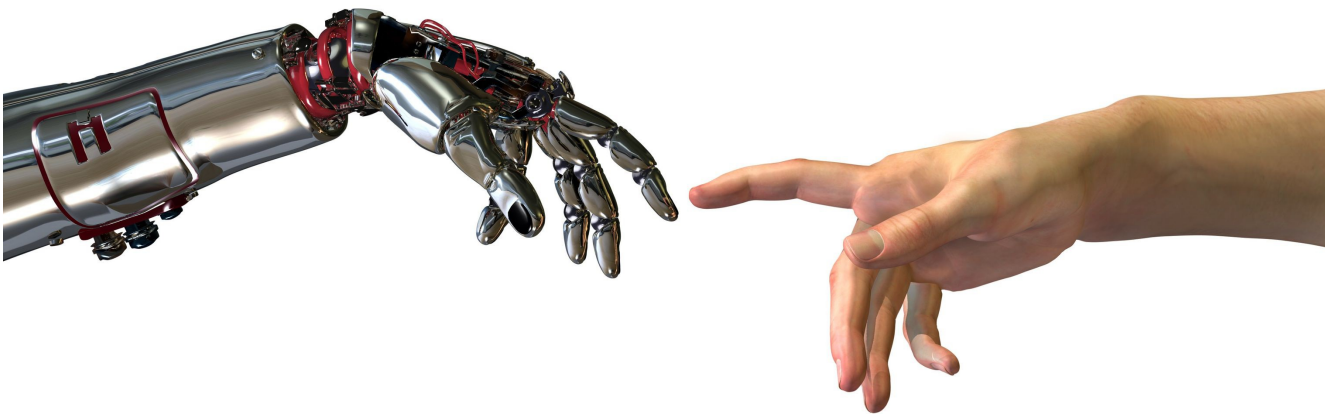


# KONNICHIWA ROBOT, SAYONARA HUMAN?

Construction and domestication of robots in Japan



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## *Thesis summary*

This thesis explores the robots of Japan in a historical and cultural context, to see how they are co-produced among a wide variety of actors in a network. It is seen both from the creators' side, through their scripting of what a robot should be understood and used as, and also from the user-side, through domestication of the robots. I focus on how the concept of “boundary-objects”, have developed through Japanese history and laid the foundation for robot acceptance. Different understandings of the concept “robot” has been constructed through a cultural-, religious- and social-historical context, leading towards the science fiction representations of robots in manga and anime. Japanese people living today have read about and seen robots in fiction all their lives, a fictional script that has lead the engineers and inventors of real robots.

In order to understand the robots in the Japanese society, I decided to seek them out, and have thus done one year of field-work in Tokyo and Osaka, in Japan. Methodologically, the thesis draws on observations and interviews in laboratories and science museums. How the people working on robots think about them are crucial in order to understand the robots themselves, and how people act around robots is greatly affected on the amount of “humanism” they perceive the robot to have. I also explain how it is to control a robot-twin, and see the challenges it raises when “he, she and it” becomes intermingled, and the gender and linguistic questions it arises when talking to and about robots.

Lastly, I follow the robots out of the laboratories, and into society, to see how they affect users as a welfare-technology. Japan is a rapidly aging society, and in dire need of manpower, especially in the welfare sector. One solution is to use robots for certain tasks, such as fetching of medicine, walking assistance and cuddles. How the elderly-users accept and domesticate robots tells us a lot on what roles the robots can and can-not do, and also how they can be developed further. Constructing an identity of a robot nation thus consists of many elements that together co-produces the network at large, with an underlying cultural acceptance of boundary-objects, such as robots.



## ***Acknowledgments***

A journey is best travelled in good company, and I have had great help from many different people. First and foremost I want to thank my thesis councilors Per Østby and Stig Kvaal for great ideas and counseling. I would also like to thank Nora Levold who made me interested in the *Studies of Science and Technology* in the first place, and who opened my eyes for the welfare aspect of the field. In addition, student counselor Jan G. Grande was very helpful with bureaucratic things. The journey would not have been possible without knowledge of the Japanese language, so “arigatou” (thanks) to my Japanese teacher at NTNU, Sachiko-sensei for making Japanese such a fun language to learn. Torimitsu-sensei at the Naganuma language school in Tokyo was also a great inspiration. On my one year exchange at Kwansai Gakuin University, I had great help from several professors: Timothy Kern, Zijiang Fan, Timothy Tsu and Thomas Burkman, each introduced me to parts of the culture that was crucial for this thesis. I also thank my informants, who allowed me to interview them.

I would like to thank Deimantè-chan, my travel-mate, for going on crazy journeys with me to ancient forests, dangerous volcanoes, ninja-villages and wild rivers. Being so alive and free helped me gain perspective. I would also like to thank my family who always supports me, even though I make some atypical choices, like moving to Japan. Especially my father who took time to come and experience Japan with me. In addition to also visiting me, I would like to thank Fabian-chan for cheering me up, Camilla-chan for designing my business-cards, Anna-chan for keeping all my things in Norway while I was away, and Elle-chan and Marte-chan for corrections. I lastly thank my grandparents who inspired me to research specifically on welfare-technology, and who helped put the whole study in perspective, and made me see that it was not just a study on something fun, but also on something that can benefit people, especially the elderly population.

I come from a small village at the outskirts of the world, in the top north of the small Scandinavian country of Norway, and staying and doing fieldwork in one of the world's largest nation's in terms of intellectual capacity, economical power, and ingenuity was a great and none the less, extremely fun challenge and experience. I hope to indulge the reader in some of the same wanderlust, thrill and exploring scientific awe that I have experienced in my year writing this thesis in Japan. I wish that you, the reader, will have a pleasant journey through this thesis, and perhaps be inspired to travel to Japan yourself, which in my opinion is the best place on earth. Maybe this is your first dive into the world of robotics, so “itterasshai, kiotsukete”, please go and come back safe!

16.08.2014. Trondheim, Norway. Roger Andre Søråa.



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## *Preface - A day in the land of the rising robots*

It is 7 AM, and the neighborhood is awakened by a car driving through, loudly playing a cute melody and today's announcements such as “remember that today is plastic-garbage day!” and “there has been a small earthquake, be careful!”. My small Tokyo apartment is of the traditional type, with the floor covered in *tatami* (straw) mats, on top of which resides my comfortable *futon* (mattress). I open one of the many wooden sliding doors, and tuck my whole bed-set into the spacious closet, before yawningly stumbling into the kitchen. As I open the door to the fridge, I am greeted by Penguin-san, my very own refrigerator robot.<sup>1</sup> He tells me in a funny Western-Japanese dialect that “The light is hurting my eyes, please close the door mate, save energy!” I oblige to the penguin-robot's request, he is quite cute after all.

I then hear a voice coming from behind me: “coming through, please move!” It is Yuki, my landlady's vacuum cleaner robot.<sup>2</sup> She is already busily doing her cleaning for the day, and while I notice that I am out of food, Yuki is already finished and returning to her socket to charge, stating “all clean boss, have a nice day!” It feels quite nice to have someone to talk to in the morning, even though it is a vacuum-cleaner robot. After glancing around to see that no one sees, I whispers “you too Yuki”, even though she is a robot, I still feel she should have a nice day too.

I decide to go out and have *Kaiten-sushi* for breakfast. This is a special type of sushi restaurant, where the trays are moving past your table on a little mechanical tracks in the form of Japanese trains.<sup>3</sup> I see some egg-sushi that looks delicious, and grabs it of the second track. I then decide to use the table's tablet to order some salmon sushi, that arrives on the high-speed first track, where the special orders arrive. The little train-shaped plate-carrier stops at my table, prodding me to “please take your order dear guest!” I oblige to the sushi-train, in order to receive my delicious breakfast.

After breakfast it is off to study at the University, and I dive into the swarm of Japanese business people busily walking, but never bumping into each other. Such an order and politeness, even though I am in the busiest crossing in the world. As I enter the train station, a voice announces that the next train to my destination is arriving soon. I scan my cute *Totoro* (a blue bear creature) train-card-holder at the gates, and stand neatly in line, waiting to board the train. Around me are businessmen reading *manga* (comic books), cosplayer girls dressed up as their favorite *anime* (animation) characters, old ladies in *kimonos*, the traditional clothing of Japan, and monks on their way to the local temple. I depart the train, with a kind voice on the speaker reminding me not to step across the dangerous yellow line. I walk past a clothing

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1 In English, it is marketed as *Fridgeezoo Fridge Pet (Penguin)*.

2 There are a wide variety of vacuum-cleaner robots on the market, the one I encountered was of the Japanese type *Sharp Cocorobo Vacuum Cleaner Robot*.

3 The inventor of the *Kaiten-sushi*, Shiraishi-san, also invented a robot served sushi restaurant, but this has not been a success (yet).

store playing one of my favorite songs, *Senbonsakura* (a thousand cherry blossoms) sung by Japanese hologram superstar, *Hatsune Miku*, which lyrics depicts the crash between modernity and tradition:

*After a bold and audacious Westernization revolution,  
this is now an open and upright anti-war nation.  
As I pedal forward my bicycle marked with the Japanese flag,  
evil spirits will disperse from my bombs.<sup>4</sup>*

I notice that my throat feels a bit dry, thanks to the combination of 35°C and air-conditioning, but luckily *vending machines* are never far away in Japan. I walk up to one, and see my favorite beverage, *CC-lemon*, with “50 worths of lemons in each bottle”. No wonder Japanese live so long, their sodas are propped with vitamins. The vending machine asks me to “insert 10 more yen”, and thanks me when I do so, wishing me a good day, ending with “we hope to see you again”. I arrive early at the school, so I pull up my Nintendo Gameboy, to play some *Pokémon*. On the street, I see a trailer driving by, featuring two robots standing on the roof, a commercial for the famous *Tokyo robot-restaurant*, where girls in minimal clothing battle it out on giant pink robots.

Realizing I drank too much CC-Lemon, I try to locate the nearest bathroom. Luckily, the university has an interactive board where one can touch the screen and search for where one wants to go.<sup>5</sup> I see that the nearest bathroom is to the left, and automatically bow to the board when it says “thank you, good luck!” In the bathroom, I meet one of my most technologically advanced and evil adversaries, the Japanese toilet, called a *Washlet*.<sup>6</sup> Slowly approaching it, my horrors are awakened when it opens automatically, somehow *knowing* that I am present, saying “good day sir!” I know that if I sit down, I will have to push all the buttons before I can find the flush-button, with the result of hot water, cold water, hot air and cold air scattering everywhere in the process. Maybe it will even try to massage me, or warm the seat up, who knows what these toilets are really up to. “Sometimes the robot-revolution goes too far”, I mutter as I narrowly escape from the wrath of the toilet, and stumble out into daylight in the most technologically advanced nation on earth, ready for more robotic adventures.<sup>7</sup>

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4 The song was written by Kurousa-P, and is performed by Hatsune Miku. The song is in Japanese, but the translation can be found at: <http://www.animelyrics.com/doujin/vocaloid/senbonzakura.htm>. Accessed 27.May.2014.

5 This technology is often referred to as a *smart-board*.

6 The *Washlet* trademark is owned by Japanese toilet company Toto, but the term is often used on all “smart toilets”. The version that warms the seat too is called a *Warmlet* by the company, but this word is not often used by consumers.

7 This is a collection of things that happened to me while staying in Japan. Not all encounters happened on the same place or time as described here, but nevertheless, they did happen over the year I spent in Japan.

# 1 – How to study Japanese robots?

Japan is a world leading country in many scientific fields, researching, developing and constructing ingenious inventions that have greatly benefited humanity. One area where it excels is robotics. Japan is the primary producer and consumer when it comes to robots, with sales reaching 28,700 units in 2012.<sup>1</sup> The world's robot demand is rising rapidly, and whether we like it or not, we are going towards a more robot-heavy and automated society. Japan is already a long step into this future.

This thesis focuses on how the Japanese make robots, and what makes the robots Japanese. I will investigate this in a cultural-historical context, tracing the long lines back into Japanese history, religion and social structures, to find traces of the robot-concept in the country's past. The Japanese population is aging rapidly, and someone needs to take care of all the elderly. I seek to understand how and why robots could or should do this job, in a welfare aspect. The discourse is strongly interlinked in a seamless web of science, technology and cultural values; of past, present and future. It is thus the goal of this thesis to shine light on the interconnection of this interaction, but also the symbiosis between man and machine, in a Japanese context. The thesis question is thus:

*How are the Japanese robots developed through the cultural tradition of the country, and what possibilities and challenges does this raise for their users and producers?*

I seek to answer the question through thorough empirical qualitative data analysis, both including interviews with people who interact with robots on a daily basis, as robot researchers or robot communicators, and also through observations of robots that I have found through my fieldwork and travel in Japan, addressing the status of robots in society.

## What is a robot?

First and foremost, it is important to understand what a robot is. The word robot was first used by Karel Čapek in his play R.U.R. Rossum's Universal Robot (1921), “robata” meaning “servant” in the Czech language of which the play was written. It features industry-worker robots who are mistreated and not paid, and therefore rises against their

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<sup>1</sup> The International Federation of Robotics (2013) *Industrial Robot Statistics*. Available from: <http://www.ifr.org/industrial-robots/statistics/> Accessed: 30.May.2014.

human “capitalist owners”, which of course is a strong comment on the communism ideology at the time.



Figure 2: "Rossum's Universal Robots (R.U.R), from the 1938 TV-version.

The term robot was further popularized by Isaac Asimov in his novel *I, Robot* (1950), which gave the three laws of robotics:

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 orders given to 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.*<sup>2</sup>

These three laws are still used as a basis for ethical programming, although they have been criticized widely.<sup>3</sup> As the term was conceived in the fictional arts, both constructing robots and their meanings are still bound heavily to works of fictions. This thesis uses a lot of different words for specific kinds of robots; machines, robots, androids and cyborgs, but how are they defined by the dictionary? The *Oxford Dictionary* defines a machine as: “An apparatus using mechanical power and having several parts, each with a definite function and together performing a particular task.”<sup>4</sup> This energy can be

<sup>2</sup> Isaac ASIMOV (1950: ) *I, Robot*. US: Gnome Press.

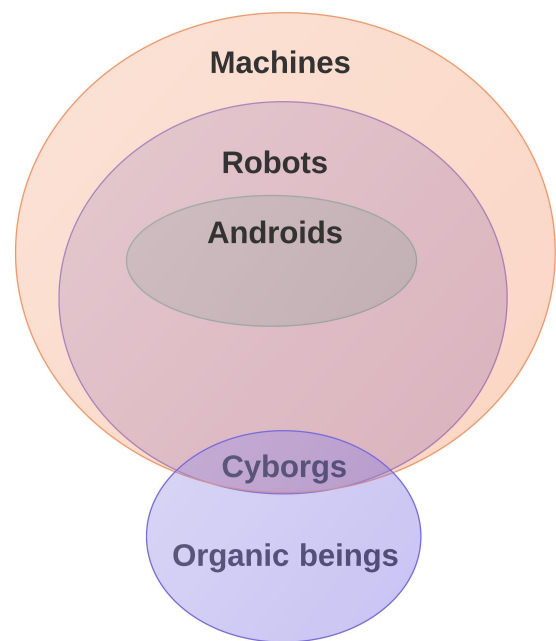
<sup>3</sup> See for example Ada Lovelace's objection on how machines can not obtain originality, or the mathematical objections through Godels incompleteness theorem argued for by Roger Penrose (1994) *Shadows of the Mind: A Search for the Missing Science of Consciousness*. US: Oxford University Press.

<sup>4</sup> From the Oxford Dictionary, at: <http://www.oxforddictionaries.com/>. Accessed: 30.May.2014.

chemical, thermal, electric etc. Motorization is another common trait, i.e. it often (but not always) moves. Some common machines are: Televisions, cars, radios and toasters. To narrow things down a bit, *robots* can be seen as a sort of sub-”species” of machines. A robot is “A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer.”<sup>5</sup> An important trait of robots, is that they often mimic life-like motions, making us think of them more in a living way, often giving them names and personality. Some common robots are: Automated Vacuum cleaners, robot dogs and industrial robot cranes.

From the wider term robot, I derive further down to the term “android”, which again can be seen as a subspecies of robots, and therefore a subspecies of machines. Dictionaries are often outdated in such rapidly advancing fields as robotics, defining it as “(In science fiction) a robot with a human appearance.”<sup>6</sup> This definition fails to emphasize the common trait of flesh and skin illusion, as androids are often built with a seemingly organic outer layer to appear more human. Androids have up until recently been more or less a concept in Science-Fiction, but recent technology has managed to bring some very interesting androids “to life”, or at least to a sort of mechanical life-like mimicking. Some well known real androids are: HRP-4C (Miim) and Ishiguro's Geminoid. In fiction there are numerous examples, such as: Ash, from the *Alien* series, Number 6, from the *Battlestar Galactica* series, and the Terminators, from the franchise with the same name.

If we add biology to the mix, we get the *cyborg*, or Cybernetic Organism. “A fictional or hypothetical person whose physical abilities are extended beyond normal human limitations by mechanical elements built into the body.”<sup>7</sup> A cyborg is both organic, and an artificial being at the same time. It is often seen as the next step in human evolution, but many critical voices argument that becoming cyborgs will put us at greater risks for “brain/body-hacking”, and “being too dependable on technology” and forgetting what it is to be human.<sup>8</sup> To further explain the distinctions, I made a Venn-diagram, to make clear what is a sub-genre of what, seeing that all



5 Same source as above (Ss).

6 Ss.

7 Ss.

8 Sherry Turkle (2011) *Alone together*. US: Basic books.

androids and cyborgs are also robots and machines, but also keeping into account that a cyborg is never an android, as they stem from two different “species”. The android is originally a machine, whilst the cyborg is originally a human. This is a very important distinction. Certain precautions must be made, for example, is a cyborg always a robot? This Venn-diagram is not set in stone, but is further developed as we construct robot-identity, as it is only a manner of definition. But these definitions only takes into account the technical terms, which is too simple, as concepts such as robots are produced in a collaboration between different fields. What does research on the field tell us?

## Previous research

The same year as iRobot was published, Alan Turing published his paper titled *Computing Machinery and Intelligence* (1950), which presented the *Turing test*, which is used to determine if machines can have/fake artificial intelligence. This is done by putting a human interrogator in one room, asking questions through text to two other rooms, one containing a human, and one a robot. If the interrogator cannot decide which room contains the robot, it has passed the test.<sup>9</sup> Robots continued to be represented in fictional works, but as humans gained the expertise to build them, academic works on the topic started to emerge. Robots have been the topic of many books and studies, most of which are in the technical field, such as: Karwowski and Rahimi's *Human-Robot Interaction* (1992),<sup>10</sup> Russel's *Artificial Intelligence: A Modern Approach* (2009),<sup>11</sup> Shneiderman et al. *Designing the User Interface: Strategies for Effective Human-Computer Interaction* (2009),<sup>12</sup> all of which gave insight in the technical aspect of machines and programming. Fields such as man-machine interaction does have a very clinical “hard science” approach to how we interacts with machines, but they do not take on the question on how and why humans and robots interact, but builds only on the premise that we do interact, treating the sociological aspect of it as a black box that can be drawn diagrams and usability charts around. The scholar Martin Baily argue for a productivity puzzle theory: “Apparently we are getting better at making computers, but we still don't really know what to do with them once they're built.”<sup>13</sup>

Robots have also been studied in relation to other fields such as: economics - Ford's *Lights in the tunnel* (2009), Engineering - Dorigo's *Robot Shaping: An Experiment in Behavior Engineering* (1998) and Linguistics - Dautenhahn and Saunders's *New Frontiers in Human Robot Interaction* (2011), but when it comes to social sciences,

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9 Alan Turing (1950) *Computing Machinery and Intelligence*. UK: Mind 49: 433-460.

10 Waldemar Karwowski and Mamsour Rahimi (1992) *Human-Robot Interaction*. US: CRC Press.

11 Stuart J. Russel (2009) *Artificial Intelligence: A Modern Approach*. US: Prentice Hall.

12 Ben Shneiderman and Cathrine Plaisant (2009) *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Fifth edition. US: Pearson.

13 Martin Baily (1991: 112) *Brookings Papers on Economic Activity, Microeconomics*. USA: Brookings Institution Press.



actual robots have been quite understudied.<sup>14</sup> The *cyborg* has as a concept been used as a metaphor in studies, most notably in Donna Harraway's Cyborg theory, stating that we "have all become cyborgs",<sup>15</sup> but she does not address the actual mechanical cyborgs in her theory, but rather uses it for symbolism:

*The cyborg is a creature in a post-gender world; it has no truck with bisexuality, pre-oedipal symbiosis, unalienated labour, or other seductions to organic wholeness through a final appropriation of all the powers of the parts into a higher unity.*<sup>16</sup>

Harraway's cyborg is a metaphor, but the word is now an established creature who does walk among us, and most important of all, cyborgs are first and foremost humans, who happen to have been mechanically modified. The cyborg that Harraway describes is perhaps hundreds of years into the future, and something completely different than the actual status quo. Harraway's cyborg is often cited in works about cyborgs, but it needs redefining, as it comes of as an anachronism in today's network of robotics. Actual cyborgs living today holds little of Harraway's extreme properties: "The main trouble with cyborgs, of course, is that they are the illegitimate offspring of militarism and patriarchal capitalism, not to mention state socialism." But cyborgs today are just normal people who happen to have robotic parts. While Harraway puts her hope in the cyborgification, others, like Sherry Turkle, sees the technologification and connectivity in a more critical manner:

*We go online because we are busy but end up spending more time with technology and less with each other. We defend connectivity as a way to be close, even as we effectively hide from each other. At the limit, we will settle for the inanimate, if that's what it takes.*<sup>17</sup>

Turkle is a major researcher on the sociology of robotics, and focuses on how we interact with robotics, and how this affects us.<sup>18</sup> In her book "Alone together", we are given a quite dystopian view on how robots, from pocket Tamagochi, to androids, affect their human users. Turkle is based in America, and primarily focuses on American robots, albeit she does mention some of the Japanese robots that are the focus in this

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14 Martin Ford (2009) *The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future*. US: CreateSpace Independent Publishing Platform Marco Dorigo (1998) *Robot Shaping: An Experiment in Behavior Engineering*. US: Massachusetts Institute of Technology.

Kerstin Dautenhahn and Joe Saunders (2011) *New Frontiers in Human Robot Interaction*. US: John Benjamins B.V.

15 Donna Harraway (1991) "A Cyborg Manifesto. Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* p. 149-181. US: Routledge.

16 Ss

17 Turkle (2011:281 ).

18 Ss.

thesis too. Turkle's focus is heavily based on the psychological level, but she does not cover what “becoming” an android feels like, in contrast to Haraway who does this only metaphorically. This thesis thus seeks to re-construct and connect Turkle's scientific psychological robot findings with Haraway's cyborg theories, but specially bound to Japan and their robots.

Some advocate that the term cyborg can mean larger systems of technology, such as a city or the internet, but this term is very confusing. I argue for a very simple definition criteria, putting humans on the left side of a line, and robots to the right. As humans approach the right, they become cyborgs, and as robots approach the left side, they become androids. What Haraway argues for, as I read it, is the actual meeting point of cyborg and android, human and machine, where we are not sure who are the “dominant-specie” in the relation. That is a theoretical question, which Haraway is well in place to discuss, but to mash up the definition of a cyborg does more harm than use, her views are obsolete, and needs to be redefined to the world humans, androids and cyborgs currently inhabit.

Another field of study that has long not been prioritized by Western scholars is Japan itself, and its complex society. Whilst some scholars advocate for Japan Studies, others prefer the term Japanology. As Japan was a closed country throughout the Western middle-ages, little knowledge on the country and its people came out at that time, except from some Eastern European sources. It wasn't really until the war, when Japan tried to take on military and research superpower US, that the country was finally starting to attract researchers from the outside, such as Ruth Benedict, writer of “The Chrysanthemum and the Sword”, who were tasked by the US armed forces to better understand the enemy they fought at the time. Benedict never sat foot on Japanese soil, but could only use the information war captives gave her, thus resulting in a very biased information pool, but nevertheless, an opening to research on Japan. After the war, many studies have been done on the Japanese society, such as “Japan Emerging”, “Japan: A documentary History” and “A modern History of Japan”, but few of these connects the studies of Japan to the studies of robotics.<sup>19</sup>

What then, if we connect these two fields of research; robots and Japan? The previous research done on this have been very concentrated on specific robots' usability and technicality, such as Nakanishi et al (2013) *Evoking Affection for a Communication Partner by a Robotic Communication Medium*, Fong et al (2003) *A survey of socially interactive robots* and Dautenhahn et al (2005) *What is a Robot Companion – Friend*,

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19 Andrew Gordon (2009) *A Modern History of Japan*. US: Oxford University press.

Lu, David J. (2005) *Japan: A Documentary History, The Dawn of History to the Late Tokugawa Period*. US: East gate book.

Karl Friday (2012) *Japan Emerging: Premodern History to 1850*. US: Westview Press.

*Assistant or Butler?*<sup>20</sup> What I thus discovered when putting together the previous research, was a hole in the cosmology that the research material presented, there were simply very little research done on robotics in society, and more specifically, in the Japanese society, which is the most robotic country on earth. The most thorough work on this as of today is Frederik L. Schodt's book *Inside the robot-kingdom*, from 1988, which takes on many of the questions raised in this thesis, but due to the mere fact that 26 years have passed since its publishing, many new robots and theories have emerged. Also, the book's historical focus is from the opening of Japan in 1853, ignoring larger historical pattern prior to that date. This thesis thus aims to complement Schodt's book both in the aspect of post 1988 robotics and tendencies in society, whilst also adding knowledge to the pre 1853 historical lines. I seek to re-actualize the questions Schodt asks in his book, in a newer perspective.

Some books on the sociology of robotics outside of Japan exists. In Singers “Wired for War”, which takes up the notification of the military, with drones, mine-sweeper robots etc.<sup>21</sup> Japan is mentioned, but in a peace context due to the Japanese constitutional article 9 which states;

*Aspiring sincerely to an international peace [...] the Japanese people forever renounce war as a sovereign right of the nation and the threat or use of force as means of settling international disputes. [...] land, sea, and air forces, as well as other war potential, will never be maintained.*<sup>22</sup>

Effectively, Japan does not focus on military robots, as the US heavily does. Japan is however mentioned in the book many a time, but more in a contrast to the war-focused US industries. When conducting research on the different robots researched in this thesis, I noticed a strong correlation between how long robots have been on the market and the share amount of research done on them. Much of it was technical papers, researching them from an engineer point of view. There is also a correlation between economical interests and research on each robot, as robots sold to consumers tend to have more research done on them. The difference being thousands of articles on consumer marketed robots, contra hundreds of articles on the robots that up to now have stayed in the laboratory. My aim in this thesis is thus to add knowledge on the sociology of Japanese robotics in a 2014 context, through my field of study, which is called

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20 Junya Nakanishi et al (2013) *Evoking Affection for a Communication Partner by a Robotic Communication Medium*. From: <http://hai-conference.net/ihai2013/proceedings/pdf/III-1-4.pdf>. Accessed: 30.May.2014.

Terrence Fong et al (2003) “A survey of socially interactive robots.” In *Robotics and Autonomous Systems* 42 (143–166).

Kerstin Dautenhahn et al (2005) *What is a Robot Companion – Friend, Assistant or Butler?* From: <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.63.9643>. Accessed: 30. May. 2014.

21 Peter Warren Singer (2009: 167) *Wired For War: The Robotics Revolution and Conflict in the 21st Century*. US: Penguin.

22 From the Japanese constitution, article 9. An online English version can be seen at:

[http://japan.kantei.go.jp/constitution\\_and\\_government\\_of\\_japan/constitution\\_e.html](http://japan.kantei.go.jp/constitution_and_government_of_japan/constitution_e.html).

Studies of Science and Technology.

## ***Studies of Science and Technology***

Science and Technology Studies (STS) is a relatively new field of study, which has grown in relevance since its origin in the 1960s. STS seeks to open the black boxes of technology in a social context, to see how technology and culture is constructed in a synergy in the wider sociological network they are part of. The “hard sciences” often ignores or forgets the social parts of the technologies they describe, and this is where STS enters the stage to fill in the gaps. STS has three primary theoretical directions, *Large Technological Systems* (LTS), *Social Construction of Technology* (SCOT) and *Actor-Network Theory* (ANT).<sup>23</sup> I use ANT, and its subcategories of *co-production* and *domestication* as the main theoretical framework. ANT focuses on non-human actors, and robots are very special in the part-humanity they inhabit. ANT is also suitable for analyzing a system still in change, whereas LTS is better suited for already closed controversies.

The field of Japanese robots in society have not been researched much by STS scholars, but there are parallels that can be drawn to previous STS works in similar fields, such as Collins' *Science Studies and Machine Intelligence*, which focuses on artificial intelligence, Edwards' *From “Impact” to Social Process: Computers in Society and Culture*, which focuses on older computer types, and Nye's *Technology Matters – Questions to Live With*.<sup>24</sup> STS have long criticized early technological research to be too deterministic, i.e. technology was seen as something fundamentally good or evil. STS' response to technology determinism is to see that technology can be seen in very positive or negative concepts, but in reality, it is all about what meanings we put into it, i.e. our construction of a technology. The social meanings of a technology is often black-boxed however, thus resulting in determinism. This is also often the case with Japanese robotics. This thesis seeks however, in good STS spirit, to open this black-box to fill the hole in the previous research, where the sociology of robots needs to be placed.

### **Actor-network theory**

ANT is a theory that focuses on how different actors together creates a network of ideas

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23 See: Bijker, Wiebe Hughes and Pinch (1987) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. USA: The MIT Press.

24 Harry M. Collins (2004) “Science Studies and Machine Intelligence” in Sheila Jasanoff et al (2004) *Handbook of science and technology studies*, Thousand Oaks, CA: Sage.

Paul N. Edwards' (2004) “Impact” to Social Process: Computers in Society and Culture” in Jasanoff, Sheila et al (2004) *Handbook of science and technology studies*, Thousand Oaks, CA: Sage.

David Nye. (2007) *Technology Matters – Questions to live with*. London: The MIT Press, Cambridge.

or concepts, such as “Japanese robot”. It was developed by Bruno Latour and Michel Callon in the 1960s, and is a theory in development.<sup>25</sup> The actors can be both human and non-human; e.g. politicians, ideas, objects and policies who affect a network in a specific direction: “Actant networks (...) treat humans and machines as indistinguishable as far as their ability to contribute to the network is concerned.”<sup>26</sup> This does not mean that the two groups contribute equally, but rather that a focus on non-human actors is of great importance. A key-stone in ANT is to analyze who affects the network by manipulating it to his/her/it's “will”.

An ANT network distinguishes between *intermediaries* and *mediators*, of which only the latter transforms their input to a new form of output, thus changing the network. *Intermediaries* are more static, and does not change the flow of information that goes through them. *Translation* is another key-concept of ANT, and describes how actors are given identity and defined, but also changed and redefined, in a co-production. In translation, a concept is translated, or re-formulated so that different actors buy into the idea, and accepts it, and for the network to grow stronger as a result. Actor-network theory follows four stages of translation:

1. *Problematize the case*, where the problem is defined.
2. *Defining automatic passage-points*.
3. *Enrollment of actors*, where the wheels are put in motion to reach the goal.
4. *Mobilizing allies*, where outside help is obtained to the network.<sup>27</sup>

ANT also uses the term *boundary-objects* (also known as tokens), which are things that are passed between the different actors of the network, who gradually are defined and redefined by the process. Robots will be analyzed as important *boundary-objects* in this thesis, as they are often redefined when going from one actor to another. I will use ANT to analyze the actor-network of Japanese robotics, to see how different people, institutions, and traditions bounces the concept of the robot between them as they define and redefine it. The *generalizes symmetry principle* that states that human and non-human actors should be treated on the same terms have also been the biggest critique on ANT. It states that human and non-human actors should have the same “possibility/opportunity”, to be treated on equal terms when it comes to their effect on the network, but does not imply that they have the exact *same* effect on it.

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25 Bruno Latour (1996) “On actor-network theory: A few clarifications.” In *Soziale Welt* 47. Jahrg., H. 4 (1996), pp. 369-381.

26 Collins (2004: 298). “Actant” is synonymous to “actor”.

27 Bruno Latour (1996).

## Co-production

A central topic in ANT is the theory of *co-production*, where society and technology together produces new ideas and knowledge, developed by Sheila Jasanoff.<sup>28</sup> Society is formed by technologies, and technologies are formed by society. It focuses on how designers and engineers together with other interest groups in a society co-produces technologies, in comparison to just seeing the engineers as creators. User-groups are also important in the producing of a technology, as they are the ones who ultimately chooses how to use it. Knowledge as produced not as social-constructions, but rather as more dynamic system, e.g. as an actor-network, which is more dynamic than a pure sociological view.

A critique on co-production is that it can be used too loosely, i.e. cover too much without giving any real feedback. Nevertheless, co-production is a theory that has gained much interest in Japan, in topics such as collaboration by the local government and the public citizens in urban planning, political responsibility of citizens in arenas of voicing concerns, and disaster planning and reaction e.g. from the Great Hanshin earthquake.<sup>29</sup> Co-production will be an important part of the network, and I will use it to see how the different actor produce the concept of the robot, together.

## Script

*Scripting* is when producers of a technology tries to define users, and creates the technology based on the user assumptions. It is done by analyzing the user-process. Latour used script to ask what actors did themselves, as well as the delegation of tasks to other actors, which he also called a scenario.<sup>30</sup> Madelene Arkrich has since redefined script, and argues instead to use script as a theory to describe how producers and designers project the users to use the technologies.<sup>31</sup> She is seen as the mother of modern script-theory.

Arkrich more or less sees script as a final product of the assumptions made on end user, a sort of manual. She also emphasizes the role of users in redefining technologies, which in turn changes the script: “In order to analyze the actual scripts and relationships

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28 Sheila Jasanoff (2006) *States of Knowledge: The co-production of Science and the Social Order*. UK: Routledge.

29 Araki, S. (1990) *Sanka to kyodo atarashii shimin, gyosei kankei no sozo*. ( Roughly translated: “Creation, cooperation and participation of new citizen-government relationships”). Tokyo: Gyōsei. Not available in English.

30 Bruno Latour (1992) “Where Are the Missing Masses?”, 1992. In *Shaping Technology-Building Society*. Studies in Sociotechnical Change. Wiebe Bijker and John Law (editors). US: MIT Press, Cambridge Mass. pp. 225-259.

31 Madeleine Arkrich (1992) “The de-scription of technical objects.” In Bijker & Law (1992) *Shaping Technology / Building Society: Studies in Sociotechnical Change*. Wiebe Bijker and John Law (editors). US: MIT Press, Cambridge Mass. pp. 205-224.

affected by the artifact, we have to go back and forward between the designer's projected user and the real user."<sup>32</sup> Another scholar who focuses on scripting is Steve Woolgar, who focus product deveolpment process.<sup>33</sup> I will use the script framework to analyze how producers of robots think about the robots they make, and why they make them the way they do. A critique on scripting is that it focus too much on the producers, and not the users. A remedy to this is to see it as a yin/yang relationship to *domestication-theory*, described below.

## Domestication

*Domestication-theory* describes how users adapt to technologies, in contrast to scripting, and sees how users domesticate a technology regardless of its manual. The theory was made by Roger Silverstone and Leslie Haddon, and has since been redefined many times.<sup>34</sup> It looks at what social meanings a technology holds, making it a social theory closely interlinked to other STS theories such as *ANT* and *SCOT*. Domestication theory analyses the giver/receiver relationship of "the domesticator", and "the domesticated", e.g. a dog owner who domesticates his dog, but who also in turn is affected by the domestication process. Another important part of domestication theory is the symbiosis between a technology's materiality and the symbolism bound in it, i.e. a technology is not only a black-box of wires and cords, but is also a communication device, a helper and friend, or an intruder in the daily life. It can hold many, many more symbolic meanings than the mere physical manifestation.

Domestication research follows the technology out of the laboratory and into society.<sup>35</sup> It is therefore bound to thorough case studies, which it has been criticized to rely too much on. I have seen the script and domestication process as a synergy, a yin and yang relationship between a technology, user and developer. Domestication theory is often used on the single user, but in this thesis I have chosen to use it to analyze a nation and how its culture has domesticated a technology. I have chosen to use the *Trondheim-model of domestication*, which focuses on how we are "making technology our own."<sup>36</sup> The model allows us to see the *practical*, *symbolical*, and *cognitive* sides of a domestication process. Practical domestication is how technologies are actually

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32 Madeleine Arkrich (1992: 205-224).

33 Steve Woolgar: "Configuring the user: the case of usability trials." In : John Law (ed.): *A Sociology of Monsters: Essay on Power, Technology and Domination*. London and New York, Routledge: 1991.

34 Roger Silverstone and Leslie Haddon (1993) *Future Compatible? Information and communication technologies in the home. A methodology and a case study*. SPRU, University of Sussex.

35 Merete Lie and Knut Sørensen (1996). *Making technology our own?: domesticating technology into everyday life*. Norway: Scandinavian University Press.

36 Ss.

implemented physically, whilst symbolical domestication focuses on the symbolic meanings technologies are given. Cognitive domestication focuses on what users think about a technology, consciously and unconsciously. The Trondheim-model is useful when analyzing a cultural phenomenon, as the past is littered with symbolism, the present with practical solutions, and the future with thought-experiments, i.e. cognitive domestication.

## ***Method – How to talk about robots?***

Knowledge about a phenomenon can be obtained in many ways, and my study has focused around *exploring science*. While exploring science have very open premises, that is, you normally do not decide what to focus on until you have travelled to the place, and looked a bit around, I had one premise that I wanted to follow, namely the technological path of Japan. Japan is world leading in a lot of different fields, and as I closed in more and more on the exact theme, I began to discover that Japan's social construction of robots was something research was missing out on, so I decided to fill the gap with this thesis. My research method focused on interviewing and observation.

## **Interviewing – talking about robots**

I decided to interview people who interacted with robots, following the basic guideline of: “Interview as many people as needed to understand what you need to know,”<sup>37</sup> following the seven stages of the interview process: “Thematizing, planning and designing, interviewing, transcription, analysis, verification and reporting.”<sup>38</sup> After deciding on the topic of robots in Japan, the *thematizing*, there was a lot of *planning* to be done, but planning too much would be just as futile as planning too little. My kind of scientific work required me to be very flexible, not only in the aspect of *how* I studied the robots of Japan, but also in the question of *who* to talk to about them, and also *which* robots I would have access to. One of the first things I did before leaving Norway, was to create an overview regarding Japanese robotics. As I saw previously, this is a STS-tool primarily used to see technological innovation, progress, and interaction, but I made my own version of “what do I want to observe, who do I want to interview, and who must I contact in order to do that”.

Social studies uses a term called “gate-keeper”, which is a person that when found, will help you to reach where you want to go. By contacting the *gate-keepers* in my network, I made ripples in it, but few people answered my email, so I needed to come of as more

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37 Kvale, S. et al. (2009: 129) Det kvalitative forskningsintervju (“The qualitative Science Interview”). Norway: Gyldendal.

38 Ss.



professional. That was when I decided to introduce a non-human actant to the network. I resorted to make a web-page about my project, which hyperlink I put in the bottom of all my emails, to give a more serious touch to my project, which resulted in giving me the interviews I needed.

All in all seven interviews were conducted. Five of these were conducted in science-universities and corporate-laboratories, and two were conducted at science museums. The informants were all working in the robot industry, either as engineers building the robots, scientists/students experimenting on the robots, or as science communicators working as human interfaces between the robots and humans. The later group has been a national political focus, and many Japanese universities have special science-communicator programs.<sup>39</sup> The informants had some variation in age and gender, with the majority being male, and age ranging from early twenties to late forties. All informants were Japanese.

The original plan was to have the interviews in English, but some informants lacked a certain English proficiency, so sometimes questions and answers had to be sorted out in Japanese (which I speak at intermediate level). All informants had at least a master-degree, and most of them either held or were working on a phd. Their educational background were mainly in robotic engineering, but some had background in other fields such as biology and mathematics. This is of course a biased informant-pool, but then again, the science studied is very elitist, which leads to certain challenges: “Experts are used to getting interviewed, and can knowingly or unknowingly have prepared 'speeches' to support the views they wish to communicate under the interviews,”<sup>40</sup> but I was not interested in making quantitative data gathering, but rather to get insight in how it feels to be working with robots, a qualitative approach.

Each interview was sound recorded, and written down right after the interviews were over, in order to go through them more easily as text. I decided to utilize the sociological method of *Grounded Theory* to analyze the data, focusing on flat empirical coding in combination with vertical empirical coding, resulting in a consequential matrix of data. The interviews gave important information on how it is to work with and be around robots. Whilst other researchers focus directly on the professor and creator level, or on the consumer level, I wanted to see the communicators in between, i.e. the people who work with the robots on a daily basis, but who haven't necessarily created them.

The result of focusing on the human-interfaces between robots and users gave some very interesting results, as they form a strong basis for understanding the interaction between

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39 Fujigaki, Y. (2009: 516) “STS in Japan and East Asia: Governance of Science and Technology and Public Engagement” in *East Asian Science, Technology and Society: an international Journal*, Volume 3, Number 4, 2009, pp 511-518 (Article). US: Duke University Press.

40 Steinar Kvale (2009: 159) *Det kvalitative forskningsinterview* (“The qualitative Science Interview”). Norway: Gyldendal.

script and domestication, thus strengthening the impact of the sources, of which all proved to be useful, and I detected no bad sources from my interviews. However, as my Japanese was not perfect, and my informants' English was neither, some language problems did occur. Also, the Japanese culture is quite different than the Norwegian, especially concerning politeness, but all in all, the data gathered have given good insight in the questions I set out to explore, despite the cultural boundaries.

## **Observing – looking at robots**

Throughout my year in Japan, I also conducted a wide variety of robot observations, some were so interesting that I decided to include them in this thesis. The robots described below, except the statues, were the objects of the interviews as well. These robots will be described more in detail in the preceding chapters

### *Autonomous (self-moving) robots*

- AIBO, a robot dog that can walk, play, and fetch things.
- PARO, a robotic seal made for elderly care.
- ASIMO, the most well known android as of today.

### *Teleoperated robots*

- Geminoid, a teleoperated android modeled on adult humans.
- Hugvie, a pillow which you insert your phone into.
- Telenoid, a teleoperated android-like robot based on a child.

### *Robot statues*

- The Laputa-robot statue in the Studio Ghibli Museum, in Tokyo.
- The Tetsujin 28 Go robot statue in Kobe.

In Japanese universities graduate students normally enroll in a laboratory under the supervision of a professor, but due to some bureaucracy misunderstandings, I got enrolled in a full study-load program about language and culture, that proved to be the only way to get access to the country. In retrospect, this was a lucky mistake, as it required me to go to classes about Japanese history, religion, language and comparative culture, all of which gave me something I could use in my thesis. In contrast to having to just sit behind my desk and write my thesis, this double study load was demanding, but extremely beneficial to the thesis at large.

I have done the thesis as a qualitative research, in good STS spirit. When suitable, I have included quantitative research data, which in combination with qualitative data is called

*triangulation*.<sup>41</sup> In the wider social-science studies milieu, the term *triangulation* is also used for checking facts with two different methodical approaches, which of course will be done in this research since both observations, interviews and some literary research were made. I have not focused particularly on the technical aspect of these walking black boxes, but rather the landscape it walks; the Japanese society, the people it meets there, and how these two of planets earths most advanced beings; humans and their creation, the robot, act together.

## ***Thesis outline***

This thesis is divided into five main chapters. The second chapter takes on the different historical and cultural impact that makes Japan unique in such a way that robotics can flourish. It explores several different aspects of Japanese history, religion and social groups, comparing with robotic aspects.

The third chapter dives into the world of robotics in the laboratory, and presents three of the six robots studied, why they were created and how they affect their users. I will then turn my gaze inwards, when exploring what it feels like to *be* a robot and what types of questions this arises, looking at personality-shaping attributes of gender and the Japanese language.

The fourth chapter goes into one of the frontiers of robots, namely their use in elderly care facilities. I will here investigate Japan from a demographic point of view, seeing how the concentration of old people give rise to a need of robotics, and what the different strategies for implementing them are. I will here also look closely on research done on care-robots, to see how elderly people react to the robots.

The fifth and final chapter will collect the threads from the previous chapters, and put it into a larger context, also presenting the thesis findings. I will here also explore further how STS can be used in such an area as robotics. A mini-dictionary can be found in the back if any word or phrasing is unclear.

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41 Tove Thagaard (2003: 17) *Systematikk og innlevelse* (EN: “Systematic and empathy”). Norway: Fagbokforlaget.



## 2 - From iron tools to ASIMO

Whenever one wants to apply a new technology in a society, the technology must be accepted by its users, and Japan has a very interesting history in regards of accepting new things.<sup>42</sup> Guns were for example seen as less honorable than swords, so the samurai continued slaughtering each other with their *katana* swords long after the superior guns were known to them.<sup>43</sup> On the other hand, when the need to catch up with Western colonial powers came, Japan showed an enormous will to change to new and more advanced technologies. A similar leap into the future can be seen in the post-war, nuclear wasteland Japan, where the nation emerged as the world leading techno-nation, and scientists are extremely important, and robots are a national pride.

Robots are much more accepted in Japan than in the West, why is that? Is there something in the Japanese past, something buried in their cultural traditions that has made them accept “the other” so easy? When walking around in Japan, one cannot help to wonder how unique cultural traditions like ninja, sumo-wrestlers, tea-ceremonies and rock-gardens can coexist in the ultra-modern technological society. Is the culture itself ideal for technologies to flourish?

This chapter seeks to explore the historical, social and religious background of Japan, to find the cultural acceptance of robots. It does so through four of the most distinctive eras in Japanese history, and points to different people, society structures, religions and ideas that has contributed to the notion of the robot-concept as an accepted technology. These are: (1) The pre-medieval times, from 1 AD–1185 AD, looking at the role of the emperor and Japanese Buddhism. (2) The medieval period, known as the shogunate era, from 1185–1868 AD, with samurai and the religious practice of Shintoism. (3) Imperial Japan from 1868–1945, where Christianity will be discussed, along with the new roles of both emperors and samurai that came with the modernization. (4) Post-war Japan, where I will look at two of the most influential robots, who are now represented as statues in Japan, the Tetsujin-Go-28 robot and Studio Ghibli's Laputa robot.

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42 Wiebe E. Bijker, Thomas Parke Hughes, Trevor J. Pinch (1987) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. USA: The MIT Press.

43 Noel Perrin (1979: 45) *Giving Up the Gun: Japan's Reversion to the Sword, 1543-1879*. USA: Shambhala publishing.

## ***Pre-medieval (0 - 1 185 AD), hello world***

Japan is an ancient land, with a history that stretches back thousands of years, with the earliest findings of Homo Sapiens from the *paleolithic period* in 35 000 BC.<sup>44</sup> After the previous ice age ended in 11 000 BC, the islands of Japan disconnected from the mainland and formed the Japanese archipelago.<sup>45</sup> The time between 14 000 BC–300 BC is called the *Jōmon period* (meaning pottery), and is the earliest sign of Japanese civilization, albeit in a hunter-gatherer form. The period has some of the world's oldest known pottery.<sup>46</sup> At the end of this period, the inhabitants of Japan started agriculture, weaving and metal-working of iron and bronze, leading to the *Yayoi period* (named after an area near Tokyo), that stretches from 300BC–250AD.<sup>47</sup> A larger part of Japan was unified at the end of this era. One of the more prominent rulers was the shaman queen *Pimiko* (170-248 AD), famous in modern fiction for example in the *Tomb Raider* video game franchise.<sup>48</sup> The records tell that people were tired of men ruling, since it only brought rivalry and war, and therefore chose a female to lead them, since women were (then viewed as) more tuned to nature and the mystical forces. Lu explains this as follows:

*As to the political structure of the country (...) rejection of men rulers in favor of a female seems to indicate a widespread practice of shamanism. The queen, Pimiko, obviously served as a medium as did her successor Iyo.*<sup>49</sup>

The historical records from this time is widely debated, and most records comes from the Chinese Dynasties, who at the time was highly advanced. China and Korea had much influence on Japan in the centuries to come, from the key-shaped burial mounds<sup>50</sup> of the Kofun period (250 AD–538 AD), and the Asuka period<sup>51</sup> (538 AD–710) that followed, where a code of laws, a constitution, Buddhism, and monarchy was adopted. This is described as a period of Chinese fixation, according to Lu (2005: 22) “They

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44 Roscoe Stanyon, Marco Sazzini and Donata Luiselli (2009) “Timing the first human migration into Eastern Asia” in *Journal of Biology* 2009, 8:18.

45 Hirotooshi Nishiwaki (2009) *Formation History of the Japanese Islands* . From: <http://www.glgarcs.net/others/about.html> Accessed: 10.08.2014.

46 Keally, C. et al “Chronology of the beginning of pottery manufacture in East Asia ” in *Radiocarbon*, Vol 46, Nr 1, 2004, p 345–351.

47 Daniel H. Temple and Clark S. Larsen “Dental caries prevalence as evidence for agriculture and subsistence variation during the Yayoi period in prehistoric Japan: Biocultural interpretations of an economy in transition.” in *American Journal of Physical Anthropology* Volume 134, Issue 4, pages 501–512, December 2007.

48 From the *Tomb Raider* wiki at: <http://www.wikiraider.com/index.php/Himiko>.

49 Lu (2005: 11) exert from Mootori Norinaga's “Complete Works of Great Thoughts of the World”, in *Japanese thought* Vol. 54. 1927, p. 17-22. Tokyo: Shunjuusha.

50 Walter Edwards “In Pursuit of Himiko. Postwar Archaeology and the Location of Yamatai”. in *Monumenta Nipponica* Vol. 51, No. 1 (Spring, 1996), pp. 53-79.

51 Robert Hall “Some Rural Settlement Forms in Japan.” in *Geographical Review* Vol. 21, No. 1 (Jan., 1931), pp. 93-123.

chose only those features of Chinese civilization most advantageous to Japan.” How does the religious practice of Buddhism, and the monarchy in the form of the emperor connect to the concepts of robots? The answers lie in symbolism.

## Android emperors

The first written Japanese sources are from 712 AD, when the capital in *Nara* was established.<sup>52</sup> This is also the time when the current imperial family emerged, who still holds their seat today, making it the oldest monarchy in the world. The first royal rulers of Japan made many contributions to society, and held much power. The 33. ruler, empress Suiko who ruled from 592–628, adopted many principles from China. Under her rule, Prince Shōtok “promulgated the so-called Seventeen Article Constitution (...) a series of moral precepts and injunctions [which] quotes freely from Confucian, Legalist, Taoist and Buddhist works. (Lu, 2005: 23)”, which is one of the earliest constitutions in the world.<sup>53</sup> The emperors and empresses were said to stem from the Sun-Goddess Amaterasu, which made them also part deities:

*this country shall be ruled (...) forever and ever (...) by the descendants of the Sun Goddess. Thus on earth, there is no single deity who is unruly, nor is there a single person who does not pay obedience to the emperor. For ages eternal, the emperor is to remain the ruler of the realm and to be worshipped as the descendant of Amaterasu.*<sup>54</sup>

The emperors were not human, but neither fully gods.<sup>55</sup> This can be seen in the Japanese *kanji* (character) for king/ruler ”**王**”, where the top line represent heaven, the bottom line the Japanese people, and the middle line the emperor, as a messenger between heaven and earth.<sup>56</sup> The Japanese emperors can symbolically be seen as *androids* in a sense. Androids too, look human, but are not. They are just machines made to look human.<sup>57</sup> The very word *android* is greek for “man”+“form of”, which could just have easily been used to describe the emperor figure, since he/she is in the form of a human, but is really divine. Of the 128 emperors of Japan, 8 have been female, of which two have ruled two times.<sup>58</sup> The current emperor (*Akihito*), who is over 80 years old, have 2 sons and 1 daughter. The crown-prince (*Naruhito*) only has one daughter (*Aiko*), but due

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52 Lu (2005).

53 The constitution can be read here (In English): <http://www.duhaime.org/LawMuseum/LawArticle-1182/604-The-Seventeen-Article-Constitution-of-Japan.aspx>. Accessed: 10.08.2014.

54 Lu (2005: 267).

55 I do not differ between emperors and kings, but generally choosing the term emperor.

56 Information on the kanji from: <http://en.wiktionary.org/wiki/%E7%8E%8B>.

57 Information on android etymology from: <http://en.wiktionary.org/wiki/android>.

58 Julius Heinrich Klaproth (1834) *Nipon o dai itsi ran:ou Annales des empereurs du Japon*. Paris: Printed for the Oriental Translation Fund.

to the laws of succession, her cousin (*Hisahito*) will ascend the throne instead of her, which prior to his birth led to a huge gender-debate.<sup>59</sup> This is an interesting parallel to the development of androids, as I will explain in chapter 3, for where emperors are preferred male in Japan, androids are preferred female.

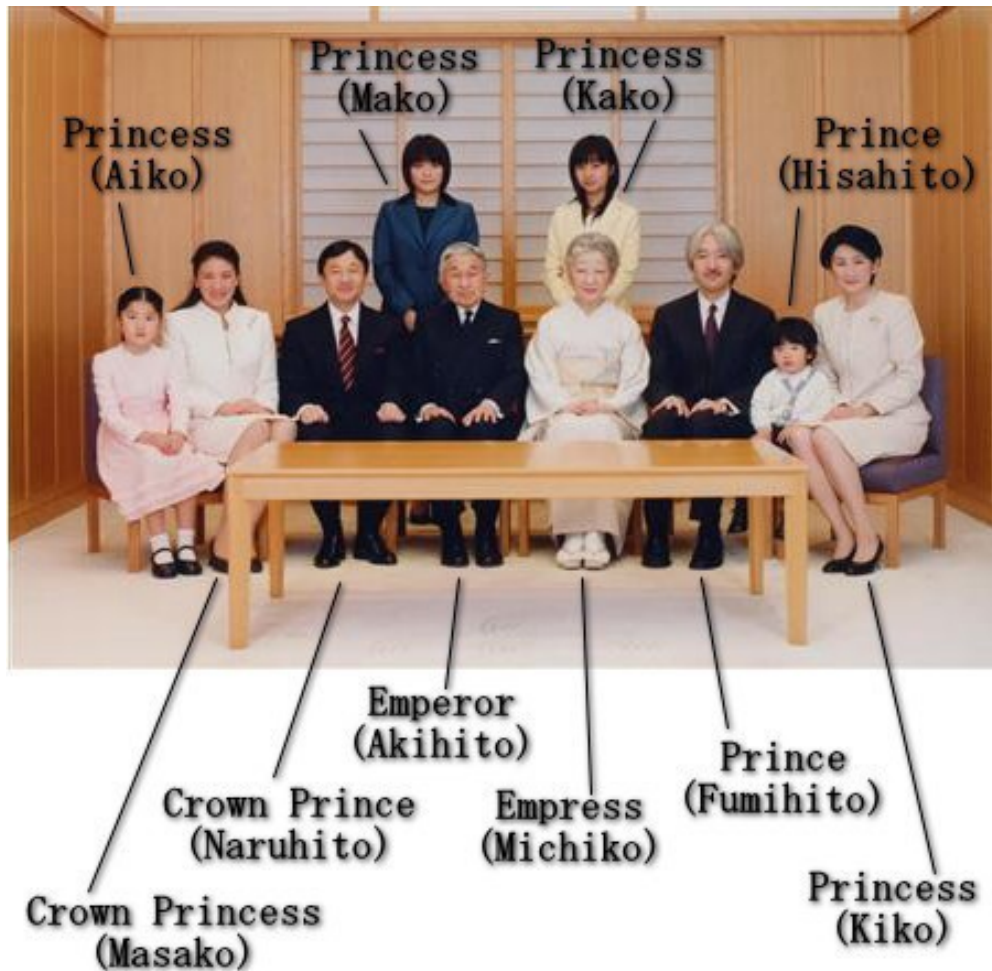


Figure 4: The royal family of Japan.

Japanese emperors have, until 1945 been seen as something “partly out of this world”, godly beings projecting themselves as mortals. I thus argue that emperors share this trait with androids, being something that “looks human, but is not”.

## Cyborg Buddhas

Buddhism came to Japan in 538 AD and “contributed to the establishments of new national institutions and to the development of a new set of values.”<sup>60</sup> As elsewhere, the religion spread quite rapidly, and “In the seventh century, Japan adopted Buddhism

<sup>59</sup> This law was made under imperial Japan, from Preussian models. The constitution can be read here: [http://japan.kantei.go.jp/constitution\\_and\\_government\\_of\\_japan/constitution\\_e.html](http://japan.kantei.go.jp/constitution_and_government_of_japan/constitution_e.html).

<sup>60</sup> Lu (2005: 46).



wholesale from China as a religion excellent for protecting the State.”<sup>61</sup> There were other religious traditions in Japan before that, but the rulers of Japan wanted something to help them control the population.

*The idea that Buddhism could protect the nation (...) was both an act of faith and a shrewd political move. The monasteries and nunneries became the outposts for the influence of the imperial power (...) through the moral suasion provided by the newly formed faith.*<sup>62</sup>

The goal of Buddhism is to reach enlightenment and become *Buddha*, which in Japan is a state of the mind, rather than the traditional *Nirvana-salvation* approach.<sup>63</sup> Japanese Buddhism therefore contains a *human boundary object*, the believer. It teaches that life is suffering, and then we are reborn to suffer more, but through becoming *Buddha*, we can end this cycle. Whilst this goal might be a bit farfetched for the general practitioner, living a good and happy life is also a goal. In fact, Japan is quite special in the context of personal salvation. “Buddhist philosophy has gone farther in Japan than in any other nation in teaching that every man is a potential Buddha and that rules of virtue are not in the sacred writings but in what one uncovers within one's own enlightened and innocent soul.”<sup>64</sup> One of the most famous Japanese forms of Buddhism, is *Zen-Buddhism*, who mainly focus on individual enlightenment.

As with cyborgs, who are part biological and part machine, the Buddhist practitioner can also be said to belong to two worlds in her strife to become *Buddha*. They start out as humans, but strive for something more. Important here is the distinction between “when one has reached Buddha-hood”, and “when one is not a Buddhist”, and the space between these two poles, belonging to the Buddhist practitioner. The seeker, who is in a state of ascension, is comparable to the cyborg, who is neither just a basic human or just a robot, but is both.

One of the most characteristic science fiction character roles is the rogue cyborg, who is on a quest to destroy humans and find itself. The cyborg science fiction medium is littered with cyborgs on personal quests of awakening. Cyborgs in fiction often have a religious, sometimes quite zealous, trait, realizing that they are something more than just one model out of many. As with the Buddhist seeker who also learns that one must “find oneself” so to speak. Sir Eliot Charles' (1936: 186) famous translated Zen-Buddhist quote reads as follows:

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61 Ruth Benedict (1946: 85) *The Chrysanthemum and the Sword: Patterns of Japanese Culture*. USA: Houghton Mifflin.

62 Lu (2005: 47).

63 Daniel Goleman (2008) *Destructive Emotions: A Scientific Dialogue with the Dalai Lama*. US: Bentam.

64 Benedict, (1946: 257).

*Zen seeks only the light man can find in himself. It tolerates no hindrance to this seeking. Clear every obstacle out of your way.  
If on your way you meet Buddha, kill him!  
If you meet the Patriarchs, kill them!  
If you meet the Saints, kill them all.  
That is the only way of reaching salvation.*<sup>65</sup>

The quote is not actually pushing the seeker to decide, but must rather be read metaphorical, as an anecdote to not be too concerned about other's way to enlightenment. The killing of Buddha refers to other peoples notion of Buddha, who should have no place in your own quest. Everyone must find their own way to reach enlightenment, the reason why they are created, a notion immensely popular among the cyborgs too, at least in fiction. The notion of Buddhism, and its transparent states is an important puzzle in the understanding of how robots came to be so popular in Japan.

### ***The shogunates (1185–1868), terminators among us***

Medieval Japan is characterized by a strict class-hierarchy.



**Figure 5: Class-structures in feudal Japan**

At the top we have the *emperor*, whose actual power was weakened greatly when the shoguns took over the power, but who nevertheless was an important symbol for the nation. Under him, the *Shogun* (meaning “general”) held power of the military, and was

<sup>65</sup> Charles Eliot (1936) *Japanese Buddhism*. US.

the de facto ruler Japan. The Japanese medieval period is actually divided by which shogun family held power. They were: The *Kamakura shogunate* (1192–1333), the *Ashikaga shogunate* (1336–1573) and the *Tokugawa Shogunate* (1603–1868).<sup>66</sup> The shogun ruled over feudal lords, called *daimyo* (meaning “big private land”), of which there were about 200 of. Some were more loyal than other, and daimyo that the shogun deemed untrustworthy were given land in the middle of the more loyal ones, to keep them in check. Each daimyo had a great number of warriors, *samurai*, protecting him. If a samurai had no master, he was called a *ronin*. The next social group were the *peasants*, who were normally heavily taxed, poor, and made up the largest population group. Under these again were the *artisans* and *merchants*. Some merchants grew very rich under the system, many became wealthier than the samurai even, but due to the class-system, they were seen as “less important” than even the poor farmers. Under the whole pyramid were the *classless*, such as prostitutes, and thieves.<sup>67</sup>

The first two shogunate periods, from 1192–1573 were quite bloody. Countless wars were fought, and the daimyo ruled Japan with an iron fist through their samurai warriors. In 1603 the powerful daimyō Tokugawa Ieyasu took control over Japan, and a long period of centralization and regulation followed. Religion, economy and politics were strongly regulated, and the nations withdrawal from the international scene, closing itself out from the outside world, a phenomenon called *Sakoku* (meaning “chained country”), and in the first time since ancient times, experienced a period of peace.<sup>68</sup> In 1854, the seclusion ended when US commander Perry intruded in the Yokohama bay with four war-ships, displaying cannons, forcing the Japanese to open the country to foreign trade.<sup>69</sup> While this was before Japan's industrial revolution, some concepts are important for the heavy industrialization and robotic development that later took place. I will therefore explore two important notions from this period in a robotic context, the *samurai* warriors, and the *Shinto* religion.

## Robot Samurai

Medieval Japan saw the rise of the samurai, another *boundary-object*. The samurai were Japan's warrior class, and were the only ones who was allowed to carry weapons. You could not become a samurai, you were born a samurai. As with robots, samurai ran a very specific algorithm, *bushido*, the code of honor, which in theory at least said that the

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66 Ichiro Aoki (2008) *Decentralization and Intergovernmental Finance in Japan*. From: <http://www.eaber.org/node/23074>. Accessed: 10.08.2014.

67 Class-system data from Japan 101 at: [http://www.japan-101.com/history/history\\_tokugawa\\_shogunate.htm](http://www.japan-101.com/history/history_tokugawa_shogunate.htm).

68 Mayumi Itoh (1998). *Globalization of Japan: Japanese Sakoku mentality and U. S. efforts to open Japan*.

69 John Lie (2001) *Multiethnic japan*. US: Harvard University Press  
and Gordon (2012: 19).

samurai should be chivalrous, honorable and loyal to their deaths. In a sense, the samurai were quite robotic, they simply did what they were supposed to, bound by *bushido*, just like a robot is bound by its *program*.<sup>70</sup>



Figure 6: Historical samurai.

*The tales of samurai stoicism are famous. They were forbidden to give way to hunger but that was too trivial to mention. They were enjoined when they were starving to pretend they had just eaten: they must pick their teeth with a toothpick.*

Of course, being a samurai, however monotonous it might have been, came with some advantages. “Until the middle of the nineteenth century only noble families and warrior [samurai] families were allowed to use surnames.”<sup>71</sup> Also, samurai did not have to work, but were given pensions from their daimyo protectors. They were also allowed (and supposed to) cut down peasants who stood in their way when they came riding: “legally samurai enjoyed the right to cut down on the spot any commoner who did not show proper deference”.<sup>72</sup>

The samurai culture also brought many non-violent things with it, such as tea-ceremony,

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70 Benedict (1946: 188).

71 Benedict (1946: 75).

72 Stephen Vlastos (1990: 9) *Peasant Protests and Uprisings in Tokugawa Japan*. US: University of California press.

and rock-gardening. The concept of samurai might have a nostalgic and historical air of excitement to it; heroic warriors, fighting to their death, feeling no fear. However, if one looks at it with today's googles, the picture of the samurai have a grimmer undertone. For who are today's feelingless warriors, who obey without objection, and kill with no rejection? Robots. And especially drones.<sup>73</sup> While humans are mostly known to fight for a cause, at least that is how we like to remember it in the history books: “I did it for the revolution!”, “for France!” “For the woman I love!”, but robots do not fight for a cause. They simply fight because they are programmed to do so, just like the samurai fought because that was what they taught to do their whole life. “ There was no question about where the samurai had to look for support; he was wholly dependent upon his lord.”<sup>74</sup> In chapter one I saw Asimov's three laws of robotics, they could just have easily been used to describe the samurai and daimyo relationship:

1. A samurai may not injure a daimyo or, through inaction, allow a daimyo to come to harm.
2. A samurai must obey the orders given to it by daimyo, except where such orders would conflict with the First Law.
3. A samurai must protect its own existence as long as such protection does not conflict with the First or Second Law... (thus dishonoring itself, resulting in seppuku, ritual suicide).

And therein lies the dilemma. In order to prevent war, people need to be aware of what war and killing does to others. You are not just killing a soldier, you are killing a husband, a mother, a brother or a daughter. Whilst national conflicts sometimes lead nations to war, humans need to be in touch with their human nature in order to prevent war, as John F. Kennedy said “Mankind must put an end to war before war puts an end to mankind.”<sup>75</sup> This becomes difficult when the warriors just run on a “killing-code”

## **Shinto – friendly gods programmed to aid you**

*Shintoism* is Japan's indigenous faith, and means “the ways of the gods”. The plural form is very essential. In Shintoism, there is not one god, but many gods.<sup>76</sup> The Japanese word *kami* (meaning gods/spirits) is used to describe the different Shinto-gods. There are kami in the forest, in the rivers, some animals can also possess a kami-nature. When a person

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<sup>73</sup> Scott Shane (2011) *Coming Soon: The Drone Arms Race*. From: [https://agriculturedefensecoalition.org/~agricum4/sites/default/files/file/drones\\_517/517K\\_2\\_2011\\_Coming\\_Soon\\_The\\_Drone\\_Arms\\_Race\\_October\\_8\\_2011\\_NYTimes.pdf](https://agriculturedefensecoalition.org/~agricum4/sites/default/files/file/drones_517/517K_2_2011_Coming_Soon_The_Drone_Arms_Race_October_8_2011_NYTimes.pdf). Accessed: 10.08.2014.

<sup>74</sup> Benedict (1946: 91).

<sup>75</sup> John F. Kennedy (1961). Said under a speech to the UN general assembly on 25.sept.1961.

<sup>76</sup> Genchi Katō (1971) *A study of Shinto: The religion of the Japanese nation*. US: Barnes and Noble.



dies, he or she too becomes a kami, in the form of an ancestral spirit.<sup>77</sup> Shinto is including towards other religions, and have accepted Buddha and Jesus Christ as kami. Emperors are often given a high kami status, and great shrines are built to enshrine their spirits.<sup>78</sup> When a kami is bound to a physical place such as a certain tree, a special rock and the like, a shrine is often built near it. The kami is *enshrined* there, i.e. the shrine is the resting place for the kami. The different Shinto shrines are visited quite a lot, the *Ise jingu shrine*, dedicated to the previously mentioned sun goddess Amaterasu has an annual visitor number of 8 million, making it the tenth most visited holy place in the world. The Meiji shrine in Tokyo, dedicated to the Meiji emperor holds the world record with 30 million plus in annual visitors.<sup>79</sup> The Meiji emperor was however a controversial figure, as I will explore in the next sub-chapter about imperial Japan. Below is a picture of the Meiji-shrine, and the *toori-gate* at its entrance, functioning as a purifying gateway. As you go through the gate, you step into the realm of the gods.



Figure 7: The Meiji-shrine in Tokyo.

77 Kami etymology from: <http://www.japan-guide.com/e/e2056.html>. Accessed: 10.08.2014.

78 Emiko Tierney (1991) *The Emperor of Japan as Deity (Kami)*. From: <http://anthropology.wisc.edu/ohnuki-tierney/files/1991-emperor.pdf>. Accessed: 10.08.2014.

79 Meiji shrine visitor data from: <http://www.travelandleisure.com/articles/worlds-most-visited-sacred-sites/11>. Accessed: 10.08.2014.

Other important aspects in Shintoism are the ancestor rituals, and purification of body and soul. Some sources claim that 80% of today's Japanese are shintoists, but when answering surveys, few people claim that they are Shinto-believers.<sup>80</sup> Shinto might be seen as a less strict religious practice, and more as a habit. Many Japanese visit Shinto-shrines, to pray for good exam grades, a healthy marriage etc. but they are not necessarily very religious. Singer also describes how Shintoism is used actively on robots:

*Japan's traditional religion of Shintoism holds that both animate and inanimate objects, from rocks to trees to robots, have a spirit or a soul just like a person. Thus, to endow a robot with a soul is not an illogical leap in either fiction or reality. Indeed, in many Japanese factories, robots are given Shinto rites and treated like members of the staff.<sup>81</sup>*

When I was conducting field-work, and asked my informers if they believed that robots could have a kami, they simply did not understand the question. Not even when I asked in a Shinto context, did the question make sense to them. I had thought that it would raise an ethical debate on the sacredness of robots and humans alike, but my informers, when explained the meaning of the question, were quite clear that “no, robots can not have kami. Perhaps in the future, but not as they are now.” I found this to be an important point in the research on robotic individualism; as they are simply not perceived to be able to have a soul at the current “evolutionary stage”.

### ***Imperial Japan (1868–1945), playing with the big boys***

The shogunate era ended with a coup d'état led by those who wanted an end to the shogunate rule, and wanted to put the emperor (albeit symbolically) back in charge. Japan was lagging heavily behind Western powers at the time, and seeing the greatest regional power China being humiliated in the opium war, Japan decided to be proactive, so that it would not end up as a Western colony. What followed was a period of rapid industrialization, when the Japanese realized that they were far overpowered by Western imperial powers, and decided to reshape their society in the motto “Japanese spirit, Western technique”.<sup>82</sup> Japan invaded Taiwan and Korea, established vassal states, making it a colonial power. At the same time, Japan's industrial revolution took place, with railroads, cotton- and silk production, steel- and textile factories. Japan also

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80 Religious affinity data from: Travel and Leisure at: <http://www.jstor.org/discover/10.2307/132163?uid=3738328&uid=2&uid=4&sid=21104111769613> Accessed: 10.08.2014.

81 Singer (2009: 167).

82 Famous quote by Sakuma Shozan, politician in the meiji era.

actively sought out Western knowledge, by hiring Western scholars and by sending Japanese students abroad. One of the imported Western ideologies from this time was the Christian religion, whose missionaries came flowing in when Japan opened its borders to the West.

The rapid industrialization, and desire for new lands to colonize as an imperial power, led Japan into World War 2, where Japan teamed up with Germany. A quick expansion followed, and at its largest, the Japanese empire controlled 7,400,000 km<sup>2</sup> compared to today's 377,944 km<sup>2</sup>. Had it kept its captured land taken in the war, it would have been the 7<sup>th</sup> largest country in the world today, more than double the size of India, and almost as large as Australia. However, after attacking Pearl Harbor, and thereby drawing the US into the war against the axis powers, things went downhill for Japan, as the country's lack of raw resources proved fatal. The whole process greatly changed the nation's social groups, especially the role of the emperor, of whose role I will investigate here, but first let us consider the introduction of Christianity into Japan.

## Jesus Christ robot-star

In the monotheistic Middle-Eastern religions of Judaism, Christianity and Islam, the doctrine clearly states that *man* is the most important, most intelligent creature created, and all other creatures should be under *him* in a strict hierarchy.<sup>83</sup> Building a robot with higher intelligence than a human is simply taboo and blasphemy, and we see this in hollywood made movies like terminator, that warns us what will happen if we “defy God” and become life-givers ourselves – it will simply lead to genocide of the human race, just like the case with *Noah's Ark*.<sup>84</sup> Perhaps the most popular Western robot franchise ever is the terminator series, where we can see the following being said to describe robots “That terminator is out there. It can't be bargained with. It can't be reasoned with. It doesn't feel pity, or remorse, or fear. And it absolutely will not stop, ever, until you are dead.”<sup>85</sup>

Western countries that build robots struggle immensely with this “punishing all-powerful God” religious heritage, as many of the population have religious concerns on the topic, but in Eastern countries, like China, Korea and Japan, we do not have a God that is principally against robots, which might be one of the reasons why robotics flourishes. When we remove the religious trait altogether, and look at more atheist nations,<sup>86</sup> like China (82% atheist), Japan (76%), Sweden (64%), Denmark (72%),

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83 Fredric L. Schodt (1988) *Inside the robot kingdom*. US: Kodansha International.

84 As seen in Genesis, chapters 6–9 in the Bible.

85 Actor Michael Biehn as “Kyle Reese” in *Terminator* (1984).

86 Atheist demographics data collected from: <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>. Accessed: 10.08.2014.



Norway (51%) and South Korea (41%), they are interestingly more keen to be very high tech nations, albeit religious affinity is hard to measure.

Christianity was long suppressed in Japan, with massacres on the followers of the religion, and the practise of *fumie* (“step on picture”) where people suspected of Christianity had to step on a picture of Christ or the Virgin Mary to prove that they were not christians. If they hesitated, they were deported to Nagasaki and imprisoned. If they then wouldn't convert, they were tortured, and if they still wouldn't budge from Christianity, they were executed by being pushed into *Unzen-san*, an active volcano, or in its surrounding “hells”, extremely hot waters.<sup>87</sup> Being a Christian wasn't easy prior to the opening of Japan in 1845, as you literally risked going “to hell” and boiling to death, but still underground-groups did practice the religion.<sup>88</sup> The main criticism came from groups that: “criticized Christianity and the materialist West for destroying Asian spirituality”<sup>89</sup> and efforts were made to “keep the plague of barbarians [christians] from capturing the hearts and minds of the stupid commoners”.<sup>90</sup>

A notion that should be mentioned is that the mythical figure Jesus Christ himself had some “magical” abilities, and as is known, technology can be seen by magic by those less advanced. We will probably see robots in the future that can turn water into wine,<sup>91</sup> it is simply a chemical equation. Robots that can walk on water,<sup>92</sup> has already been built, it was just a physics problem. We might be able to even build robots that can resurrect the human mind, after the death of our bodies.<sup>93</sup> If we can copy all of Jesus' miracles in a robot form, will he lose some of the alluring nature that draws people to Christianity? Nietzsche famously said ““God is dead, and we killed him.””<sup>94</sup> As we advance as a species, especially in the computer field, might we become gods ourselves? I am not saying that Christianity prohibits robotic research, but rather that Shintoism and Zen-Buddhism encourages it more, so that Japan is given a robotic advantage with a population less suspicious to artificial intelligence and robotics.

## The emperors new compose

As I have seen, the emperor lost political power in the shogunate era, and the shogun

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87 The purge of the christians is thoroughly described in Friday (2012: 379).

88 The “execution by fire” is now used as a tourist magnet, as seen in: <http://www.japan-guide.com/e/e4453.html>.

89 Gordon (2012: 109).

90 Gordon (2012: 76).

91 For a less ambitious project, see the Water to wine guide on:

<http://chemistry.about.com/od/chemistryhowtguide/ht/waterwine.htm>. Accessed: 10.08.2014.

92 As seen by the water strider robot at: <http://www.gizmag.com/water-strider-robot/23493/>. Accessed: 10.08.2014.

93 Which is debated many places, for example here: <http://turingchurch.com/2013/01/23/can-science-resurrect-the-dead/>. Accessed: 10.08.2014.

94 *Die fröhliche Wissenschaft*, by Nietzsche, F: 1882: section 108).

generalissimo held all power. After the opening of Japan, and the introduction new ideas such as Christianity overflowed the country, many felt that the shogunate had become weak, and that changes needed to be done. In 1868, the concept of *sonnō jōi* (“revere the emperor, expel the barbarians”) was introduced, and the imperial movement declared the end of the shogunate, and restored the emperor as the highest leader of Japan, giving the emperor Meiji (reign: 1867-1912) supreme command.<sup>95</sup> Shintoism was used as propaganda to expel the foreign influences of Christianity. The reformers were selective however: “The empress (...) adopted Western clothes in the 1880s as part of the effort to project and image of the monarchy as a modern institution. The emperor also underwent a striking metamorphosis to become the symbol of a modern monarch.”<sup>96</sup>

The most controversial emperor in Japanese history was perhaps the *Shōwa emperor* (reign: 1926–1989), known in the West as *Hirohito*. To understand Hirohito, is to understand the Japanese spirit in imperial Japan, and its political ambition. When interviewing Japanese prisoners of war during WW2, Ruth Benedict found the following attitudes towards their emperor:

*The Emperor was to them, however, inseparable from Japan. 'A Japan without the Emperor is not Japan.' (...) 'The Japanese Emperor is the symbol of the Japanese people, the center of their religious lives. He is a super-religious object.' Nor would he be blamed for the defeat if Japan lost the war.*<sup>97</sup>

When Japan capitulated after the defeat in WW2, one of the demands from the allied forces was that the emperor had to resign his deity-status, and to no longer be considered sacred, which he did on national radio on his new-years speech the 1<sup>st</sup> of January 1946. Even though the emperor had supreme command, he was not prosecuted after the war. This is one of the most debated issues of modern Japan. Previously, I have compared the role of the emperor to that of an android, being partly deity, partly human. With the emperors denunciation of his godhood, he chose to be seen as “just human”. But as with androids who are designed to be “just human”, an eerie effect takes place, and people become a with uncertain on what to label them as.

## ***Post war time (1945–present), let it grow***

After the nucing of Hiroshima and Nagasaki, Japan capitulated, and was occupied by the

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95 Albert Craig (1959) “The Restoration Movement in Chōshū” in *The Journal of Asian Studies*. Volume 18 / Issue 02 / February 1959, pp 187-197.

96 Gordon (2012: 68).

97 Benedict (1946: 52).

allied forces (called SCAP) led by the US until 1952, forcing them to adopt a demilitarized democracy. This ban on military spendings has contributed heavily to the science focus of the nation. Money that otherwise might have gone to military spendings has instead been put into research, a parallel Japan has with post-war Germany, which also has become a large economy, as predicted by Benedict:

*A Germany which is not allowed to rearm could in a decade or so have laid the foundations of a sound and prosperous economy which would be impossible in France if her policy is to build up great military power. Japan could make the most of a similar advantage over China. Militarization is a current goal in China and her ambitions are supported by the United States.*<sup>98</sup>

Interestingly from Benedict's quote one sees that the US was supporting Chinese militarism at the moment of writing (1946), but as times have changed, "US establishment also began to see Japan as the showpiece of the non-communist model of development in Asia",<sup>99</sup> which of course can not be said of China at the moment. How Japan was so quickly turned from mortal enemy, to closest ally, is peculiar. It might be explained by the spirit of the Japanese people, who after the defeat of WW2 had to choose a new path, in order to rise again. The emperor, who had held a questionable role under WW2, was as noted, not prosecuted, but he lost all formal power.

Post-war Japan lay in ruins, with almost all the major cities heavily damaged by bombings. The industries were also heavily damaged, but due to economical help from the US, and a roundhouse technology trading policy, combined with the hard-working population, Japan started to grow again, and soon saw a huge economical boom. Beneficial trade agreements with the West, and a free policy of technology trade, soon made Japan's economy and technology research blossom, and from 1978 until 2010, Japan was the world's second largest economy. It is at present the third largest, but is projected to be surpassed by India in a few years, and in 2050 also by Brazil.<sup>100</sup> Technology wise, however, Japan is extremely advanced. The economical boom gave possibilities to the huge research efforts done after the war. Japan is responsible for inventions such as: Blu-ray Disc, CD-R, Cup Noodles, DVD, FAX, Flash memory, Karaoke and VHS. And as this thesis aims to show, Japan is also responsible for numerous robotic technologies. After the year 2000, Japan has invented a number of world leading robots, androids and cyborgs, becoming the number one robot country in the world. I will now look into a special case of Japanese culture, it's *manga* and *anime*,

98 Benedict, (1946: 418-419 ).

99 Yoshio Sugimoto (2002) *An introduction to Japanese society*. UK: Cambridge.

100 Economy estimates from pwc at: [http://www.pwc.com/en\\_GX/gx/world-2050/assets/pwc-world-in-2050-report-january-2013.pdf](http://www.pwc.com/en_GX/gx/world-2050/assets/pwc-world-in-2050-report-january-2013.pdf). Accessed: 10.08.2014.

to try to explain why Japan so quickly builds, accepts, and adapts to robotics.

## Reading manga, watching anime

*Manga* (meaning “comics”) are Japanese comic books, and are immensely popular in Japan. They are normally in black and white, and cover a wide area of genres. The modern manga became very popular in post-war Japan.<sup>101</sup> While in the West, comics are mostly considered a children and youth media, manga targets a wide variety of groups in the Japanese society. When I took the train in the mornings, it was just as likely to see boys reading samurai manga, girls reading *yaoi* (boy on boy love stories), jocks reading baseball manga, businessmen reading detective manga, housewives reading cooking manga etc. The Japanese manga market was valued to \$5.5 billion in 2009, with the North American market worth \$175 million. The European and Middle-Eastern markets put together were valued \$250 million.<sup>102</sup> In Japan, manga stand for about 27% of the total book sale.<sup>103</sup> A manga is originally read from right to left, the reverse way of which the West read comics. In Japanese, manga means both Japanese and foreign cartoons. When used outside of Japan, it generally refers to Japanese cartoons.

*Anime* (meaning “animation”) are animated movies produced in Japan. It goes hand in hand with manga, and many manga starts out as anime or vice versa. Anime dates back to about 1917. As with manga, anime is a word used to describe all kinds of animated cartoons when in Japan, but outside of Japan, it normally means “animation movies from Japan”. For example, Disney-cartoon movies such as Snow-White would be refereed to as *anime* in Japanese, as would the Pokémon-movies. In the West, we would call Pokémon an anime, but not Snow White, which would be a cartoon. Anime stands for about 70% of the Japanese DVD-market, and was in 2007 worth \$763 million. The US anime market is valued to \$2.74 million. Both anime and manga have sparked a lot of foreign interest lately. In countries like Norway, the US and France, it is a big part of geek-culture, or “*otaku-culture*” which is a common term within the sub-culture. Otaku in English is the neutral synonym for Japan-geek, but in Japan the word has a more negative connotation, meaning someone who is obsessively interested in something, not necessarily manga. Train-, history- and robot *otaku* are also common.

## The Tetsujin-28-go statue –robots as protectors

The manga Tetsujin-28-go (tetsujin meaning “iron man”) was written in 1956 by

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101 *Manga! Manga! The World of Japanese Comics*, by Fredric L. Schodt (1983). US: Kodansha.

102 Manga-sale data from: <http://geekout.blogs.cnn.com/2012/01/26/manga-in-the-heart-of-europe/>. Accessed: 10.08.2014.

103 Japan manga market from: :

[https://web.archive.org/web/20120406232125/http://www.jetro.org/trends/market\\_info\\_manga.pdf](https://web.archive.org/web/20120406232125/http://www.jetro.org/trends/market_info_manga.pdf). Accessed: 10.08.2014.

Mitsuteru Yokoyama, and adopted into an anime in 1963, as one of the first to feature a giant robot. It was also released in the US under the name “Gigantor”, and has since spawned a TV drama (1960), a live action movie (2005) and an anime movie (2007). The plot is that a Japanese scientist, Dr. Kaneda buildt a giant robot to help imperial Japan under WW2. He dies shortly after the robot, and the war, is finished, and gives the control-stick over to his ten-year old son. He then uses the robot to stop crime, and counter “bad robots”, such as his nemesis, the german villain “Catsnmeow's” evil constructions. Whilst the Japanese original version certainly has a war-setting, the american version removed this setting, and rather have the anime set in the year 2000. The creator of the original manga has said that he went to see Frankenstein in the 1930s and discovered that “the monster is neither good nor evil”. This inspired him in the making of the Tetsujin-28-go robot, which does not have a will of its own.



Figure 8: The Tetsujin-28-go statue in Kobe.

After the Great Hanshin Earthquake ( magnitude: 7.2, deaths: 6 434) of 1995 in Kobe, the city lay in ruins. The creator of Tetsujin-28-go originated from the area, but he sadly died from a house-fire in 2004. 15 years after the earthquake, in order to keep spirits high and show the hard-working nature of the people of Kobe, the city decided to erect a monument of the Tetsujin-28-go robot. It stands 18 meters tall and weighs 50 tons. It is meant to symbolize the rise of Kobe after the earthquake, and also to serve as a guardian figure against future earthquakes, which interestingly would normal be the task of the local Shinto and Buddhist deities residing in shrines, to do. Perhaps we see a change in protectors of the people? The statue also serves as a tribute to honor the local hero Mitsuteru Yokoyama, who created the tetsujin-28-go manga.

## The Studio Ghibli robot statue - between good and evil

To understand the Studio Ghibli robot statue, which resides at the Studio Ghibli museum in Tokyo, one must first understand the importance of Studio Ghibli itself. Chances are, if you have ever seen an *anime*, it was highly likely a Studio Ghibli production. The studio is by far Japan's most famous anime producer, and has a huge foreign fan-base too. The studio has of writing made over 20 anime movies,<sup>104</sup> which of many are critical claimed masterpieces; ranging in topic from the cuddly children-movie *My neighbor Totoro*, by many labeled “the world's most cosy movie”, to the bombing of Tokyo themed “Grave of the fireflies”, by many labeled “the world's saddest movie”.

Studio Ghibli has a huge foreign fan-base, immensely popular among geeks of all ages, and in Japan, its mascot figure *Totoro* (a huge blue-grey bear-rabbit thing) is probably Japan's most famous character. It is so popular that when children starts school, the Totoro theme song is played, and every person in Japan knows who Totoro is, comparable to the West's Mickey Mouse. On IMDB (the Internet Movie DataBase), the world's largest movie-database where users comment and rate movies, Studio Ghibli has 7 spots on the 250 highest rated movies of all times, being *Spirited Away* (Made in: 2001, ranking: number 36 best movie of all time), *Princess Mononoke* (1997, 73), *Grave of the Fireflies* (1988, 82), *My Neighbor Totoro* (1988, 132), *Howl's Moving Castle* (2004, 154), *Nausicaä of the Valley of the Wind* (1984, 201) and *Laputa - Castle in the Sky* (1986, 229).<sup>105</sup>

Robots and mechanical things of all shapes and sizes are frequently seen in the Studio Ghibli movies. The movies often have deep moral undertones of what happens to nature when humans grow too greedy to exploit it (for example as in *Princess Mononoke* and *Nausicaä and the Valley of the Wind*), where nature strikes back on the industrialization of the humans. One of Studio Ghibli's earliest movies is *Laputa - Castle in the sky*. The story follows a young girl who resurrect a robot made in an ancient technologically-advanced past. In Laputa, the first robot we meet is a scary figure of destruction, that is held captive by humans who don't understand it. When it tries to break out of its captivity to save a princess, it blows up a whole fortress. The robot is not evil, but programmed to protect the princess (who is also held captive), and that brings about the destruction. The next robot we meet is the same model, but is a nice gardening robot. It is programmed to tend a garden, and help the animals who lives in the forest when they are threatened. The movie shows that the robots are not good nor evil, but simply follow their programming and does what humans command. They do not possess a strong artificial intelligence, in contrast to the terminator robots, who develops a consciousness.

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104 For a list of movies, see: <http://www.onlineghibli.com/films.php>. Accessed: 10.08.2014.

105 For the imdb list, see: [http://www.imdb.com/chart/top?ref\\_=nv\\_ch\\_250\\_4](http://www.imdb.com/chart/top?ref_=nv_ch_250_4). Accessed: 10.08.2014.



This Studio Ghibli robot is in that sense a bit more primitive, but nevertheless is an important piece of the social cultural picture of robots in Japan. Remember, the movie was created as early as in 1984, meaning that young people who watched it as it came out, might have gone into the field of robotics with this in the back of their minds.

A statue of this robot is displayed at the Studio Ghibli museum in Tokyo. It is on the museum's roof, but visitors are welcome to go up and take a picture with the robot. One of the things I noticed when visiting, and observing the other visitors where that the two main groups of people I saw were either *gaikokujin* ("foreigners") or Japanese people aged 30+. There were few Japanese children at the museum, which I found strange, being a huge Studio Ghibli fan myself, and imagining that the museum would be swarming with children, but no, apparently this wasn't the case. I started to investigate why this was so, why don't Japanese children love Studio Ghibli as much as their parents and the geeky *gaikokujin* such as myself.



Figure 9: Studio Ghibli's Laputa robot.

To my surprise the reason was quite obvious: age. The Studio Ghibli movies are simply seen as "old style" by many Japanese children, they have newer things to occupy them, such as Pokémon and other newer, more modern anime. The Studio Ghibli movies, fun as they may be, always seem to come with a contemporary society criticism. How robots are represented in Eastern and Western cultures differs widely, as described by Singer:

*While the robot is constantly something suspicious in Western science fiction, it is the exact opposite in Asian science fiction (...) A robot that keeps the peace among humankind (...) especially in the anime genre, the robot is usually the hero who battles evil. This has heavily influenced both Japanese scientists and the nation's culture.<sup>106</sup>*

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106 Singer (2009: 167).

This is also the case with the robots I have described in this chapter, albeit the Studio Ghibli robot is depicted to be capable of great destruction, if their remote is put in the wrong hands. This is a very typical scene in anime, bad people make robots do bad things, good people make robots do good things.

## ***Cultural robots?***

In this chapter I have investigated the different eras of Japanese history in the pursuit of understanding how robots have come to be easily accepted by the Japanese population. I found that the Japanese robots have a long cultural heritage to draw their acceptance from, and that a robot is not simply just a piece technology, but a cultural product too. Different historical events, social classes, and ideologies have helped ease the translation process of the robots, since Japanese people are used to live among boundary-objects.

I first looked at the pre-medieval times, from 0–1185 AD, where the notion of the Japanese people took form. I saw the role of the Japanese emperor, a boundary object between heaven and earth, who has the form of a human, but was believed to be divine, much like androids who also have human shape, but is “something else”. Buddhism has, since its introduction in the fifth century, been an ancestor to spiritual cyborgs, the Buddhist practitioner, as partly human, partly something else, as enlightened creatures. The second period covered is the shogunates, from 1185–1868AD. The samurai's code of honor, bushido, was read as a parallel to the code in computers. I also saw how Shintoism, have given Japan the mindset to accept the world not in a hierarchical order, but more in a “everything floats” notion.

The third period covered was imperial Japan, from 1868–1945, where Japan set out on conquering its neighbors, and becoming a colonial, imperial power. Christianity was read in contrast to the former Buddhist-Shinto religious practice that was unchallenged prior to its introduction, and the role Hollywood has on our perception of robots, which is bound together with the Western Christianity cultural heritage. I also saw the changed role of the emperor, who resigned his “android-status” in favor for being “just human”. Lastly, I looked at post-war Japan, and the rise of the manga-anime culture, and saw how robots in Japanese fiction have myriads of forms and motives, but often tend to have the Frankenstein underline of being “neither good, nor evil”, but rather leaving the moral question in the eyes of the beholder, or in the hands of the controllers.. I saw how the anime Tetsujin-28-go/Gigantor differed in content from Japan to the US, and I looked at the effect Studio Ghibli have had on Japanese society. The fictional robots presented in the manga-books started the enrollment of actors, and mobilized allies in the scientists growing up. These young scientists had the cultural background of robots through manga with them, when they put on their lab-coats and started making real ones.



### 3 - Then man made the machine in his own likeness

In the previous chapter, I saw some of the rich cultural heritage that have made Japanese robotics possible. Japan has a long tradition of representing boundary-humans, and boundary objects, which also is preeminent in their rich doll-culture, manga and anime, and also in more vague concepts such as the emperor figure. But what happens when the robot walks out from the fiction-book, and into the laboratory? When constructing a highly advanced robot with a programmed personality, we are setting out on a quest to explore our own human identity too, but how this affect us?<sup>107</sup>

The chapter title is from the movie *Animatrix*, which explores the rise of the robots.<sup>108</sup> It is a wordplay on a famous bible quote, but as I saw in the previous chapter, Japan does not have the Christian bias towards robots, but have rather different cultural meaning through Shintoism and Buddhism. In *Animatrix*, robots rise in revolt due to being treated as second-class citizens. If it had been made in Japan, we might have seen a very different result of the robot-identification process. But how do we identify what being humans mean?<sup>109</sup> We simply do not know enough about our own race yet, but in the process of creating a mechanical race of *androids* and *cyborgs*, can we get new insights in what it means to be human?<sup>110</sup>

In this chapter I will look into three of the most well-known and advanced robots in the world to date, all made in Japan. These are: the robot dog *AIBO*, the “astronaut” android *ASIMO*, and the teleoperated android *Geminoid*, which will be analyzed in an identity constructing context. How researchers want us to think about them, their script, is different from the way users think about them, their domestication. I will also look at this from the personality shaping attribute of gender, and how robots are gendered in regards to their amount of human-looks. I will also describe linguistically how people

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107 A study that touches the subject: Jill Drury, Jean Scholtz and Holly Ianco (2003) *Awareness in human-robot interactions in Systems*. IEEE International Conference on Man and Cybernetics 2003, published by IEEE, Volume:1, pages 912–918.

108 From “The Second Renaissance” in the movie *Animatrix*, written by Andy and Lana Wachowski, 2003. The quote ends with “Thus did man become the architect of his own demise”. Computer evolution as a parallel to the Renaissance have also been done by scholars such as Nye, D. (2007: 95).

109 As explained in “Human Nature, Organizations, and Management Theory”, by Jeremiah J. Sullivan, 1986, in *ACAD manage rev.* vol. 11,no. 3, pages 534-549.

110 Atkeson, C.G. Et al (2000) “Using humanoid robots to study human behavior, in Intelligent Systems and their Applications” in *IEEE* (Volume:15 , Issue: 4).

talk to and about robots. Finally, I will discuss robots in a script context, to see how meaning is encoded in them from the laboratory side, which this chapter covers.

## ***Meet the robots***

Japan holds the spot as robot country number one, which is due to strong political control, as explained by Singer:

*About a third of all the world's industrial robots are in Japan (...) Japan's success with robotics and AI comes from a long history of strong government support. In 1981, the Japanese Ministry of International Trade and Industry launched an \$850 million program to faster development of AI software and hardware, while today it plans to replace about 15 percent of its workforce with robotics over the next twenty years.*<sup>111</sup>

This is however data heavily dominated by industrial robots, which are often simple mechanical cranes, used primarily in industries such as motor vehicles, electronics and automated parts.<sup>112</sup> This thesis does not focus on industrial robots, but rather on entertainment and care robots, along with teleoperated androids. In this sub-chapter I will first look at a robot dog that is programmed to *befriend* you and entertain you, then a robot astronaut that is programmed to *help* you, by fetching medicine and such, and then finally I look at a robot that attempts to *be* you, i.e. by being a robotic clone of a human being.

## **Robot dog AIBO wants to be your pet**

AIBO is a robotic dog made by the Japanese electronic company Sony, known also for its TVs and Playstations. In 2013 it was the 94<sup>th</sup> largest company in the world with a revenue of \$81.9 billion.<sup>113</sup> Its AIBO robot was sold from 1999 to 2005, and is currently out of production, due to not being profitable enough.<sup>114</sup> Whilst the most famous version has a design based on a small dog, other models include a lion-cub-design (ERS-210), and a space-dog-explorer-design (ERS-220). The Japanese word *aibō* means “partner” or “sidekick”<sup>115</sup>, and signals just what the creators intended AIBO to be. The designer, Masahiro Fujita, received the IEEE *Inaba Technical Award for Innovation Leading to*

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111 Singer (2009: 242).

112 IRF (2013) *World Robotics 2013 - Industrial Robots*. From: <http://www.worldrobotics.org/>. Accessed: 10.08.2014.

113 CNN (2013). *Fortune Global 500*. From: [http://money.cnn.com/magazines/fortune/global500/2013/full\\_list/?iid=G500\\_sp\\_full](http://money.cnn.com/magazines/fortune/global500/2013/full_list/?iid=G500_sp_full) Accessed: 15.May.2014.

114 CNET (2006) *Sony puts AIBO to sleep*. From [http://news.cnet.com/Sony+puts+AIBO+to+sleep/2100-1041\\_3-6031649.html](http://news.cnet.com/Sony+puts+AIBO+to+sleep/2100-1041_3-6031649.html). Accessed: 15.May.2014.

115 Robotbooks. *Sony AIBO robot dog*. From: [http://www.robotbooks.com/sony\\_aibo.htm](http://www.robotbooks.com/sony_aibo.htm) Accessed: 15.May.2014.

*Production* award in 2007 “For creating AIBO, the world's first mass-market consumer robot for entertainment applications”.<sup>116</sup>



Figure 10: Different AIBO models.

There are many versions of AIBO, but they are normally categorized in three generations. The user manual, which is available online, shows the technical specifications of the AIBOs.<sup>117</sup> The first generation (ERS-110) featured a 64-bit RISC processor and 16MB of RAM. Later, sensors, microphones, speakers and Wi-Fi were added. The last generation (ERS-7) featured a MIPS R7000, a 576 MHz processor and 64MB of RAM, and could display over 60 emotions on its face, though colored sensors. It also featured a heat- and a vibration sensor. Most AIBO's can operate for about 90 minutes before they need charging, which in the latest model takes 150 minutes. The weight ranges from 1.25kg to 1.65kg. AIBOs is equipped with their own software, which gives them the ability to walk around and interact with their environment through their sensors. They can recognize speech in Japanese, English or Spanish.

AIBO runs on Sony's Aperios operating system, which specializes in real time capabilities to react to sensor feedback. It has however been discontinued for its lack of network support: “Aperios was an operating system of a pre-Internet age and we decided

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116 *IEEE Inaba Technical Award for Innovation Leading to Production*. From: <http://www.ieee-ras.org/awards-recognition/society-awards/69-awards-recognition/society-awards/59-ieee-inaba-technical-award-for-innovation-leading-to-production> Accessed: 15.May.2014.

117 AIBO user manual from SONY at <http://www.aiai.ed.ac.uk/project/aibo/documents/ERS-7M2/AIBO-Basic-Manual.pdf>. Accessed: 15.May.2014.

that it isn't adequate for the future".<sup>118</sup> AIBO also features OPEN-R architecture, which makes the parts that make up the robots easily changeable, and is apparently made to encourage users to add functionality, the following stated by Sony in 2002: “Sony hopes to accelerate the development of robots throughout the industry by introducing the "OPEN-R SDK”.<sup>119</sup> AIBO has been opened up for non-commercial users to add their own code, through OPEN-R SDK, R-CODE and R-CODE plus and AIBO Remote Framework. These three tools are free, and some of them are easy enough for children to use. Programming for children is known also from the Lego mindstorm series, and this makes AIBO not only a thing for entertainment, but also for education.<sup>120</sup>

AIBO uses a software called AIBOware, which allows its owners to “raise it” from puppy to adult. Contrary to biological dogs, it will not go to a death stage however, which of course in biological dogs can be a very traumatic experience for its owners, as biological dogs have a much shorter lifespan than humans. The AIBOware software had to be bought separately in earlier versions, but in the latest versions, it was included in the robot, along with a “self charging system”, that allows the robot to walk back to its charging station when it needs “a nap”. This is also a feature that the newest vacuum cleaner robots have adapted, as it gives the user less strain with managing the robot.<sup>121</sup> The sales of the AIBO robots are as follows:<sup>122</sup>

<b>Model</b>	<b>Launch price (ex. tax)</b>	<b>Units sold</b>
First generation AIBO	From 250 000 yen.	65 000
Second generation AIBO	From 150 000 yen	60 000
Third generation AIBO	From 160 000 yen	40 000–50 000

AIBO has also been popular at universities, and was the player in the RoboCup, a football league of robots, from 1999-2008, now replaced by the french NAO robot.<sup>123</sup> When it was decided that AIBO research and production was to be discontinued, a mock funeral was held for the robot, by its creator who stated that “the risk-taking spirit at

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118 AIBO software information from SONY at: [http://www.eetimes.com/document.asp?doc\\_id=1201510](http://www.eetimes.com/document.asp?doc_id=1201510). Accessed: 15.May.2014.

119 AIBO software information 2 from: [http://www.sony.net/SonyInfo/News/Press\\_Archive/200205/02-017E/](http://www.sony.net/SonyInfo/News/Press_Archive/200205/02-017E/) . Accessed: 15.May.2014.

120 For more information on the Lego-mindstorm, see: <http://www.lego.com/en-us/mindstorms/?domainredir=mindstorms.lego.com>. Accessed: 15.May.2014.

121 For specifications on the vacuum cleaner robot roomba, see: <http://www.irobot.com/us/learn/home/roomba.aspx>. Accessed: 15.May.2014.

122 AIBO sales data from: <http://www.sony-aibo.com/aibos-history/>. 100 YEN = 1 USD = 6 NOK circa.

123 For more information on the change, see: Robot cup information at: <http://www.emeraldinsight.com/journals.htm?articleid=17020708>. Accessed: 15.May.2014.

Sony was now dead”.<sup>124</sup> When I observed children interacting with AIBO in my fieldwork, my general impression is that they found it interesting, and wanted to test its capabilities, being delighted when it did what they wanted, such as fetching a ball. Some scholars are puzzled why robots as AIBO sell: “some apparently reasonable technologies fail to sell, people may nonetheless flock to 'unreasonable' devices, such as Japanese electronic pets.”<sup>125</sup> AIBO is however not just a dog-copy, “75 percent regarded their AIBO as something more than just a machine”.<sup>126</sup>

While the AIBO robots have been discontinued, they still have an active user-base, and remains popular. The impact AIBO has had as a pioneer for entertainment robots has been an important piece in the cultural acceptance to robots, and for the human-robot relationship construction. Human-looking robots, as I will see next, are usually expected to do more advanced roles than fetching a ball, namely fetching medicine and such.

### **Android ASIMO wants to be your assistant**

ASIMO is an *android* developed by Honda, released in 2000. Honda is the world's 45<sup>th</sup> largest company (\$119 billion yearly revenue), and is by most people known for manufacturing cars. They do however invent and invest in cutting edge robotic technology, of which one result is ASIMO. The name ASIMO stands for Advanced Step in Innovative MObility, and it was initially created to help users who lack full mobility, in tasks like picking up medicine, getting the remote control etc.<sup>127</sup> The ASIMO developing project started in the 1980s, with background in the Honda E series of walking robots, proceeded by the P series, becoming more and more humanlike as the development went on. As with humans, robots too go through evolutionary stages, albeit in an engineering context, making them stages of design. From being a computer with walking legs, it has developed into an android, with mobility in fingers, hands, arms, neck, waist and legs, with a total of 34 degrees of freedom.<sup>128</sup> This evolution is heavily influenced by what the creators script it to be, i.e. how they perceive the users to adapt to it. By making it humanoid, they project that the users will adapt more easily to this design.

ASIMO is 130cm tall and weigh 54kg. Its main feature is the ability to navigate in the real world, being able to ascend and descend stairs. It has a max walking/running speed

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124 Sea-Jin Chang, S: (2008: chapter 1). *Sony vs Samsung: The Inside Story of the Electronics Giants' Battle For Global Supremacy*. US: Willey.

125 Nye (2007: 40).

126 Singer (2009: 340).

127 ASIMO tasks, as seen at: <http://www.futuretimeline.net/blog/2014/04/18.htm#.U2rhZ62SzvY>. Accessed 19.May.2014.

128 All technical specifications are from the *technical information* at the Honda web-page: <http://asimo.honda.com/abstract-technical-information/>. Accessed 19.May.2014.

of 6km/h, comparable to a walking penguin. It had also been demonstrated to be able to kick a football, and the opening and closing of doors. Being a multi-usage tool, it is capable of many different jobs; the most notable has been directing the Detroit Symphony Orchestra, and ringing the bell at Wall Street that signals the start of a new auction day.<sup>129</sup> One might ask why the robot is based on a human-physique, surely legs must be much more difficult to program and engineer than per say wheels. One of the reasons is the *human social interaction factor*, stated by Fong to be a design plus because of the following:

*Humans are experts in social interaction. Thus, if technology adheres to human social expectations, people will find the interaction enjoyable, feeling empowered and competent [...] Many researchers, therefore, explore the design space of anthropomorphic (or zoomorphic) robots, trying to endow their creations with characteristics of intentional agents.*<sup>130</sup>

In 2007 ASIMO's intelligence was updated with many new features. It can now step aside when crossing paths with a human. Another feature was a program that allowed ASIMO to know when it needed to be charged, and from that revelation, walk back to it's charging station, the same feature we saw with AIBO and the roomba vacuum cleaner robot, a program feature that we might start to see as "fundamental" in robots, in our construction of a robot perception, as more and more of them are built with this feature, i.e. it becomes scripted into the robots as a standard. It can also distinguish between three different voices talking at once, a feature humans are mostly incapable of.<sup>131</sup> But the most interesting feature is the networked co-working between several ASIMOS, i.e. they can now work together as a group, or a swarm. As networking of robots is one of the frontiers of robot research and development, this is a huge advancement in the whole field. It also takes the whole dystopia scenario a bit further; do we dare to have robots communicate easily with each other? Do we dare not to? In the case of major natural disasters, humans are often incapable of helping, but robots that can communicate with each other might save lives.

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129 ASIMO appearances. From:

<http://www.thefreelibrary.com/Honda+Celebrates+25+Years+on+New+York+Stock+Exchange%3B+-+Honda's...-a082842367>. Accessed 19.May.2014.

130 Fong, Nourbakhsh and Dautenhahn (2003: 146-147).

131 Honda homepage.

Due to a successful marketing campaign, ASIMO has perhaps become the number one face for humanoid robots. Since its creation, ASIMOs have traveled the world, as a sort of created mechanical superstar. It has met with crown prince Charles of Great Britain,<sup>132</sup> and also US president Obama.<sup>133</sup> It is often used for demonstration purposes, with the goal to spark the science and technology interest in schools and universities. An ASIMO is currently employed at Disneyland USA in the show “Say hello to ASIMO”.<sup>134</sup> The case of being a “artificial superstar” is something ASIMO shares with few other things in the world today, but there are examples such as the Japanese computer created hologram song diva *Hatsune Miku* from the *vocaloid series*, now warming up for human superstar *Lady Gaga* on her concert tour. Hatsune Miku is known for her green body-length hair, and is shown on the concert poster below.<sup>135</sup>



Figure 11: Hatsune Miku, Japan's hologram superstar

When I first met an ASIMO, it was standing in a glass display case. I was surprised how tall it actually was, and as I approached it I couldn't shake of the feeling that it might be

132 Alderson, A. (2008) *Prince Charles meets ASIMO the robot on Japanese tour*, in The Telegraph online, from: <http://www.telegraph.co.uk/news/uknews/theroyalfamily/3272562/Prince-Charles-meets-ASIMO-the-robot-on-Japanese-tour.html>. Accessed 19.May.2014.

133 As seen here: <http://news.nationalpost.com/2014/04/24/domo-arigato-mr-obama-u-s-president-meets-japanese-robot-asimo/>. Accessed 19.May.2014.

134 A video of this demonstration can be seen here: <https://www.youtube.com/watch?v=mgy3dXWYLPU>. Accessed 19.May.2014.

135 Hatsune Miku's gender is interesting, as most refer to “her”, and not “it”, which would surely be seen as a strange pronoun. This “easy-gendering” debate might be because she lacks a physical body, and thus is seen as less “real”.



just a child in a costume. It looked so real, but in the same time unreal. Like something from the future. The Japanese who visited the museum at the same time as me recognized it immediately, saying “ah, Ashimo”<sup>136</sup> as they passed by its display case. In the museum I visited, the ASIMO had two shows each day, where it showed off its abilities. The first time I visited, I was too late for the show, so I could only observe a motionless ASIMO. This was a bit frightening, because this is a thing created to move and be “alive”, so when it was just standing still, I couldn’t help thinking that it was “up to something”. It was just staring blankly back at me with an empty black robot helmet for a face. My first encounter with ASIMO was stranger than I expected it to be. Even though it didn’t move, talk, and just plainly stood there behind the glass, I felt like I had just met ET. Something... unusual, different. And as all humans, we fear “the others” if we do not understand them. The next time I met the robot, I was in time to see it demonstrated to the public, and I liked it more when it was moving, and doing things, which is what it is scripted to do.

I also observed other people when meeting ASIMO, and interviewed people who controlled it. I found that ASIMO's “helpers” differed widely. Some had always been interested in robotics, but some had never been interested in it before ending up in their current job-position. Some were very clear that ASIMO were just a robot, and focused more on the people behind the robot, its controllers, engineers etc. They also emphasized that people were quite surprised the first time they met ASIMO, shocked by the wide variety of task that it can perform. The people I interviewed had very social jobs, for example they had to get the crowd to call out “ASIMO” to make the robot emerge from its dwellings. Most often, only kids called out the androids name, but sometimes grown-ups take part in this. One of the people I interviewed stated that:

*After working with robots, I realized the deep connection with the origin of human beings, and also the future of human beings. Now I think there is a symbiosis between robots and humans, a sort of 'friendship'.<sup>137</sup>*

The museum where I conducted my interviews, had ASIMO as a part of their research exhibitions that encourages users to help construct ways of seeing how we will live with robots in the future. Visitors are asked to actively participate when walking through the museum, which I am sure can take some of the credit for making such a science-minded nation. In the interview they stressed that they see ASIMO “as a gift to the people in the future, as a tool to build a better future.”<sup>138</sup> The Android ASIMO is clearly designed to help people as well as entertain them, and is therefore a step up from the AIBO robot.

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136 In Japanese, there is no “si” sound, therefore “shi” is used.

137 Interview on ASIMO, in Tokyo, autumn 2013.

138 Interview on ASIMO, in Tokyo, autumn 2013.



## Android Geminoid wants to be you

Today we are quite dependent on our cellphones, being able to reach anyone at any time with text, our voice, and sometimes through video too. But what if we were to add touch and feeling to our far-away communication situations? This can be done with *teleoperating*, or “remote control”, i.e. controlling a machine from a distance. *Teleoperated voice communication* is when entity A (normally human), which can be anywhere, speaks through entity R (for example a robot) who is in a room with entity B (another human). The teleoperated receiver (B) is then supposed to project the teleoperated tool R as his or her conversation partner A.



Figure 12: Geminoid robots and their (standing) human twins.

The Geminoid androids are robots made to look as human as possible. The name was created by combining the latin words “gemini” (meaning twin), with “oides”, (meaning similarity),<sup>139</sup> which of course borrows from the naming convention of the word “android”. While androids looks like *some* person, *Geminoids* looks like a *specific* person, i.e. they are robot twins, or copies, of some already existing human. As they are exclusively made in Dr. Hiroshi Ishiguro's laboratory at Osaka University,<sup>140</sup> they are not mass-produced entities, but unique entities, who each are unique clones of one specific human, with the exception of Dr. Ishiguro himself, who have been copied two times. The below picture shows the Geminoids, with the humans they are copies of. As can be seen, determining who the robots are, and who the humans are, can be difficult.<sup>141</sup>

139 Nishio, Ishiguro & Hagita (2007: 346).

140 The project's homepage can be accessed here: <http://www.geminoid.jp/en/index.html>. Interview on ASIMO, in Tokyo, autumn 2013.

141 Presumably, the robots are sitting, while the humans are standing.

As of writing, there has been made four Geminoids. the first created in 2006.<sup>142</sup> They are:<sup>143</sup> The Geminoid H1-4, a true copy of Dr. Ishiguro himself, which is 140 cm in sitting position, and 180 cm in standing position. It has 16 degrees of freedom, and was created in order to answer the questions: “*What is a human presence?*” and “*Can human presence transfer to a remote place?*”<sup>144</sup> A similar looking Geminoid is the HI-2, which is also a copy of Dr. Ishiguro, but with 50 degrees of freedom, and no standing capability. As this was the Geminoid I did my fieldwork on, this will be the one I mean when referring to *Geminoid* in this thesis, if not explicitly stated otherwise. The third android, Geminoid F, with 12 degrees of freedom, is based on a Japanese female, and is therefore smaller, with a standing height of 165cm, and a sitting height of 95cm, which makes it easier and cheaper to produce. The fourth Geminoid made is the Geminoid DK, made in the image of Danish Asc. Professor Henrik Scharfe, whose laboratory in Aalborg, Denmark collaborates with Dr. Ishiguro's in Japan.<sup>145</sup>

Whether or not we apply human interfaces to robots, humans tend to anthropomorphize machines; giving them personalities, being polite to them, and gender them, as seen in the media-equation theory.<sup>146</sup> Dr. Ishiguro had been creating robots for a long time, but the acceptance of the robots was in the start of his career not adequately positive, a factor described in the *uncanny valley theory*,<sup>147</sup> which states that robots who attempts to

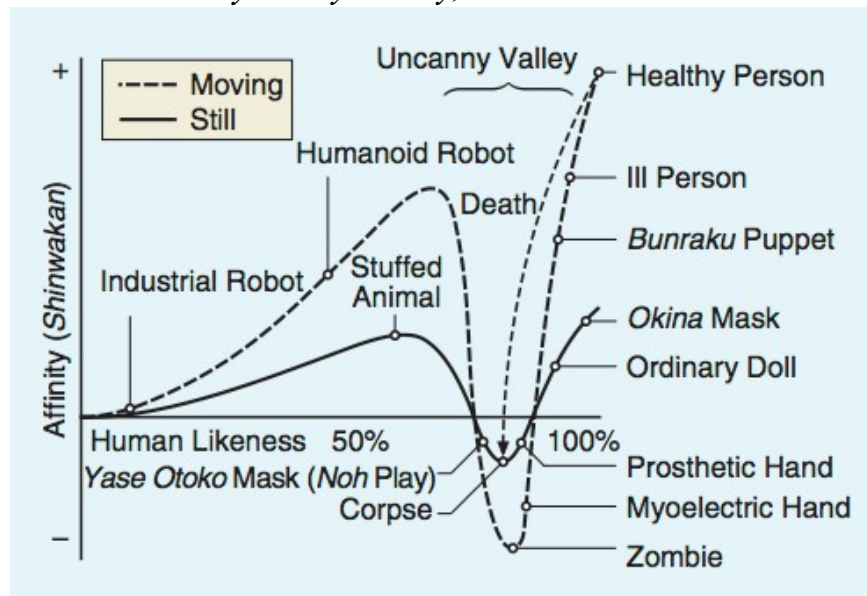


Figure 12B: The uncanny valley theory

142 Nishio, Ishiguro & Hagita (2007: 349).

143 The specifications of the robots are taken from the Geminoid homepage.

144 Ss.

145 For more info on the Danish project, see: <http://c.aau.dk/geminoid/>. Accessed 19.May.2014.

146 Byron Reeves & Clifford Nass: *The Media Equation: How People Treat Computers, Television, and New Media like Real People and Places*. UK: Cambridge University Press, 1996.

147 The theory was created by: Masahiro, M. (1970) “The Uncanny Valley” in *Energy*, 7(4), pp. 33-35.

look human risk coming of as scary, or strange, if they are in between the polarized “just robot-looking” and “human clone”. The uncanny valley theory therefore problematizes robots who, in their task of looking human, has too many design flaws, which makes them come of as frightening hybrids:

In fact, Ishiguro tried to make a copy of his young daughter, which was apparently unsuccessful as it frightened her, and made her cry, refusing to set foot in his laboratory again.<sup>148</sup> Some scholars seem to have interpreted the Uncanny Valley as an obstacle made into a design criteria, stating: “...a robot’s design needs to reflect an amount of “robotness”. This is needed so that the user does not develop detrimentally false expectations of the robot’s capabilities”,<sup>149</sup> whilst others, such as Dr. Ishiguro, seeks perfection as a mean to overcome the uncanny-valley problem.



Figure 13: Ishiguro's daughter meeting her robot twin.

When realizing that he needed to make the robots even more human-looking for them to be accepted as androids, Ishiguro made the Geminoid, a highly advanced robot which used his own hair as a basis, and a silicon skin mask copied from his own skin.<sup>150</sup> In fact, the appearance alone is enough to trick many people who enters a room to believe:

*(...) the Geminoid to be Dr. Ishiguro (...) they saw HI-1 for the very first time, they thought that somebody (or Dr. Ishiguro, if familiar with him) was*

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148 Singer (2009: 305).

149 Fong, et al (2003: 150).

150 Nishio, Ishiguro & Hagita (2007: 346-7).

*waiting there. After taking a closer look, they soon realized that HI-1 was a robot and began to have some weird and nervous feelings.*<sup>151</sup>

This happened to me too when I first entered the room where Geminoid sat, to do my fieldwork. There were six scientists in the room, we shook hands, except for the professor dressed in black who was sitting on a chair in the middle of the room. I suddenly realized that he was no person at all, and for me, it felt like we had E.T. Among us. There was an entity in the room, which I had no idea how to interact with. I caught myself casting glances at the Geminoid, being very intrigued just by its presence, wondering what *it* was “thinking”.

If appearance alone was enough, we might fully accept Geminoid as a clone among us, but that is not the case. The next problem Dr. Ishiguro became aware of when building the android, was that artificial intelligence programming just isn't advanced enough today. There simply is not highly enough advanced technology to make the android hold up to its almost perfect appearance, as soon as it opens its mouth, or moves, one immediately knows that something is “wrong”. This is of course a very xenophobic feeling, built on the idea or expectation that the entity in front of you is supposed to be as human as possible, but research shows that “even if we recognize a robot as an android, we react to it as a human.”<sup>152</sup> The problem is described by Dr. Ishiguro as follows:

*Androids [...] are still quite limited. The bottleneck in interaction with human is its lack of ability to perform long-term conversation. Unfortunately, since current AI technology for developing humanlike brains is limited, we cannot expect humanlike conversation with robots. When meeting humanoid robots, people usually expect humanlike conversation with them. However, the technology greatly lags behind this expectation. AI progress takes time, and such AI that can make humanlike conversation is our final goal in robotics.*<sup>153</sup>

With this realization, Dr. Ishiguro sought ways to bypass the uncanny-valley which the lack of AI led to. In an STS perspective, one can interpret this in light of *Actor-Network Theory*,<sup>154</sup> where Dr. Ishiguro is but an actor in a larger network of research on androids, but an active one, who attempts to push the whole research field that the network represents, over the uncanny-valley, by introducing a new object in the network. The result of this was the new category of robots, the Geminoid, which does not rely on

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151 Nishio et al (2007: 350).

152 Nishio et al (2007: 345).

153 Ss.

154 Bruno Latour (1999) *On Recalling ANT*. UK: Oxford university.

artificial intelligence programming at all to communicate, as it is teleoperated,<sup>155</sup> i.e. it is controlled by a human. This is done by removing the need of an actor-group one had until now seen as crucial to the development of android robotics, the AI-programmer. What Dr. Ishiguro has done with the Geminoid has sent shockwaves through the network, by cutting of this important actor-group, the network has been reshaped. This has also opened up brand new ways on how to think of robot identity, as they are very strongly bound to the human operator, which in Dr. Ishiguro's case focuses on a term called "sonzai kan": "In developing the geminoid, our purpose is to study *Sonzai-Kan* , or human presence, by extending the framework of android science."<sup>156</sup> Next, I will look on how this notion of human presence is researched.

## ***Constructing robot identity - reconstructing human identity***

David Nye opens his book *Technology matters* with: "*Technology matters because its inseparable from being human.*"<sup>157</sup> We are a techno-curious specie, always building new technologies, and inventing new tools. The goal with the Geminoid robot is not primarily to find out what makes a robot, but rather what makes us human. As robots get more and more advanced, and alien to us, it can be easy to loose grasp on the main purpose for their design, namely to aid humans. While some robots are simply entertainment robots, such as the robot dog AIBO, or service robots, such as the android ASIMO, the Geminoid android is a rather new category, which raises some interesting ethical questions. In this subchapter I will first present my experience of being in Geminoid's body and controlling it, a task I had not dreamed of being able to do when setting out for my fieldwork, but when given the opportunity, I gladly did. I will then look at a group of already existing robotic humans, the *cyborgs*, who are living with robot parts in their bodies. Lastly, I will go deeper into one of the personality shaping attributes that robots challenge, namely the notion of gender in robots.

## **Becoming the android**

One of the most interesting experiences in my fieldwork was when I was allowed to control the Geminoid android myself.<sup>158</sup> The Geminoid was placed in one room, while I was seated in a another room. I was then given a sort of helmet, which tracked my head and eye movement. Screens showing a live video feed taken from a camera in Geminoid's eyes were displayed in front of me, so that not only did the Geminoid move

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155 Operating a machine at a distance, the technology dating back to: Nikola Tesla (1990) *Apparatus for transmission of electrical energy*. Applied to the United States patent office, New York.

156 Nishio et al (2007: 350).

157 Nye (2007: ix).

158 On a tour in Dr. Ishiguro's laboratory, autumn 2013.



its head from my movement, its eyes also focused on what I was looking at *through* its eyes. I was also given a control stick (actually an XBOX controller) which allowed me to control Geminoid's hands. This allowed me to shake hands with the people in the other room. When I spoke, Geminoid's mouth was emitting the sounds I made, moving its lips and mouth, to give the illusion of it speaking with my voice.

The robot had not become me, I had become the robot. It felt like I was in Geminoid's room, where my “new body” was residing. I shook hands with the people in Geminoid's room, with my “new hands”, and I spoke to them through my “new mouth”. When they touched my android face, it felt a bit like they were touching my very own, and as an invasion to privacy.<sup>159</sup> At the same time, I was fully aware that I did exist in my own body, but it was like my sense of self had split. At once, I was a human in room A, but also a robot in room B. The picture below shows how the signal output is sent to Geminoid through the user interface, and then goes through the internet to a server, and then goes as input in the robot.

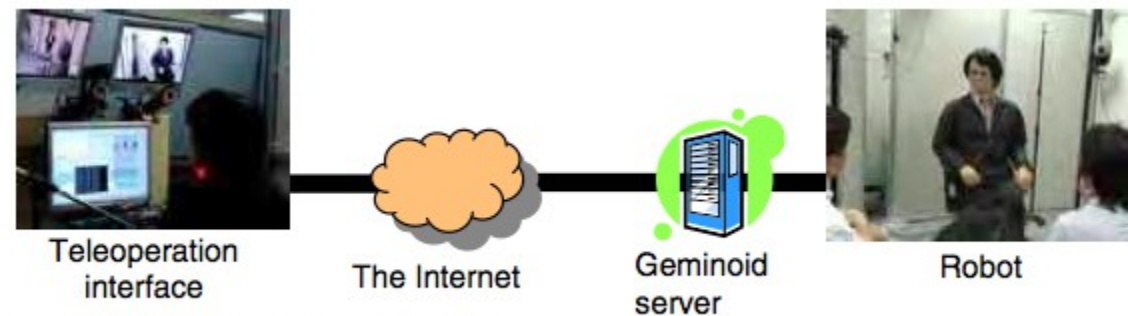


Figure 14: Geminoid's operating.

The whole experience is very difficult to explain, as it was something profoundly new to me. I can only compare it vaguely and partly to playstation games, where you control an avatar running around as pixels on a screen,<sup>160</sup> or when playing a roleplaying-game, narrating what your character does, but only seeing it in your head. Even so, this was a whole new category, differing by the extreme sense of reality in the situation, and it added much more to the senses than gaming does.

My initial thought was “that was fun, I want to do it again”, but then I started to think about what this means for those who do not have a functional body, as I do. For example, people who, due to illness, are confined in their beds, not being able to go out and socialize with their friends, would probably benefit quite remarkably if this

159 This invasion of privacy was also experienced by Dr. Ishiguro, as seen in: Nishio et al (2007: 350).

160 For research on this, see Ask (2007) *Ekte liv i syntetisk verden? Sosiotekniske montasjer i et online dataspill*. (Eng: Real life in a synthetic world -socio-technical montages in an online computergame).

technology would evolve more. If a sick person could easily just put on a robot-hat, and then control a robot-body, to go out and shop groceries, sit with their robot-bodies in a café, speaking to their friends, or even go to work, if their head is fine, but just their body too weak to leave the house. I would imagine, for sick people, this could be an immensely important factor on their lives, as it would allow them to go out in society, at least partly.<sup>161</sup> The ambitions are high, as the following statement by Dr. Ishiguro shows:

*The teleoperated, semi-autonomous facility of geminoids allows them to be used as substitutes for clerks, for example, that can be controlled by human operators only when non-typical responses are required. Since in most cases an autonomous AI response will be sufficient, a few operators will be able to control hundreds of geminoids. Also because their appearance and behavior closely resembles humans, in the next age geminoids should be the ultimate interface device.*<sup>162</sup>

Operating a copy of oneself probably has a very different feeling than operating someone else, but can also lead to the operator feeling alien to the robot-clone of himself that he operates.<sup>163</sup> How will this affect us our sense of self, when we have to interact with beings that resembles us so closely, who we in some cases can not tell apart at first. And some people, as Nye describes, goes into this quite willingly: “some people today want to leave their bodies behind and merge with the machine.”<sup>164</sup>

## A cyborg among us

*'We are going to become partially robot. What's a robot, what's us, is starting to get a bit messy.'*<sup>165</sup>

This prediction has already been made obsolete by the rapid technological development. We have not only adopted robot technology in our homes and environment, but some of us are already merging with the robots. This phenomenon is called "'Cybernetic organisms' or 'cyborgs', creatures that have changed and enhanced their bodies' capabilities via technology."<sup>166</sup> These are people who have robot-parts connected in their human bodies, for example a robot arm, leg, a pacemaker, a robotic lung etc. Technology is used to better their lives. The cyborg technology is quite expensive though, but the

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161 This has been featured in the TV-show *The Big Bang Theory* episode “The Cruciferous Vegetable Amplification” (S4, Ep. 2), where Dr. Sheldon makes a “mobile virtual presence device”, in order to be safe from the dangers of the world.

162 Nishio et al (2007: 351).

163 Nishio et al (2007: 349).

164 Nye, (2007: 223).

165 Rodney Brooks, founder of iRobot in Singer (2009: 375).

166 Singer (2009: 380).

market is clearly there, since people are in need of organs all the time, and as is known, finding donors is often difficult.<sup>167</sup> In the next century or so, will we have an additional type of doctor, the mechanical doctor, who not only fix your biological parts, but also adds mechanical parts to you if needed?<sup>168</sup> The merging of human and machine as seen in the cyborgs introduces many new ethical questions: “In such a cyborg world, what constitutes a person? Who has human rights? Who has voting rights?”<sup>169</sup>

This may sound like fiction, but for the (current) minority of cyborgs, the situation is very real. The founder and president of the *Cyborg Foundation*, Neil Harbisson, was born colorblind. He therefore went on to implement an antenna-device who connects to his skull, which allows him to hear colors. Mr. Harbisson is an advocator of Cyborg rights, and made a breakthrough when being recognized as a cyborg when his color-hearing antenna was approved as part of him by the governing forces who approved it on his passport-photo. When confronted by cyborg-phobia, which states that becoming cyborgs makes us less human, he replies that:

*Many people think that becoming a cyborg is becoming less human, but I think they are completely wrong. It can actually help us extend our senses to the level of other animal species, so it can actually bring us closer to animals and to nature.*<sup>170</sup>

The terms *cyborg* and *android* often get mixed up. Cyborgs are defined as primarily biological, but with human parts that enhances their capabilities, but androids are primarily robots made to look human. Science fiction, both Western and Japanese is filled with both, but often mix up the definition. There has also been small tendencies to see Large Technological Systems as “cyborgs”, e.g. road-networks, the internet, government etc, but I would advocate to stop this, as it only confuses, and discriminates the actual cyborgs, who primarily are people, and who, presumably, would not like to have their identity shared by a road or a cabinet of ministers. Also, since fiction has produced an image of a cyborg as something human, it would be best to just cut out the non-humans in the definition, and refer to those as LTS instead, to follow the lead set by fiction, and it is loaded with cyborgs. The terminator would not really be a cyborg, as it is primarily a machine with a human tissue disguise. Also, the *Cylons* from the *Battlestar Galactica* franchise, albeit human-appearing down to their very cells, were created from

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167 Horton, R and P. (1991) “A model of willingness to become a potential organ donor”, in *Social Science & Medicine* Volume 33, Issue 9, 1991, Pages 1037–1051.

168 The future of biological and robotic organ industry have been featured in many futuristic movies. For a dystopia view, see the movie: *Repo! The Genetic Opera* (2008), directed by Bousman, D.L.

169 Nye (2007: 144).

170 Quote and interview with mr. Harbisson is taken from <http://motherboard.vice.com/blog/what-its-like-to-be-a-cyborg-as-explained-by-a-cyborg>. Accessed 19.May. .2014.



machines, and then was made human looking, which all in all would make them androids, not cyborgs. Perhaps the most famous cyborg to date, Darth Vader, from the *Star Wars franchise*, gives a very good definition on cyborgs, as he was originally human, but after some bad counseling and a fall into a volcano, needed mechanical parts in order to survive and terrorize the galaxy.

Famous examples from Japan are *Motoko Kusanagi* from the *Ghost in Shell* anime, who fights crime, under the title song's lyrics “And is she really human? She's just so something new”.<sup>171</sup>

The picture to the right shows the protagonist's human and robot sides. But, as she originally is a human, she is a *cyborg*. Other Japanese cyborgs in fiction are the “android #17 and #18” from the *Dragonball* manga, which are not actually androids as their name suggest, but cyborgs, as they are built from humans. *Cyborgs*, as well as *androids*, are often heavily described in gendered terms, as gender seems to be one of the key human-personality-defining criteria. But why should that matter, when they are primarily mechanical, and not reproducing organisms in the biological way?



Figure 15: Ghost in Shell's protagonist

## He, she or it? The robotic gender

When observing the robot dog AIBO, and the robot seal PARO, (which we will meet in the next chapter), I discovered that I didn't think about these robots in a particular gender. I then realized that the gender biological animals have is not very interesting or even clear to me in most cases, unless it can be clearly visible, as with lions or peacocks. In many species we can see the gender quite clearly, but it doesn't really matter that much, except from a biology point of view. When I was looking at the robot animals, I didn't have a need to say “it is a she” or “it is a he”, it simply was a cute robot animal, regardless of its “gender”. Of course, it is not a biological creature, so gender doesn't really apply to it as with normal animals, where we often emphasizes the gender in context of mating, reproduction, upbringing and such.

<sup>171</sup> From the song *Lithium Flower*, by Scott Matthew on the album “Ghost in the Shell: Stand Alone Complex O.S.T”, 2003.

Being mechanical, these robot animals' lack of gender, aren't that surprising. We do not normally put gender on our computers, cars, or pencil cases, unless we are speaking a language that refers to them as him and her, and even so, it doesn't necessarily carry much meaning beyond the linguistically aspect.<sup>172</sup> What struck me was that in my research, the human-like robots, the androids, were more bound to be put in gender categories than their animal counterparts, even the seemingly genderless android ASIMO. An android simply can not lack gender it seems. But since these humanoid robots are not biological, they do not in any biological sense have gender. In feminism studies, it is common to refer to two different types of gender, a person's sex (the biological gender), and a person's gender (the mental and/or spiritual gender, what a person “feels like”).<sup>173</sup>

Of course, these androids do not have a biological gender unless we program them with “those parts”, and even so, they would be artificial constructions.<sup>174</sup> The thing robots do officially “need” in the eye of the beholder is however a “mental gender”. When it comes to mental genders, feminism refers to this as what the person feels like. Today's androids do not feel a thing however, unless programmed to do so, and in all simplicity we can program this as the following code:

*if (female equals true), do act female.*

*If not, do act male.*

Or one can set it as a value curve:

*male - 0 1 (2) 3 4 5 6 7 8 9 10 - female,*<sup>175</sup>

and then assign the android a gender-feeling number e.g. 2, which would determine its mental gender state, here to be quite masculine. Feminist scholars would have a lot more to say on this matter, it is on its own worthy of a research paper, but the type of mental gender I would more like to focus on here is how *others* gender the “person”, i.e. how does people put gender on androids, and none the less, why? If we were to discuss how androids do a gender, I would advocate strongly for Butler's performance theory<sup>176</sup> to be a very relevant theory to compare with, for what does these androids, if not act on a gender algorithm?

When it came to robot dogs and seals, the people I interviewed, and the people I observed were more likely to refer to them as “it”, with the occasional “he”(I did not

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172 One of my interview objects did however argue that he genderified his computer, which was to him the closest he had a girlfriend.

173 Prince, V. (2005) "Sex vs. Gender." in *International Journal of Transgenderism*. 8(4).

174 Sex-robots are however real, but little research have been put into that field. I did some research on this, and might publish it in future research.

175 This is pseudo-code, i.e. it can easily be implemented in most programming languages.

176 Judith Butler (1990) *Gender Trouble*. US: Routledge.

hear many “she”). But when it comes to the androids, I found that the more human-like their appearance and movement register got, the more they got labeled “he”, unless they were clearly based on human females, which then they were labeled “she”. It seems that gender neutrality leads to more male-labeling, such as with ASIMO. This may be a result of the society we live in, where we are bombarded with the “dolled up” female, as someone with long hair, long eyelashes, much make-up etc,<sup>177</sup> which make everything that lack those traits gender-neutral to borderline male.

The teleoperated robots were a special case, as they were refereed to as “it” when not active, but immediately became “he” or “she” when operated by a male or a female. This lead to many interesting observations. When I was observing one of the teleoperated android-based robots, the *Telenoid*, which we will see more of in the next chapter, a european male in his thirties volunteered to a demonstration. The European was given Telenoid to hold (it is approximately the torso the size of a child, with a neutral head, and with arms that grip around you). The Telenoid is a a hugging robot, designed so that the holder of the robot get the illusion that he is hugging the person that talks through Telenoid through teleoperation. In this particular example, the operator was a Japanese male in his twenties, staying in the next room. The European male looked amused, shocked and bewildered at the same time while he held the robot-doll and hugged it, and talking to the teleoperator who was speaking through the mouth of Telenoid. The first thing the European did after that demonstration was to say the following: “It was interesting, but weird, since I'm not gay!”

If this is lack of sexual confidence, or some homophobia, we can not say, but what's interesting is the immediate sexual (or emotional) attraction the presumably genderless android provoked when being operated by a male towards a male. The European male clearly felt strange, hugging and talking to a Japanese male in such an intimate manner, even though they were not physically in the same room, and even though the conversation was about the android. When doing the same thing, I did not feel any negative feelings towards the male operator, but that might be cultural and personal based.<sup>178</sup>

Japanese on the other hand do not have a strong culture for hugging, and physical contact is often limited to lovers and close family members, with some exception among todays youth. For example, where I would hug a friend goodbye in Norway, in Japan I

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177 As seen in: Paula Black and Ursula Sharma (2001) “Men are real, Women are ‘made up’: beauty therapy and the construction of femininity”, in *The Sociological Review Volume 49*, Issue 1, pages 100–116, February 2001.

178 This is a fascinating topic where more research is needed. Some tests have shown that many heterosexual males have a fear of hugging other males in order to be perceived as homosexual, as seen in: Kori Floyd (2000) “Affectionate Same-Sex Touch: The Influence of Homophobia on Observers' Perceptions”, in *The Journal of Social Psychology Volume 140*, Issue 6, 2000. Further research could investigate if this applies to robots too.

would say “sumimasen, arigatou, kiotsukete!” (I'm sorry, thank you, goodbye), and bow on each word, slowly backing away. What the other European male made me realize was his unconscious sexualization of the android, and bear in mind that this Telenoid android is not that similar to humans, but looks more like an alien species, with empty eyes, no ears, and a very blank face. What's fascinating though is when we take it up a notch to more humanoid androids, like the Geminoid, is that the gendering and sexualization becomes even stronger.

Many of the students I interviewed connected the male Geminoid very strongly to its creator, and no wonder since they look so very much alike. One student stated “I do of course not feel any attraction to the robot, since its my (jokingly: ugly) professor!”<sup>179</sup> And it seemed they felt very strange controlling the robot, as they had a lot of respect and maybe even a tiny bit of healthy fear for their professor. The female Geminoid, on the other hand, was much more objectified. One student said that since he liked to study at cafés and libraries, and have a lot of people around him. He sometimes, when studying alone at the laboratory, placed the female Geminoid in front of him, as if they were having a friendly cup of tea at a café. What I started to see was that the gendered scripting of robots was not very much used, but nevertheless proved very important in domesticating them, which I will explore more of in the next chapter. But first, how do people talk to and about the robots?

### ***Lost in robot-translation***

*Japanese is a sexist language, differentiating between male and female vocabulary, expressions, and accents. The male language is supposed to be coarse, crude, and aggressive, while the female language is expected to be soft, polite, and submissive.*<sup>180</sup>

Building further from the gendered principle, we see that they overflow into the language. As the quote above suggests, Japan has a very clear distinction on male speak and female speak. As this thesis focuses heavily on Japan, a notion on the Japanese language is in place. This has great importance both in the gendering of robots, and in the *sonzai kan* theory of human presence. I want to focus on two different Japanese language components, the verbs for *to be* (“iru” and “aru”), and also the lack of *personal pronouns*, which both came to be important results of my interviews, as they show some of the uniqueness of the Japanese culture.

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179 From one of the interviews done. Please understand that the words used were not meant crude, but as a joke.

180 Sugimoto (2002: 8).

## To be or not to be - iru or aru?

If you want to say “to be” in Japanese, you have to choose between the two verbs “iru” and “aru”, both meaning “there is”, but differing in the fact that *iru* is used for living or moving things, such as a person, a dog or a cartoon-character, whilst *aru* is used for inanimate objects such as a rock, the sun or a vending-machine.

One of the questions in my interviews was whether the interview objects used *iru* or *aru* when referring to the robots we were talking about. My assumption was that which verb they used would tell us something about the level of *humanness* that they put into the robots. What I did not expect was how difficult this question proved to be to answer for some of the participants. I found was that the more human- or animal-, lets say *lifelike*, the robot became, the more frequently *iru* was used. Whilst PARO, AIBO, and ASIMO had both instances of *iru* and *aru*, depending on who spoke, and how much the robot was moving, the more interesting results came from the teleoperated robots, which *Geminoid*, and as we will see, *Telenoid* and *Hugvie* are parts of. What I found out is that when a teleoperated robot, such as *Geminoid*, is sitting still, and not being operated, the verb used is *aru*, as it is considered inanimate, i.e. not moving. But, as soon as someone steps into its body through teleoperating, most people refer to it by *iru*, as it is clearly “alive” and moving.

Another linguistic gem of the Japanese language is the absence of gender of nouns, and gender pronouns. In Japanese, the sentence “sensei wa koko iru” can mean several things when translated to English. *Sensei* is the word for teacher, *wa* is a particle that marks the subject, and *koko* means here. So, we would presumably take it to mean “The teacher is here”. It is not gendered, so we do not know if this is a female teacher, or a male teacher.<sup>181</sup> Also, we don't know the number of teachers, it could be one, two, a thousand, but the sentence does not say.<sup>182</sup> Notice the use of *iru* in the sentence; this is clearly a living sensei.

## The rudeness of not referring to robots by their names

The Japanese words for “you” (*anata*), “he” (*kare*) and “her” (*kanojo*) or not by far used as often as their English counterparts.<sup>183</sup> If per say I was speaking to Jim about Susan, and would in English say the following “Have you seen her?” heavily relaying on the personal pronouns “you” and “her”. But in Japanese it would be “Jim-san, Susan-san wo mitta?” (Mr. Jim, have you seen Ms. Susan?) Using “anata” (you) and “kanojo” (her)

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181 The impact of this might not be very clear, but compared with languages that have clearer gender-nouns, like the Norwegian “lærerinne” meaning “female teacher” proves the impact it has.

182 This might at first seem confusing, but the context usually makes it crystal clear.

183 Hasegawa, N. (1985) *On the so-called “zero pronouns” in japanese*. The Linguistic Review Volume 4, Issue 4.

directly would be seen as a bit rude and unnatural. Therefore, when talking to robots, it was a bit unnatural to say, when referring to ASIMO “is he popular?”, a better phrase would be “is ASIMO popular?” This might also be one of the reasons that Japanese researchers that do not have much English practice have to think long about questions such as “is it a he or a she”, since for them in Japanese, it is simply ASIMO. Also, the English word “it” does not translate easily to Japanese, the best option I could think of was “ano mono” (meaning “that thing”) for it, which has a slightly different meaning than the English version.

A noteworthy mention is that the word for robot in Japanese is written using the katakana-alphabet, which is reserved for words from the “outside”. It is written: ボット (“robotto”) meaning robot. Chinese, which have a far less foreign-word-friendly alphabet uses 机器人 (Jīqìrén) which means “machine man”, which linguistically makes the Chinese robots more Chinese, and the Japanese robots more foreign, when talking about them. This is comparable to both English and Norwegian, which similarly to Japan uses the words “robot”, which originates from the Czech word “robota” (work/labor), actually stemming from Old Bulgarian Proto-Indo-European. Few however connects robots to Bulgaria, but rather as something English. This is of course not the case, as English (from the Anglo-sphere) just borrowed the phrase. It is thus only China who linguistically get a national robotic pride.<sup>184</sup>

## A robot and her script

A technology's *script* is “the manual the producer suggests, and what notion he/she has on the relation between the technology and its users”,<sup>185</sup> i.e. what they wishes the technology to be seen as.<sup>186</sup> In the case of AIBO, the strong entertainment and fun concept shines through, whereas in ASIMO the fun concept is paired with the care concept, and of course the mysterious and high-science radiance the astronaut-design gives. AIBO is meant to entertain you, and cheer you up, as it is modeled on a dog, which we all know have these traits, but ASIMO's script is a bit more unclear, as it is a whole new category. This makes its actual script, as a care-robot, become overshadowed by its immense popularity as the face of android-robotics, taking it to a celebrity status.

With Geminoid, the creator is very clear on the script, it is supposed to be a communication-tool, and it is supposed to teach us something about being human. That is the two main design-purposes of the robot, but as it is too expensive to produce to the

184 This very small and incomplete analyzis which just covers the langauges I have studied.

185 Stig Kvaal (2008) *Kulturvitenskapelige innfallsvinkler til integrert produktutvikling* (En: Cultural-scientific approaches to integrated product-development). Work note.

186 I chose to use the term “her” in the title, to raise awareness that not all robots are male, unless we chose to see them as such.

general consumer, the scripting is still in the laboratory test-phase. This however, makes it interesting, since we can then see the scripting taking place. When visiting the robot, and talking to the people researching on it, I saw an immense effort in script research. Having built such a strange and high-tech entity, the researcher where thrilled with all the opportunities the robot had, and had a wide variety of scripts for it, based on what they were working at, whilst some wanted it to teach us about human-robot-interaction, others were more interested in scripting it to function well as a communication medium. Androids and animal-robots based on biological creatures are not just made in the laboratory, but in a synergy with other diciplines, as described by Fong:

*Biologically inspired designs are based on theories drawn from natural and social sciences, including anthropology, cognitive science, developmental psychology, ethology, sociology, structure of interaction, and theory of mind. (...) these theories are used to guide the design of robot cognitive, behavioral, motivational (drives and emotions), motor and perceptual systems.*<sup>187</sup>

To construct a robot is thus not only about gears and wires, but a co-production of several different concepts, and also “configuring the user” as Woolgar writes.<sup>188</sup> As a computer scientist and programmer, I have seen this conclusively throughout my education and work. Figuring out the user is often given just as much focus as figuring out one's program, and many different analytical approaches are done. As the scripting process describes, defining “common user groups” is a popular approach, where producers make categories such as “woman in her sixties, high income”, or “teenage boy, easily bored”, and then work on making the technology based on the assumptions on what these users wants. Interviewing and observing is also something that is commonly used, and in my bachelor degree we were introduced to a numerous amount of diagrams and charts that would, presumably, quantify the users into an “make this algorithm”.

The strong tradition for representing robots in fiction have given rise to urges to create them in reality. In fiction, the lone, mad professor might create a robot in order to take over the world, in his secret laboratory in antarctica; but as I have seen in this chapter, these are real researchers who works on realizing some of the most advanced robots on the planet, in clean laboratories in the middle of big cities. Dr. Ishiguro, saw the lack of research in human-robot interaction, and created a new study, *Android science*. The “bi-directional, cross interdisciplinary research framework” of Android science<sup>189</sup> seeks to

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187 Fong et al (2003: 147).

188 Woolgar (1991).

189 Kazuo Ishiguro (2005) “Android Science - Toward a new cross-interdisciplinary framework.” In *Cognitive Science Society*. July 25-26, Italy, pp 1-6.

understand humanity through robotics, so compared to more traditional engineering approaches, this interdisciplinary field is based more on how we as humans construct technology identity in contrast to our own human identity.<sup>190</sup> The way this is constructed is quite special in Japan. The historical cultural “calmness” that engulfs the Japanese people greatly helps them in accepting robots, which Western nations might have more difficulty in, as Turkle describes:

*many find that, trained by the Net, they cannot find solitude even at a lake or at the beach or on a hike. Stillness makes them anxious. I see the beginnings of a backlash as some young people become disillusioned by social media. There is too, the renewed interest in yoga, Eastern religions, medicating and 'slowness'.*<sup>191</sup>

Some scholars, such as Marit Hubak, divides scripting into two parts, physical and sociotechnical. The physical script is what is built into the robot as it walks out of the factory, the gears and wires it actually consists of, whereas the sociotechnical script is what the producers want the users to think about this robot. A central point is: “How do the users perceive the scripts, and how do they construct their own?”<sup>192</sup> Latour introduced the concept of “program and anti-program” to see this feedback<sup>193</sup> which shows how user feedback further develops the technology, but I have chosen to rather focus on the domestication theory, as seen in the following chapter.

## ***Scripted robots?***

In this chapter I have found that the three robots, *AIBO*, *ASIMO* and *Geminoid* help us understand aspects of our own humanity. The robot dog *AIBO* aspires to entertain us and gain our friendship, but has nevertheless been discontinued. Even so, I found that it has played an important part in robotic history as it has sparked design-ideas for newer robots. I saw how *ASIMO* have successfully positioned itself as a global robotic superstar, and the poster-face for android robotics. The third robot investigated, *Geminoid*, gave an insight on how it is to become a robot yourself, and for me, shattered the wall between robot and human, as teleoperating allows us to extend our bodies to

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190 This is a core element in STS studies, and is therefore widely approached in works such as: Nye (2007) *Technology Matters – Questions to live with*. London: The MIT Press, and Cambridge and Colins. (2004) *Science Studies and Machine Intelligence*, in Jasanoff et. al. (2004) *Handbook of science and technology studies*, Thousand Oaks, CA: Sage.

191 Turkle (2011: 289).

192 Kvaal (2008).

193 Bruno Latour (1976) *Technology is society made durable*. From: <http://www.bruno-latour.fr/sites/default/files/46-TECHNOLOGY-DURABLE-GBpdf.pdf>. Accessed: 10.08.2014.



another self. I also followed Geminoid's creator, Dr. Ishiguro, on his journey to overcome the *uncanny valley* by introducing Geminoid as a new object to the *actor-network* of android science.

I then saw how some already existing robotic-humans, the cyborgs, are re-constructing their human identity and rights. I also saw how some cyborgs in fiction are mistaken for androids and vice versa, but argued for the claim that cyborgs are primarily human, whilst androids are primarily machines. A notion on the gendering of robots were also given, and I discovered that the more human the robots became, the more gendered they became. As for the animal-robots, they do not have the same amount of gendering, but as for androids, the gendering was very strong. Lastly I discussed how the Japanese language gives us some unique ways to approach robot identity, in the verbs for “to be”, *iru* and *aru*, in the form of genderless nouns, and also in the lack of usage of personal pronouns. Whilst many argue that Japanese is a very sexist language, I here advocates that it can also be a very non-sexist language compared to English, when used on subjects such as robots, as we do not refer to “he” and “she”, but rather “ASIMO” and “Geminoid”.

All of these topics are important pieces of the puzzle of constructing a robot identity, especially in the physiological aspect. I saw how the mental construction of robot identity is shaped, and also how the producers of the technology script it for what they perceive to be its users. In the next chapter, I will see how the actual impact of implementing robots out in an instance of society helps construct our perception of robots, when I turn my focus towards a specific user-group, namely the elderly. What happens when a technology's script faces its users, and is domesticated? How does the script hold against the domestication process, is it still reliable, or are there challenges unforeseen that shows up when the robot walks out of the laboratory and into society? Japan is not only the top robot-, but also the top aging country in the world, and how these two groups collide is the question I have researched in the next chapter.



## 4 - Old humans with new robots

*If a robot could genuinely love a person, what responsibility does that person hold toward that mecha in return? It's a moral question, isn't it?(...)  
The oldest one of all. But in the beginning, didn't God create Adam to love him?<sup>194</sup>*

Love and affection is some of our most basic human values, but as the movie A.I. quoted above suggests, it raises ethical questions when applied to a machine. In the previous chapter I drew the cultural heritage of Japan into the laboratory. I saw the construction of a robot identity, by mirroring it with our own human identity, with comparisons such as language and gender.

But what happens when robots walk out from the laboratory and into society? And where do they go, who are their consumers? This chapter takes us into society to see how robots are adapted there. I will here explore one of the places where robots can be found, namely elderly care facilities, in this thesis shortened to ECFs. Japan's demographical situation is quite special, as the society is aging rapidly, resulting in a need of more health-care workers. Could possibly robots fill some of these needs?

This chapter is divided into three main parts. The first part gives a *demographic overview* of elderly people in Japan, comparing with other countries. It also takes immigration into account, as the two population groups are strongly interlinked as groups that strongly affect the workforce of a country. The second part presents the robot seal *PARO*, who's furry presence is intended to calm the elderly, and two teleoperated robots, the hugging-pillow robot *Hugvie*, and the hugging-android *Telenoid*. The third part of this chapter puts the groups together, and looks at how the elderly interact with robots, seeing how the three robots have been studied in ECFs in attempt to better the lives of the elderly residing there, drawing on the *Trondheim-model* of domestication.

### *The elderly wave of Japan*

Headlines such “Sales of adult diapers in Japan surpass those for babies”<sup>195</sup> have for long

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194 From the movie A.I. directed by Steven Spielberg.

195 Japan daily press (2013) *Sales of adult diapers in Japan surpass those for babies*. From: <http://japandailypress.com/sales-of-adult-diapers-in-japan-surpass-those-for-babies-1132153/>. Accessed 02.06.2014.

been characteristic for Japan, as the elderly population grows. But who does this population-group contain? The *elderly* can as a term easily be defined by setting an age limit and stating that everyone over the age limit are in the category of “elderly”. The UN sets this limit to 60 years, but that is too simple, mainly because *actual-* and *physical age* can differ widely.<sup>196</sup> Physical age is how healthy your body is, also known as *metabolic age*. For example, if you neither smoke nor drink alcohol, but eat very healthy and exercise regularly, your physical age can be far younger than your actual age, a huge factor in longevity, which is a trait of the Japanese people who has the highest life expectancy on the planet (90 years for females, and 84.6 for males). Also, in some South-East Asian countries, your *actual Eastern age* is counted from the time of your conception in combination with the Chinese celestial calendar, which can make +2 years in difference to your *actual Western age*. In Japanese this is called “kazoedoshi”, but it is less common used than per say in Korea.<sup>197</sup> In addition, mental age can differ greatly to actual age due to illnesses such as Alzheimer, which ages the brain more rapidly. The effect is nevertheless that as we age, we are in larger need for care and assistance.

In older times, it was often the task and duty of the family, primarily women, to provide for its elders, but in today's industrial countries, due to education- and the emancipation of women, it has long been the job for hospitals, elderly care facilities and retirement homes to do this care job. A research conducted in the 1990s found that 6% of the Japanese population over 65 years of age were not residing at home, i.e. they were either in hospitals, nursing homes or residential homes, i.e. ECFs. This is not particular high compared to other countries, such as Sweden (also 6%), Italy (4%), UK (7%) and Denmark (15%), all of which are highly industrialized countries.<sup>198</sup> These countries put together, do however have approximately the same population size as Japan, so the problem is intensified by the size of the Japanese population, ranking tenth in the world with 127 million people.

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196 WHO (2014) *Definition of an older or elderly person - Proposed Working Definition of an Older Person in Africa for the MDS Project*. From: <http://www.who.int/healthinfo/survey/ageingdefnolder/en/>. Accessed at: 23.05..2014.

197 Willem Koops and Michael Zuckerman (2012: 113) *Beyond the Century of the Child: Cultural History and Developmental Psychology*. USA: University of Pennsylvania Press.

198 Ribbe, M. W. et al. (1997:6) “Nursing homes in 10 nations: a comparison between countries and settings.” In *Age and Aging (1997) 26 (suppl 2):3-12*.

## The demographic problem of Japan

Japan has the world's highest median age of 44.6 years.<sup>199</sup> This median age isn't extremely high compared to other countries such as Germany (43.7), Norway (39.7), which are both highly industrialized countries, but compared with countries such as Brazil (30.5) or Philippines (22.7) we see that the industrialized countries are certainly lagging behind age-wise. Many african countries have the opposite problem, with civil wars, diseases and poverty leading to median ages under 20 years, which leads to a different set of problems. A balanced but growing age pyramid is needed to have a stable society.

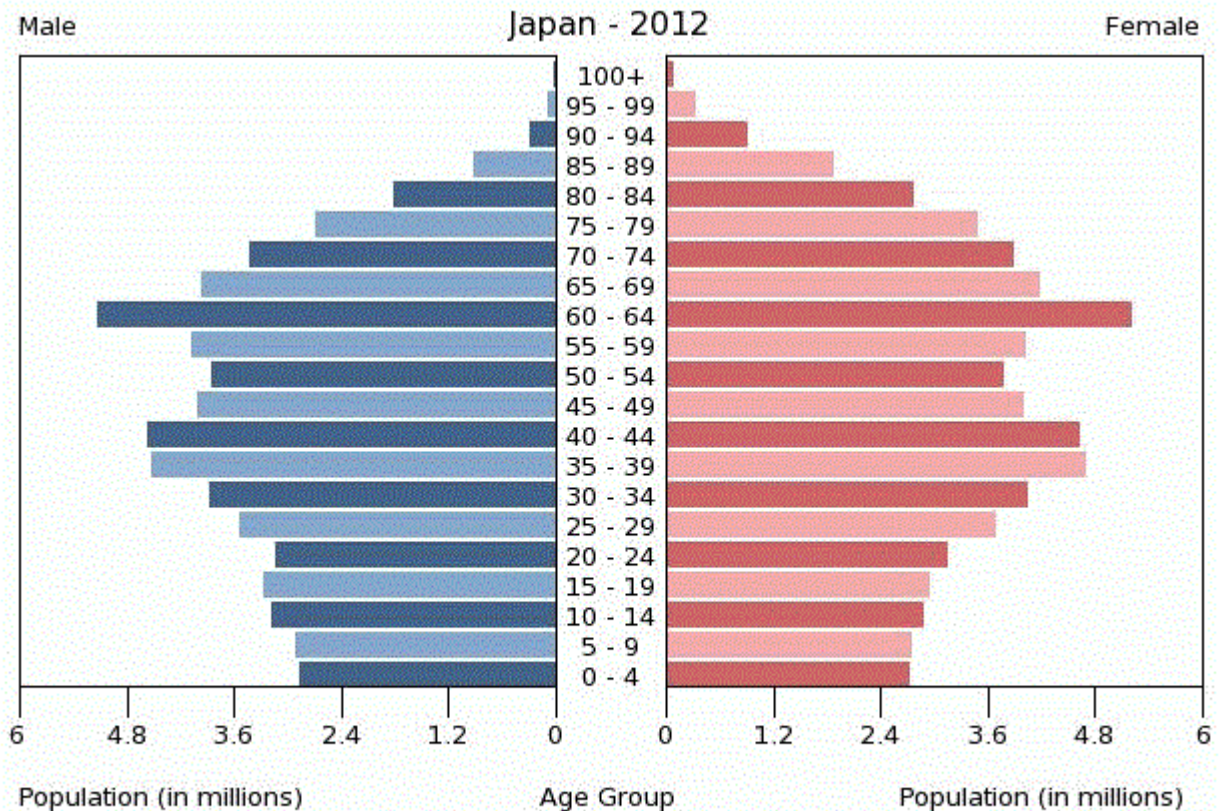


Figure 16: Japan's population pyramid.

The largest age group in Japan is the post-war-baby-boom 60-64 group, which is quite concerning. Comparing Japan's demographic population pyramid to other countries, even industrial ones, gives a very gloom outlook. With a fertility rate of 1.41 babies born per Japanese woman in 2012, it is simply born too few babies to fill the gap the people who dies leaves behind.<sup>200</sup> This gives a negative population growth, and as we can see on

199 CIA (2013) *The World Factbook – Field listing: median age*. From: <https://www.cia.gov/library/publications/the-world-factbook/fields/2177.html>. Accessed: 22. 05. 2014. Actually, Monaco (48.9) is higher, but due to a population of just 36 000, I chose to omit mini-nations in this research.

200 Nishioka, H. et al (2005: 30) "Population Projections by Prefecture in Japan 2005–2035 Outline of Results and

the population graph shown below, the Japanese population is shrinking fast.

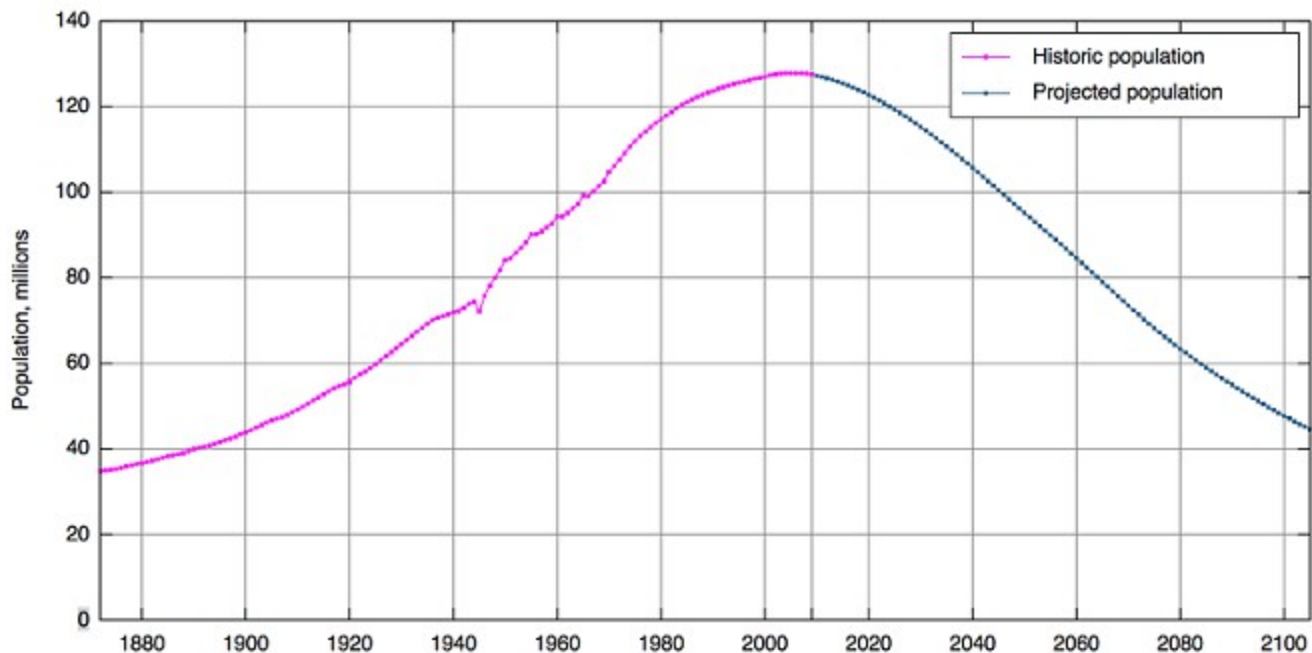


Figure 17: Japan's population graph shows a decline of 1 million per year.

As of April 2014, the Japanese population consist of ca.127 120 000 people.<sup>201</sup> As we can see from the predicted graph, the Japanese population is declining with about 1 million a year, which gives an estimate of circa 87 million people in total in the year 2060, and about 45 million people in the year 2100, which by todays population data would push it from the 10<sup>th</sup> most populated country in the world, to the 30<sup>th</sup> most populated country, squished between Ukraine and Tanzania. However, as with Japan, Ukraine's population is also decreasing, whilst Tanzania's population is increasing, a trait it shares with many underdeveloped countries. Japan might not be the only industrial country that has a population decline, but the almost non existent immigration to the country contributes highly to the population decrease we see now, and is a cause for the rapid decrease in population. Countries such as Norway also have a negative fertility rate (1.86),<sup>202</sup> but is, due to heavy immigration, increasing its population, projected to go from 5 million in 2013, to 7 million in 2060.<sup>203</sup> The problem with an aging population is twofold. First, more elderly people results in fewer people in the workforce. Second,

Methods", in *The Japanese Journal of Population*, Vol.9, No.1 (March 2011).

201 Statistics Japan (2014) *Population Estimates*. From the Statistics Bureau, Director-General for Policy Planning (Statistical Standards) and Statistical Research and Training Institute From: <http://www.stat.go.jp/english/data/jinsui/tsuki/index.htm> Accessed: 23. 05. 2014.

202 CIA (2013) *The World Factbook – Country comparison: Total fertility rate*. From: <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html> Accessed: 22. 05. 2014.

203 CIA (2014) *The World Factbook – Europe - Norway*. From: <https://www.cia.gov/library/publications/the-world-factbook/geos/no.html> Accessed: 22. 05. 2014.

more elderly people means a larger need for care-personnel. These two problems are heavily interlinked. In countries such as Norway, immigration is used to fill up the demand for care-jobs,<sup>204</sup> why is this not done in Japan as well?

## **The lack of immigration - xenophobia or robotophilia?**

An interesting aspect of Japan's demographic situation is the almost complete heterogenous society, i.e. there are very few immigrants.<sup>205</sup> 98,5% of the population are Japanese, whilst 0,5% are Korean, and 0,4% are Chinese. The remaining 0,6% are “others”, primarily from Brazil, Philippines, the US and Europe. This data is of course debatable, as the Japanese government has a policy of “making people appear on the paper more Japanese than they really are”, a result from just counting nationality and not ethnical background. Many workers has historically arrived from Korea, but after one generation they are counted as Japanese in the data, so the definition of what makes one Japanese are less strict than Western countries which normally count ethnicity and nationality in their data.<sup>206</sup>

If one compares this with for example Norway, which also has a negative total fertility rate, but with 86,2% ethnic Norwegians,<sup>207</sup> one can start to see why the Japanese population is decreasing so quickly. For comparison, Germany has about 80% citizens without immigration background, whilst Russia has about 81% ethnic Russians. As a Norwegian, traveling around Japan, I would generally say that there are surprisingly few non-Japanese people walking around, except in the big cities. In rural areas, signs are primarily in Japanese, sometimes in English, whilst in the big cities one can hear Chinese and Korean broadcasted in department stores.

This gives some difficulty in attracting workers from other countries, as a need of Japanese language proficiency is highly required. The Japanese work-visa procedures are also stricter than most countries, and getting access to the country can be very difficult. We might see that the government will loosen this up as the population ages, as there will be more need for health care personnel and workers in general.

Some Japanese politicians, such as professor Ono Goro, author of books such as

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204 Myklebø, S. (2007: 46) “Innvandrere på arbeidsmarkedet” (EN: Immigrants in the labor market) in *Arbeid og velferd* (EN: Work and welfare) nr. 4-2007.

205 Immigration data from the Japanese Ministry of Justice, accessible at: <http://www.moj.go.jp/ENGLISH/index.html>. Accessed: 22. 06. 2014.

206 Japan Ministry of Justice bureau (2009) 平成20年末現在における外国人登録者統計について (EN: Registered foreigners Statistics in 2008 at year's end). From: [http://www.moj.go.jp/nyuukokukanri/kouhou/press\\_090710-1\\_090710-1.html](http://www.moj.go.jp/nyuukokukanri/kouhou/press_090710-1_090710-1.html). Accessed: 22. 05. 2014.

207 SSB (2014). Data from: <http://www.ssb.no/en/innvbef/>. Accessed: 22.06.2014.



*Accepting Foreign Workers Spoils Japan* (2008) suggests: “The Japanese would, in general, prefer a humanoid robot in their social milieu rather than a human foreigner [he] argue that robots are better for Japan than immigrants when it comes to solving the evolving demographic decline in the population.”<sup>208</sup> As xenophobic feelings such as these exist, some might ask what if Japan instead of importing workers who need to be taught Japanese language and social norms, could just construct them from scratch? Then again, if a racist politician can't accept foreigners, what is to stop him from lashing out on robots next? It might not be unreasonable to project this to be a problem, for when robots are programmed to project emotion, might they develop a sense of it themselves?

### ***Robots as caregivers?***

What happens when we start to care for machines, and also, what do their projected care for us mean? The whole concept of love might not be something incorporated in a being, but can also be seen as a variable in a relation. But can we set love as a variable in a robot's program, stating if (human → do love), with a variable range from 1-10 where 1 is detesting and 10 is unconditional love? One researcher stated that yes, this was very possible. For her robot dog, she could set variables for shyness to strangers, affection towards a specific owner, and also happiness (projected) when that owner was around.<sup>209</sup> Her robot dog could thus mimic the behavior of either a Chihuahua with napoleon complex, over protecting of its owner, or the rather more relaxed St. Bernard, who just want your love. But is this even needed, is love a requirement for care? I will here see how robots designed for care impacts the life of their users.

### **PARO – it's so fluffy**

PARO is a therapeutic robot seal, designed to be very cute and calm its users. It was created by Dr. Takanori Shibata of the *Japanese Intelligent System Research Institute* (AIST) in 2001, and have been sold to the public since 2004. As of writing, it is available from eBay.com for \$4,636.<sup>210</sup> PARO's design is based on baby harp seals, and they actually emit the real sounds of real seals, recorded in Canada, where the creators went to get inspiration. The robot is designed in specific for elderly users, to give them a sense of contact with the soft fur. The reason for choosing seals as the design, is that few

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208 Wayne A. Borody (2013: 31) “The Japanese Roboticist Masahiro Mori's Buddhist Inspired Concept of “The Uncanny Valley” Bukimi no Tani Genshō, 不気味の谷現象

” in *Journal of Evolution and Technology*- Vol. 23 Issue 1 – December 2013 - pgs 31-44.

209 Interview at a university in Tokyo winter 2014.

210 This is the eBay-shop I checked: [http://www.ebay.com/itm/PARO-Robot-Seal-Healing-Pet-Gold-Therapeutic-robotic-animal-new-colors-gold-/161294564573?pt=LH\\_DefaultDomain\\_0&hash=item258de7bcdd](http://www.ebay.com/itm/PARO-Robot-Seal-Healing-Pet-Gold-Therapeutic-robotic-animal-new-colors-gold-/161294564573?pt=LH_DefaultDomain_0&hash=item258de7bcdd) Accessed at: 23.05.2014.



people (at least in Japan) have had any contact with the animal type before, and therefore hold little bias and prejudice towards it, which many hold towards dogs and cats per say. In this way, the domestication of seals require it to be introduced as something new, contra something that borrows from already domesticated biological animals.



Figure 18: The robot seal PARO

PARO has light, posture and temperature sensors all over its body, and responds to petting and stroking. It also gives cries of happiness when given attention, in order to request further contact with its human user. It can also remember its own name, and “show” (project) emotions like happiness, anger and surprise. It “sleeps” (charges) at night, unlike the real seals who sleep with half their brains awake, so in this it is more “human than animal”. PARO is no ordinary seal, it is a human's companion, designed to be your friend, as with AIBO, the robot dog, in the previous chapter. Stafford's (2010) research team approached the seal in a medical way: “Prior to meeting the robot, participants had their heart rate and blood pressure measured.”<sup>211</sup> Their findings was that indeed, it lowers the heart rate and blood pressure, which in turn reduces levels of stress. Many studies has shown that PARO also stimulates interaction between patients and caregivers, such as Klamer (2010):

*Results concerning the treatment of demented elderly people (...) showed*

211 Stafford, R. Q. (2010) “Improved robot attitudes and emotions at a retirement home after meeting a robot.” In *IEEE International Symposium on Robot and Human Interactive Communication - ROMAN*, pp. 82-87.

*that interacting with a zoomorphic robot led to an increased amount of communication with others, such as residents and caregivers.*<sup>212</sup>

One of the most critical negative tendencies with elderly people is “loosing them” socially, i.e. they stop responding to questions and don't participate in conversations.<sup>213</sup> PARO sparks the inter-human interaction in such patients, a positive side-effect of which it was not specifically intentioned upon construction, showing us that as the technology becomes domesticated, new ways of use emerge. One of the main strengths of the robot might be its “intelligence”. PARO has quite a good learning intelligence, if you treat it nicely, it will repeat the previous action more often. If you mistreat it, it will stop doing the previous action. In this way, it adapts to what the person using PARO likes. A study from Kazuyoshi Wada and Takanori Shibata, who studied the PARO robots in ECFs for two months, analyzing stress levels through urine samples found that:

*In order to investigate the psychological and social effects of the robots, each subject was interviewed (...) and their social interaction was analyzed. In addition, their hormones in urine: 17-Ketosteroid sulfat (17-KS-S) and 17 – hydroxycorticosteroids (17-OHCS) were obtained and analyzed. The results showed that the robots encouraged them to communicate with each other and then strengthened their social ties (...) urine tests showed that the reactions of the subjects' vital organs to stress were improved after the introduction of the robots.*<sup>214</sup>

By exploring the topic from two different angles, *triangulation*, the research comes of as more reliable.<sup>215</sup> I saw earlier how AIBO, the robot dog, was taken out of production due to failing sales, but how does PARO compare, as it is not in the entertainment field, but works in the care-field? The research done on PARO is more serious, maybe because the user group is more fragile? Welfare is something that is partly substituted from government level, whereas entertainment normally is not a political focus at large. Presented as a mini-network in the wider actor-network of Japanese robotics, PARO thus performs a more “ethically”important job in helping elderly people get more social and less stressed, thus receiving more research and funding.

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212 Klamer, T. & Allouch, S. B. (2010) “Acceptance and use of a social robot by elderly users in a domestic environment” at *The Conference on International Conference on Pervasive Computing Technologies for Healthcare*, PervasiveHealth in 2010.

213 Thomas DeBaggio (2002) *Losing My Mind: An Intimate Look at Life with Alzheimer's*. US: The Free Press.

214 Wada, K. (2006) “Robot therapy in a care house - its socio-psychological and physiological effects on the residents.” At *IEEE International Conference on Robotics and Automation*, 2006 in Orlando, US.

215 Wendy Olsen (2004) “Triangulation in social research: qualitative and quantitative methods can really be mixed.” In *Developments in sociology*. UK: Causeway press.

## Hugvie and Telenoid – co-producing love?

*Teleoperation* is, as we saw in the previous chapter, when a human talks to another human through a robot. I saw how this conversation was done through the android Geminoid, who is a robot-twin and quite human looking. I will here downgrade to some more robotic-looking creatures, the Hugvie and Telenoid robots who can be thought of as less evolved Geminoids, but still with one crucial function, the hug. In the case of the android Telenoid, and the pillow robot Hugvie we are thus speaking of teleoperated voice communication with the extra dimension of hugging.



Figure 19: The hugging pillow Hugvie

Hugvie is a pillow in the shape and size of the torso of a human child. It comes in a variety of colors, and is equipped with two vibrating motors that mimic heartbeats. Hugvie has a blank face and no moveable parts: “The Appearance is very neutral, and also no detailed face, so anyone can operate with no prejudice.”<sup>216</sup>

It has a hole on the back of the head, where you insert your phone when someone calls

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<sup>216</sup> Interview at ATR autumn 2013.

you. You then hug it as if it would have been a human. The idea is that you project the person you are talking to as the pillow. As its only mechanical parts are the vibrating motors, and the phone you have to insert into it, calling it a robot is debatable. Researchers have chosen many different definitions, such as “communication device”,<sup>217</sup> “huggable communication medium”<sup>218</sup> and “whisper pillow”,<sup>219</sup> but I have chosen to just use the term “pillow robot”, since it does contain mechanical parts, and is teleoperated when used in combination with a phone.

Beside being a soft pillow, Hugvie also aspires to have a psychological effect on its users. A study from Osaka university sought to measure the feelings of closeness and attraction using a Hugvie, contra not using one, when talking to a potential romantic partner. The male participants were seated in a comfortable chair, whilst hugging Hugvie, and talking through it to a female human, who they thought was another experiment participant, but who actually was an actress. The male and female was not able to see each other, as they were in separate rooms. They were instructed to talk of topics such as introducing themselves, planning a romantic date etc. One of the hidden measures of the study was to see if the male participants leaned around the corner of the wall to glance at their female conversation partner when she was led into the same room. When not using Hugvie, the males did not lean to look at the female at all, but whilst using Hugvie, over 40% of the participants did do so. The researchers assumed to be working with heterosexual males, but also asserted that this was an unsure variable, which is quite interesting in a gender-perspective, not only because they realized that not everyone are straight, which is a quite common gender-discrimination in Japan, but also because they realized that it might affect the robot's design. The experiments further concluded that:

*hugging subconsciously evokes an attraction or affective feeling toward a stranger communication partner. This suggests that a robot-mediated communication involving virtual-physical interactions can support starting the development of a close relationship.*<sup>220</sup>

When I asked one of the researchers if he had a Hugvie himself he answered “...yes, in

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217 Kuwamura et al (2014) Hugvie: Communication Device for Encouraging Good Relationship through the Act of Hugging. From: [http://www.omicsonline.com/open-access/Hugvie\\_communication\\_device\\_for\\_encouraging\\_good\\_relationship\\_through\\_the\\_act\\_of\\_hugging.pdf?aid=24445](http://www.omicsonline.com/open-access/Hugvie_communication_device_for_encouraging_good_relationship_through_the_act_of_hugging.pdf?aid=24445). Accessed: 22.05.2014.

218 Sumioka et al (2013) Huggable communication medium decreases cortisol levels. From: <http://www.nature.com/srep/2013/131023/srep03034/full/srep03034.html>. Accessed: 22. 05. 2014.

219 Chien et al (2013) *The whisper pillow: a study of technology-mediated emotional expression in close relationship* From: <http://dl.acm.org/citation.cfm?id=2513512>. Accessed: 22.05.2014.

220 Nakanishi et al (2013).

my house... but I only use it as a cushion... I do not have a conversation partner”.<sup>221</sup> A need for a human talking through the robot is needed, and it is thus not a supplement, but rather an addition to the communication scenario. Japan is no stranger to humanized pillows however, as the *dakimakura hugging-pillow* trend bear witness of.<sup>222</sup> But if just a pillow can have these effects, how will a more advanced robot measure up?

*Telenoid* can be seen as a more advanced, evolutionary form of Hugvie. Its outer appearance is also a torso the size of a human child, but the difference is that Telenoid is definitely a robot, as it has mobile joints, and can move its arms to hug you as you hold it close. As with Hugvie, the idea is that you project the robot to be the person that you talk to, which explains the *tabula rasa* design, as too much detailed facial features makes it more difficult to be able to project a broad range of people. This leads to the design coming of as a bit creepy, described by some as: “First appearance of it is scary, maybe most people have fear since it has no ears, small eyes...”<sup>223</sup> I personally also found it quite frightening at first. For me, I got horror movie connections with undead, faceless children. Young and old people however do not feel scared of it at all, perhaps they have not seen many horror movies?. This is a direct result of the *uncanny-valley* theory, where this particular mix of human and robot design comes of as scary.



Figure 20: Telenoid, the hugging android

### ***The domestication of robots in ECFs***

As I have seen with the three robots: PARO, Hugvie and Telenoid, their intentions and measured effect are quite promising, at least on the paper. When applying a technology

<sup>221</sup> Interview at ATR autumn 2013.

<sup>222</sup> *Dakimakuras* are pillows ca. 160cm high x 50 wide, with two printed sides, both portraying the same character. One side is normally with clothes, while the other side is not.

<sup>223</sup> Interview at AIST autumn 2013.

into the real world, several new issues do emerge. First and foremost, the users must accept the technology, or at least try it out. Entertainment robots such as AIBO have different challenges than care-robots such as PARO. Communication robots also have their own marketing challenges. Whilst the entertainment-robots needs to convince the market and the consumers to buy them, the care-robots do not have the same pressure, due to the immense need of care-personnel. They are researched and tried out not in coherence with the market pull, but from political push. A greater challenge the care-bots faces, is to actually be appreciated by the elderly users they are “pushed upon”. For the general consumer, the robots do come off as a bit weird, but might it be that we just haven't domesticated them yet? Even so, we have a situation where people of their own free will do not consume richly on these products, why is that?

### **Elderly care facilities – a panopticon dystopia?**

In today's industrial countries, we are often put in certain age restricted places as our lives progress. Human facility life can be summarized as a flow of placement from one facility to another: From kindergarden, to elementary-, junior high-, and high school, to college and universities and perhaps the military, with a large break as an adult caring for yourself, until a potential retirement at an ECF. We are all thus meant to be in certain facilities at certain points of our lives. Most people would undoubtedly prefer to live all our lives healthy with friends and family, but as we saw earlier, a large percentage of the elderly population are placed in ECFs, and the older they get, the more likely they are to be placed there.

After having been in the relatively free stage of non-institutionalized adulthood, being placed, willfully or against your will, in another facility would presumably feel strange for people used to deciding themselves when to get up, eat, go to the toilet etc. To have staff personnel tell you what to do and when to do it, might feel as a return to childhood, and even though the body might fail, the mind can still be well functional. It is therefore not just an economical and political question, but also a question about the welfare of the elderly users, which life-quality tends to change when moving into ECFs, and often for the worse.<sup>224</sup>

English social-theorist Jeremy Bentham introduced the idea of the *Panopticon* in the 18<sup>th</sup> century. This is a thought-experiment institution where the inhabitants live in their own cells in a ring surrounding a watch tower. The wall facing the tower is transparent, so the inhabitants can see the tower, however the tower is a one way mirror, so that a guard can *potentially* watch the inhabitants. The inhabitants never know if they are being watched,

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224 Xu et al (2013) Effect of nursing home characteristics on residents' quality of life: a systematic review. From: <http://www.ncbi.nlm.nih.gov/pubmed/23623273>. Accessed: 22. 05. 2014.



just that they in theory can be under surveillance all the time. I would suggest that modern ECFs are starting to resemble the panopticon idea. While no one surely intends to build ECFs into a *panopticon* dystopia, surveillance is quite common in these facilities, mostly due to safety reasons. The use of technology has greatly affected the share amount of surveillance. It is now possible to remind inhabitants when to take their medicine, have sensors that measures falling, and of course camera-monitoring of rooms.<sup>225</sup> But where is the balance between surveillance for the safety of the inhabitants, contra a violation of the private sphere? Robots strengthen the panopticon idea, but, as for now, they do come with a “stop” button.

Chang and Fang, who did a cross-cultural study of the mental impact of staying at ECFs in 2014 found the following: “They only know that they are not happy living in nursing homes.”<sup>226</sup> Studies also show that the biggest impact on life in the ECFs is when care is given, either from nursing staff, or visitors.<sup>227</sup> In the next part I will look into what happens when who (or in the robot case: what) comes to visit. In Japan, it is more common for families to be the primary caregivers to elderly people, but just given the share amount of the population, there are lots of ECFs, all in need of care personnel. As there seems to often be an understaffing problem in ECFs, (perhaps since they are normally government run?) the need for an extra pair of hands, and care is heavily needed. How is the technology domesticated in such a scenario?

The practical domestication of these robots is quite simple, they are sent out as emissaries of science, and normally are part of scientific programs. The elderly users are then interviewed and/or observed in regards to their use of the robots, and the scientists thus gain data on how the users adapt to the technologies. As I have seen, most elderly react positively to the technology, which of course are designed to run as smoothly and naturally as possible, to avoid ill feelings towards them. Many elderly appreciate to have a “someone/something” to talk with/to, in contrast to loneliness, and thus accepts the idea of a robot in their lives, practically domesticating it. As the Trondheim-model of domestication describes, the domestication process is not linear, but have multiple co-producing parts. A robot is not first practically domesticated, then given symbolical and cognitive meaning, i.e. it all floats. In the face of modernity “everything solid melts into the air”, as Marshall Berman describes.

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225 For example, Phillip's Lifeline system. Available from: <http://www.lifelinesys.com/content/lifeline-products/auto-alert..> Accessed: 22. 05. 2014.

226 Su-Hsien Chang and Miao-Zhun Fang (2004) “The Elderly Living in Nursing Homes: Cross-Culture Comparison” in *Tzu Chi Nursing Journal*, 2004; 3:2, 41-49”. Available from: <http://www.tzuchi.com.tw/file/divintro/nursing/content/93-2/6.pdf>. Accessed: 22. 05. 2014.

227 Xu et al (2013).

## Robots in ECFs – better than nothing?

*The child operating becomes calm. Normally, children are crazy like a monkey, but once they control Telenoid they become calm, and try to become good.*<sup>228</sup>

Children's resentment to visit ECFs is common in Japan as well as other countries. For children, the experience can be dull and boring, as the environment is catered to calmness and recreation rather than fun or games which kids tend to prefer. As the above quote shows, bringing children to an ECF risks not only upsetting the child, but also the elderly residents, if the children run around and wreck havoc. When children are teleoperating their presence to the ECF however, they are much calmer. One research group interviewed told that they tried doing experiments with the Telenoid robot being controlled by children who were at an elementary school, who talked through Telenoid to elderly people staying at ECFs:

*If children goes to the facilities, they don't know what to say, they are scared, they are not used to such kind of place. So they become unstable and can't say anything, but if they talk through internet [through telenoid], its like Skype, so they can talk a lot of things and ask questions, and we project to [the elderly].*<sup>229</sup>

Japan is no stranger to sending “something new” to visit elderly family members, as seen in the case with the company *Japan Efficiency Headquarters*, who hires out actors to play family members, with the company motto “Our purpose is to fill a hole in the heart”.<sup>230</sup> As is known, the pressure on Japanese workers is immense, with some fathers working from the early morning hours, to late in the evening, and then the social pressure often requires them to go out for a drink to build social bonds with colleagues. Thus they do not come home until late at night, and then waking up early next morning, running of to work, resulting in headlines like “Jobs for life: Japanese employees are working themselves to death.”<sup>231</sup> This is especially relevant for Japanese males, who traditionally have responsibility to bring home the money, but females showing similar symptoms too. This cycle of extreme pressure result in some children not knowing or understanding who the strange man they see every sunday is, but luckily the situation is

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228 Interview at AIST autumn 2013.

229Ss.

230 Harrington, James (2000) *Hole in the Heart or Hole in the Head?* From: <http://www.qualitydigest.com/dec06/columnists/jharrington.shtml>. Accessed: 22. 05. 2014. And: The Baltimore Sun (1992) Japan's lonely may rent 'family' for home visit. From: [http://articles.baltimoresun.com/1992-08-06/news/1992219046\\_1\\_strangers-japan-actors](http://articles.baltimoresun.com/1992-08-06/news/1992219046_1_strangers-japan-actors). Accessed: 22. 05. 2014.

231 The Economist (2007) Jobs for life Japanese employees are working themselves to death. From: <http://www.economist.com/node/10329261> Accessed: 22.05.2014.



improving. No wonder one sometimes need to hire an actor, if there simply is not time left in the day to visit relatives.

In this, the actor company is quite comparable to Telenoid, which also seeks to add meaning by providing social interaction: “once I visited elderly facility, and see interaction between elderly person and, I recognize that it is very useful and meaningful to have Telenoid at elderly care place.”<sup>232</sup>



Figure 21: Elderly man interacting with Telenoid.



Figure 22: Elderly woman interacting with PARO

Above is a picture showing an elderly person holding Telenoid, like he would hold a child. The next thing that would happen would be that Telenoid's tiny robot arms would grab for the man, to initiate a hug, perhaps while the man's granddaughter, who might live in another part of the world, talks through Telenoid's mouth. The creators found that people prefer the more advanced Telenoid to the immobile Hugvie: “Aaah... they prefer telenoid from Hugvie, because Hugvie doesn't move, only hugging.”<sup>233</sup>

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232 Interview at AIST autumn 2013.

233 Ss.

The picture is twofold. At one side, it is nice that old people have someone to interact with, to have that human touch that is so important for all humans. But on the other side, would it be better to have family or friends, or maybe a real animal, to show the love the robot can only fake? Robots do not feel love, it is only programmed to make the users think they love them. Then again, perhaps a PARO is better than nothing, compared to just looking at the wall. The robots are generally reported to be very popular in the elderly homes that uses them. “Old people tell some secret about stuff – he's very mean or something like that [talking about staff-members] – to telenoid. So staff can operate to listen to what they are really thinking about.”<sup>234</sup> Thus acting as “mini-spies” in a sense, enforcing the panopticon-ideals.

The symbolical domestication of robots is thus filled with many meanings, quite different from the practical domestication. Symbolically, these robots hold much more meaning than what physically actually are; bolts, wires and software. As with the uncanny-valley problem, how robots come of to the users greatly affect how they are perceived. Whilst the robot seal might symbolically mean “furriness, cuteness, care”, the Telenoid, who is designed child-like, holds a different symbolism, and is of course loaded with the symbols the teleoperator, on the other side, projects to the elderly user. The Trondheim-model describes symbolism to be strongly interlinked with practical domestication. For example the robot-seal, it is not simply a soft thing you pet, but it gains the symbolic status of a pet, a friend, or companion. The robots symbolical domestication is strongly interlinked with the socio-cultural context it works in, a robot in Japan, as I have argued in chapter one, will have a more positive symbolical luggage of anime and manga which it will be symbolically compared with. A Western robot will have the symbolical disadvantage of the Terminator. This is in line with the Trondheim-model, seeing that not only do the three domestication dimensions of practical-, symbolical- and cognitive domestication float together, but the intra-cultural factors also affect the domestication process.

As described by Sherry Turkle: “any contact is better than no contact at all.”<sup>235</sup> Not everyone thinks that the robots are cute, as one of my interview subjects describes: “it was the first version of Telenoid, which was more weird and heavy. Thats why, many people feel scary or something, however, once they hug and communicate, the feeling of scariness decrease.”<sup>236</sup> Even cute robot seals can give bad vibes to some, as one Science-Communicator described:

*Many people seems very happy, touching PARO. And they want to live with*

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234 Ss.

235 Turkle (2011).

236 Interview at AIST autumn 2013.

*PARO in their home, but not all of them... On the other hand, opposite feeling also exist, some high school students said, they don't feel happy (with PARO). They described this feeling as. 'Kimochi warui'. But very few people say so.*<sup>237</sup>

The Japanese phrase *kimochi warui* roughly translates to “bad vibes/bad feelings”, i.e. the high school students that described their interaction with PARO as a *kimochi warui* moment, felt uneasy around PARO, which of course can have many explanations, since it is very much alike a real seal, it might be some other explanation than the uncanny-valley problem, which is much more prominent in Telenoid which even its researchers have problems accepting at first: “Aaah, at first I think it little scary, but somehow it becomes cute and mysterious”.

PARO gained some fresh reputation after being used at an elderly retirement home near Fukushima Japan, after the triple crisis of earthquake, tsunami and nuclear meltdown happened in 2011, which of course was a very traumatic and stressing period. If the research done on PARO is correct, it would have contributed to release the stress of those users who were affected by the crisis, which was a dire need at the time. But what social meanings do this technology hold?

When analyzing PARO from a *domestication theory* point of view, I chose to see the ECFs as the robot's “daily life environment”, and the elderly people living at the ECFs as its primary users. Normally the robot comes to the ECF as a science experiment. The elderly users do of course have consensus on the introduction, as far as their mental health can understand it. Normally consumers have very active choices when adapting new technologies; do we buy an iPhone or a Samsung, a Playstation or an XBOX, a Toyota or a Honda? As grown ups, we actively choose our purchases, but for children and residents in the ECFs, the choice is often made for them. An interesting study could be to see how people that chose themselves to buy a PARO reacted to it, but most research is done on the ECFs, leading to some bias in the appreciation analysis.

The co-creation of a technological discourse between the engineers/scientists, who script it, and the users who domesticate it, is in constant re-negotiation. The cognitive domestication of robots is thus both a result of practical- and symbolical domestication, but also a premise for the process to take place. Cognitive analysis of the robot's effects is something Sherry Turkle have researched on, and her results tells us that the image we create of a robot identity greatly affect if the domestication is successful or not. Users have to cognitively accept the robot in order to domesticate it, and this is of course greatly affected by the practical domestication, how they actually are implemented, but

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<sup>237</sup> Interview at Miraikan autumn 2013.

also symbolically, what they represent. Symbolical domestication have shown issues not predicted, as the uncanny-valley, but some researchers such as David Hanson predict that as we grow more accustomed to the technology, this effect will gradually disappear, stating: “In my experience, people get used to the robots very quickly,” Hanson says. “As in, within minutes.”<sup>238</sup> The Trondheim-model of domestication argues that the cognitive meaning the robot hold and creates is co-produced even before it is physically and symbolically introduced and domesticated; in this case the users might know that “thursday a robot is coming”, and they will start to create cognitive thoughts and meaning-paradigms of the foreseen encounter. In a cognitive manner, I would say that it is domesticated like a Janus-figure, in a pre- and post encounter, which of course is strongly interlinked with the practical and symbolical domestication described before.

In many of the ECFs the PARO robot was so popular that many users and staff “needed to keep it”, and there has been cases reported by Turkle, where users “lost their robots” when the researcher came to pick them up.<sup>239</sup> The robot did more or less become a part of the ECFs environment, not as a human, not as a furniture, but as a “boundary (inhabitant)-object”. While some elderly people do not distinguish it from a real animal due to mental deceases, most users are very aware that it is a robot. However, there is a demand for it, the technology has been domesticated.

The chapter opened with the movie AI's questioning of a robots definition of love. By looking at how robots act in ECFs in a domestication perspective, we can say that love is the sum of the domestication process. With regards to the three interlinked parts of the Trondheim-model, love is practical, it is the stress reducing hormones, the urine samples that proves that robots actually do help, but it is also symbolical, as the robots act as something they are not. A robot caregiver is a symbol for a human caregiver, at least as of writing, and thus only plays a symbolical role. As this progresses however, we might see new cognitive meaning categories that the robots creates. I have seen the cognitive effect robots can have on users, and we might even question what it means to love? If you can love your biological family-dog, what then does stop you from loving your mechanical seal?

## ***Domesticated robots?***

In this chapter I found how the elderly residents' domestication of welfare-robots is much more positive than one would think from a Western perspective. Elderly Japanese people love to have something to cuddle, and something *is* better than nothing. The

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238 Barody (2013).

239 Turkle (2011).

robots are domesticated both practically, through their actual, physical implementation in ECFs, symbolically, especially as a replacement/addition for human care or visitors, and cognitively, as a new being coming into the ECFs, creating new thoughts and meanings. The domestication is done in a synergy with the scripting process, as I found that the push and pull in need of making and using robots goes both ways.

I first saw that the *demography* of Japan's 127 million people show huge population group of elderly people. People in Japan live the longest, and also have the highest median age on the planet. I have seen that there is little immigration to Japan, with 98.5 ethnic Japanese, and all this combined gives the challenge of who is going to care for the elderly? And how will this care be provided? One possible solution is robots, and in the second part I looked into three robots, the robot seal *PARO*, the hugging-pillow robot *Hugvie*, and the android *Telenoid*. I saw how they are domesticated into society, and how people interacted with them.

In the third part I saw how the elderly, together with the robots, co-construct their socio-technical life at the elderly care facilities, when they domesticate the robots. I investigated how the three robots have been studied in elderly care facilities in attempts to better the lives of the elderly residing there. The robotic future is still very clouded to us though, and we might even see a future where robots actually gain citizen cards, which then would give Japan a very big population boost as robot country number 1.



## 5 -Constructing a national robot-identity

*We will not care if our machines are clever but whether they love us. Indeed, robotics want us to know that the point of affective machines is that they will take care of us. This narrative-that we are on our way to being tended by caring machines-is now cited as conventional wisdom (...) That it has become so commonplace reveals our willingness to take the performance of emotion as emotion enough.<sup>240</sup>*

As can be seen above, Sherry Turkle is worried that we must accept robots since we “have to”, but do we really not have a choice? And do we need to worry that much? In the previous chapter I saw how the robots came out of the laboratory and into society, and that they were quite welcome, and often quite successfully implemented into the Japanese society.

In this final chapter, I will retrace back to see how the cultural tradition of Japan has affected the domestication and scripting process, and which possibilities and challenges it has made for the users and producers of Japanese robots. The first part summarizes the findings of the three environments I have followed the robots in. These are (1) The cultural-historical context, where I found that the connection between robots and the Japanese historical-cultural tradition goes very deep, and greatly affect how the Japanese experience robots. (2) The laboratory and research context, where I found that the boundary between human and machine is much more diffuse than is expected. (3) The user-experience with robots out in society, where I found that elderly people in Japan react quite positively to robots, which again is bound to their cultural background.

The second part of this chapter aims to see the robots in the broader socio-technical network and place it in the wider Studies of Science and Technology landscape, and to see the synergy between producer and user, script and domestication, and how they together co-produces the robots. Lastly, further research questions based on my findings will be given.

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240 Turkle (2011: 286).

## *Out of history and into the manga books*

In the second chapter I explored the historical background for the acceptance of robots, in a quest to understand how the Japanese can so easily just accept robots in their daily lives. What I found was that the robots are deeply connected to the cultural tradition of Japan, and that a robot is not simply just created in a laboratory, given a number, and then put to work. The robots traces their heritage much longer than just to the factory where they were made. Anime and manga may have the honor of shaping the idea of the modern robot, and they have had an immense impact on the Japanese way of thinking, but as Japanese history has shown us, the seed of accepting robots was sewn and have grown for a long, long time.

The first written Japanese sources gives insight into a mysterious ancient past, where figures such as the shaman queen Himiko and the emperors, descendents of the sun-goddess Amaterasu, were already making the Japanese used to “boundary-humans” living among them. The emperor role was presented as a boundary-object, comparable to the role of the androids of today, as both characters are in the image of humans, but have a strong identity of being something else *originally*. The emperors, who were seen as divine, long held on to the status of being androids, in their nature of being part deity, in the image of men and women. Not until the capitulation of Empirical Japan after WW2 did the Japanese population start to see the emperors as human, and not gods, due to the forced radio-speech where the emperor at that time renounced his divinity.

The *shogun*, *daimyo* and *samurai* who were the military class under the emperor in the shogunate era were also presented in a robotic context. Samurai were almost like computers, programmed with *bushido*, the code of honor. As power often corrupts, the role of the samurai was gradually diminished, and the new and powerful merchant class rose, which ingenuity have from the shogunates to today made Japan a economic superpower, currently the third in the world. This economical strength has strongly contributed to the highly advanced robots we see today, as researching, manufacturing and marketing them are extremely expensive, and could perhaps only be done by the support of powerful companies such as Honda and Sony.

I also saw how the ingenious religious practice of Shintoism has shaped Japan, in its belief of the kami, the spiritual nature of things, which raised the question “does robots have kami”, of which I got the answer “not yet” from my informants. The idea of Shinto coexists with a strong Buddhist tradition. Japanese Buddhism, of which Zen-Buddhism is an important part, can be read in a cyborg context, where the Buddhist is seeking to become something more than just a human. The seekers are on a quest to discover enlightenment, which is quite comparable to some of the cyborgs I saw in later chapters,



who felt that becoming cyborg, actually can bring them closer to nature. This was seen in contrast with Christianity, who strongly emancipates the individualism and superiority of man. Although Christianity was banned for a long time in Japan, it was allowed after the opening of the country when Japan attempted to catch up with the Western powers through imperial colonialism.

When gunpowder was first introduced to Japan, despite being far superior, it was seen as less honorable due to cultural reasons as described by Nye: “(...)awareness of particular tools or machines does not automatically force a society to adopt them.”<sup>241</sup> Japan's involvement in WW2, its loss, and the remarkable rapid industrialization and economic boom after, contributes to show Japan's uniqueness in accepting new ideas whilst still holding on to their own cultural identity. Ancarani writes that: “In the 1980s Japan (...) began their commercial invasion of the rich markets of the Western world”,<sup>242</sup> which of course has been crucial to building an economy strong enough to make, export and fund robotics. Another finding is that there is simply not one or a few robots, but a whole fauna of them, almost making them a race of their own, which of course in a biological manner does not make sense, but culturally, it might actually do.

Robots can also be esthetic, and as I explained, many robot statues are displayed in Japan. The strong *manga* and *anime* entertainment culture is strongly interlinked to national identity. The *Tetusjin-Go-28* statue in Kobe serves not only as a memorial to its creator, a national manga heritage, but also serves as a guardian figure towards the horrible national catastrophes that plagues Japan, built where the Kobe-earthquake of 1994 struck. I also saw how Studio Ghibli, Japan's most famous animation company is an actor in the network who strongly contributes to a conscious population, both regarding environmentalism, and technology-ethics. Japan's rich and unique cultural heritage has undoubtedly helped lay the foundation of accepting robots into society.

### ***Out of the manga-books and into the laboratory***

The fundament of robotics had been laid, Japan was in a post-war status, and had renounced war forever as seen in its constitutional article 9. How then did the research milieu respond to these opportunities? Robots had been flying around in the manga magazines long before it was technically possible to build them, but when Japan rebuilt the society after the war, strange creatures began to stir in its laboratories. The third chapter introduced three of the robots made in Japan, and saw the physiological effect they have on their users, and how the individuality of both robots and human-users was

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241 Nye (2007: 20).

242 Vittori Ancarani (2004: 658) “Globalizing the world. Science and Technology in International Relations” in Jasanoff, Sheila m. fl. (2004) *Handbook of science and technology studies*, Thousand Oaks, CA: Sage.

constructed.

AIBO the robot dog was for long the star of animal-robots, but has been discontinued. I found that this entertainment robot was very well liked (even loved) by its users, and that it's still very popular, despite being off the market. Another robot, the android ASIMO, is probably the world's most famous android as of the year 2014. I looked into its features, that it could walk stairs, carry medicine, play football, but also the different roles it has as a “robot superstar”, meeting world leaders and ringing the bell on Wall Street among other things. In my own meeting with ASIMO, I experienced the thrill of meeting a whole new being, and I saw how the science communicators that worked with it felt about “him”.

The third robot introduced in this chapter was the very humanlike android Geminoid, which construction purpose was to make a human twin. I saw how it was to meet Geminoid, and how it felt like to work with it. Geminoid's creator was also analyzed in lieu of Actor Network Theory, as his quest to overcome the uncanny valley is particularly interesting. Next I explored how it is like to actually become a robot and the experience of controlling it. What I realized from this experience was that the boundary between man and machine is not as solid as we are prone to think. As androids are starting to resemble humans more and more, some humans go in the opposite direction, towards a robotification of their own body. Some robotic-humans already live among us, the cyborgs. In the Oxford dictionary they are defined as science-fiction, but for a growing number of the world's population it is reality, i.e. some are already merging with the machines. This brings up topics such as machine-rights, an interesting ethical field that has not been put much research into. Albeit we are not close to the question on “what separates a human and a machine?” we are getting closer every time a robot becomes more humanoid, or a human becomes more robotic.

I also looked at a human personality shaping attribute of gender, and analyzed the robotic gender, and/or lack of it. My finding is that the more humanoid the robot becomes, the more gendered it becomes. I saw the lack of gender in robotic animals, and the gradual gendering of the Telenoids and Hugvies, to the very strict gendering of ASIMO as male, and of course the Geminoid robots gendered as the same gender by which their human twins appear as. My findings in regards of the Japanese language and robots were also presented, where I argue that the two verbs for “to be”, *iru* and *aru*, represent a uniquenesses of the Japanese culture when accepting robotic entities. The verb *iru* strongly gives them a living quality, and in contrast, the *aru* verb does not. Thus, both gender and language helps construct the robot identity.

## *Out of the laboratory and into society*

In chapter four I explored one of the most crucial reasons for the robotic revolution that is taking place in Japan, namely the elderly wave that washes over Japan as a dangerous tsunami. When almost half of the population becomes 65+, there is an enormous need for health-care personnel, and with Japan's negative fertility rate, the gap between old Japanese and young Japanese is growing larger in a dangerous pace. Turkle argues however that this is a fake demand: "Robotics present (...) the idea that as our population ages, we simply won't have enough people to take care of our human needs, and so, as a companion, a sociable robot is 'better than nothing.'"<sup>243</sup> The discourse on defining what the term "elderly" means was discussed, and I advocate for being more region-specific in the term, as the life expectancy of Japan (82.73) at the top of the list is much higher than for example Sierra Leone at the bottom (47.5). This limit is also very crucial political, with regards to retirement age, government support and the amount of Japanese people in work. I also discussed how the very small immigration to the country strongly affects the further need for health-care personnel from other sources, and thus enter the robots. I found that in this welfare-problem situation, there is a need that is driving the technological development, a user-generated technological pull. The way users and producers affect each other is crucial in order to understand the robotification of Japan. The hierarchical way of thinking has been strong in Japan from early history, where everyone knew their place. When facing a new entity, say a robot, one only needs to place it somewhere in the hierarchy, and people then know how to treat it.

The need for an extra pair of hands (or gears?) is attempted to be partly solved by the introduction of health-care robots. I saw how PARO, the robot seal is deployed at ECFs with the promise of making the inhabitants more relaxed and social. An analysis on the research data behind the claims were given, showing a rich research on the robot, backing up its claims as helpful in many ways. I also saw how two teleoperated robots, the Hugvie and Telenoid are introduced as ways of communicating in a physical way with someone who are not physically present.

The idea of communicating through a robot was discussed, and interestingly the scariness of the robots follows a Bell-curve, where the youngest and oldest people are least afraid of it. This correlates with the Uncanny-valley theory where robots who fall in between the "looking robot" and "looking human" categories are perceived as scary. Interestingly, young children might not be afraid of robots, but that doesn't mean they are uncritical to implementing them in ECFs, as my findings with the "uneasy feeling" show, albeit generally, I found that the robots were accepted quite happily, and sometimes seen as indispensable in the facilities they are implemented in. All of these

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243 Turkle (2011: 281).

factors, from history and individualism, to the demographic problem, are important parts in the larger network of building a robot nation.

### *A network of pushing and pulling*

The world is changing fast, and technology is taking more place in our lives than before. Toffler argues that: “There is no facile way to treat this wild growth, this cancer in history. There is no magic medicine, either, for curing the unprecedented disease it bears in its rushing wake: future shock.”<sup>244</sup> On the other hand, Nye advocates that children growing up today adapts quick to the technological tools: “We live not merely in a technological world, but in a world that from our earliest years we imagine and construct through tools and machines”<sup>245</sup> It is in this ever growing and rapidly expanding world of machines that I have attempted to see the network of actors. Machines are not something that simply pop into an engineer's head, and then out of the factory. The whole *co-production* of technologies are bound in a larger network of actors, *human* and *non-human*, who affect it. From the historical perspective, I have seen that the robot-technologies does not only push their impact on the user, but that they also pull their cultural weight with them, as Merrit Roe Smith describes: “Technologies can and do have 'social impacts,' but they are simultaneously social *products* that embody power, relationships and social goals and structures.”<sup>246</sup> I found this to be true for the Japanese robots as well.

Some actors in the network of Japanese robotics are mediators, who strongly affect the network at large, e.g. Dr. Ishiguro with his refinement of the *android* by introducing a new actor and concept to the network, the *Geminoid* robot twin. Other actors are more intermediary, such as the historical concept of the samurai, who do not willingly affect the network today, but who are nevertheless important actors through the meaning they hold in the culture at large. I see here that the network is in heavy movement, and that my field of research is an open book at the moment, the controversy on what the robots in Japan is and should be, is by no means closed.

The robots are most often built as tools, to cater one of humanities needs, be it elderly care, entertainment, or national defense, maybe boiling down to what Singer describes as the “(...)motivation for making artificial beings comes from wanting to save the lives of real ones.”<sup>247</sup> However, in the laboratory, the design focus differs. Whilst some take the feedback of the users into account, I found that some are more in it for research

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244 Alvin Toffler (1970) Future shock. USA: Bentam book.

245 Nye (2007: ix).

246 Merrit Roe Smith (1985) *Military Enterprise and Technological Change*. Cambridge, MA: MIT Press.

247 Singer (2009: 135).

purposes. This is the case of the Geminoid robots, that according to Ishiguro are not commercial projects at the moment: “The goal of android science is to realize a humanlike robot and to find the essential factors for representing human likeness.”<sup>248</sup>

In the network of robotics, the scientists and the engineers in the laboratories are often over-empathized, as: “consumers, not scientists, often discover 'what is the next big thing'. Most technologies are market driven”<sup>249</sup> according to Nye, i.e. we must take into account the power money has to pull the market. Also important is who found the research. Ancarani reports that: “In Japan roughly 80% of research is funded by industry, whereas the federal government funds about half of all research in the United States.”<sup>250</sup> I found that the market demand is partly a product of cultural representations; since the Japanese have read manga about robots for almost a century now, a pull on the production has emerged.

Through the *translation process* of creating a forum, or network of intereseents, the robot network of Japan has highly succeeded. They have (1) problematized the case, in lieu of the need of robots, a so-called push-methodology, where the society is given strong influences that robots are something “friendly” and “helpful”, as I saw in chapter 1. From there, (2) automatic passage-points have been created, we have seen the establishment of the profession “Science-communicator”, of which some of whom was interviewed for this project, and also the funding of both industry and government as vital passage-points at large, and also down to the so called “key-keepers”, of which one has to cooperate with to get access to the field. The network have enrolled a large number of actors (3) whose work contribute to grow the network, research on its topic. Some of these are active producers of robots, some are researchers and some are politicians seeking to better the life of his or her voters. The translation process of the network is lastly also mobilizing allies outside of the network (4), as the robots of Japan are expanding into other countries and disciplines, Scandinavian examples include the Danish version of Geminoid, and also research done on PARO the robot seal in Scandinavian elderly care facilities, in addition to other research-programs focusing on welfare-technology.<sup>251</sup>

### *A co-production of robot identity*

In regards to technology, David Nye questions: “Do they shape us, or we them?”<sup>252</sup> But

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248 Nishio, Ishiguro & Hagita (2007: 345).

249 Nye (2007: 39).

250 Ancarani (2004: 667) .

251 Two Scandinavian examples of this are: NTNU's *Lev vel* project and the Danish *WelfareTech* cluster organization.

252 Nye (2007: x).

this is too black and white, as we shape each other in a wider *co-productive network*. When humans invented the androids, we were faced with a dilemma, as human definition criteria could not as easily be put on these new creatures, who differs primarily by not being biological, but mechanical. In ANT, the *boundary-object* concept is crucial, as we saw in chapter 1, this is a concept that several actors throw back and fourth in order to define and redefine. One part of the robot-definition is its gender. As I saw, the identification criteria of gender could not be applied to androids the same way as humans, perhaps except by strongly differentiating between performed gender, and biological sex. As Judith Butler describes, we are continuously reestablishing our gender by performing it towards one of the male/female poles.<sup>253</sup> As I discovered, humans continue to label robots such as androids and cyborgs. in the male/female axis, contrary to what Donna Harraway writes, albeit her cyborgs are metaphorical.

I found that the co-production of a robot identity need to take into account that the cyborgs and androids are very complex creatures, and that making/becoming them raises difficult ethical questions. Cyborgs, who are originally human will demand rights based on their human-nature, as I saw with the president of the cyborg-organization, who was allowed to have his cyborg-parts defined as part of him on his passport-photo. They would also not be pleased by being labeled “it”, which takes away their gender of “he” or “she”. Co-production is normally focused on the actors who are positive to the common discourse, but as I have shown, there are actors who does not share the positivism of the issue. Most notably here is Turkle in her critique of welfare technology robots: “We deserve better. When we remind ourselves that it is we who decide to keep technology busy, we shall have better.”<sup>254</sup>

As I have argued, the historical background is extremely important in understanding of the robotification that is taking place in Japan, and undoubtedly the co-production of robotics is a global phenomenon, especially as a consequence of the internet. Ordering your own robot seal, robot dog, and in the near future, android, or robot twin, is possible, but then again, money is the power to get you one. In comparison to only allowing the rich to take part of the robotic revolution, the elderly care facilities is an interesting, more egalitarian arena for robot research, as they are not bought by the residents, but by the elderly care company. Thus a non-economical voice is given, to a user-group who not necessarily had ever thought about having a robot, and from that we see that co-production take many different approaches. Nevertheless, it is a co-production of long lines in the society that has produced the robots. As I opened the concept of the robot to reveal its broad inter-disciplinary composition, I found that technicality does not work alone, but that the robot is co-produced by many disciplines.

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253 Butler (1990).

254 Turkle (2011: 296).

## *The synchronicity between Script and Domestication*

Robots are getting more and more domesticated into the lives of the Japanese people, and they are not always seen as tools or technical objects, but also as friends and companions. A humanoid robot was been included in an elderly Japanese woman's will.<sup>255</sup> Japanese robots are given several scripts, and what I have found to be the most “Japanese-typical” is how cute the robots are scripted. Most have cute sounds, soft fur or large eyes. On the other hand, some are scripted quite creepy from a Western perspective, but in Japan, this script apparently works. As I have seen, perhaps the greatest issue towards accepting robots in our daily lives, is the uncanny-valley problematic, where robots who become very human-looking are seen as suspicious. So, one might ask, what might we do to overcome this uncanny-valley?

One solution can be to send down an animal first, a mechanical Laika to scout the terrain, and this is precisely what is happening in homes and elderly care facilities now, with zoomorphs such as the robot dog AIBO entertaining you, and the robot seal PARO caring for you, as described by Fong: “*The most common designs are inspired by household animals (...) Avoiding the “uncanny valley” may be easier with zoomorphic design (...) because our expectations of what constitutes “realistic” animal morphology tends to be lower.*”<sup>256</sup> If we live with zoomorphic robots and get used to them, the threshold becomes lower for living with androids, which of course are strongly linked to the programmed emotional triggers in the robots, a companion robot is designed for you to love it. There are those who just zip-line over the valley, and evades it all together, such as some of the cyborgs who exists today. Having a pacemaker or a mechanical organ is seen as much less scary than per say a robotic eye or mouth, the difference being if they are on the inside or outside of the body.

Domestication theory focuses on the domesticator, and the domesticated, and for now it is clear which role humans have, and which role robots have, but as the categories mash up, new boundary-objects is given meanings, and the question of who domesticates who might gain new grounds. The question on what roles robots should have in society has just begun, and is not stabilized yet, as domestication takes time. Humanity used thousands of years to domesticate dogs, we might be faster with robots, dependent on the synergy between script and domestication. There is also a strong symbiosis between practical, symbolical and cognitive domestication, i.e. how we actually use, what symbolical meanings we put into, and how we think about robots. As I have found, the symbolical domestication goes far back in Japanese cultural-history, which greatly affects the practical and cognitive domestication to go more smoothly.

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255 Singer (2009: 167).

256 Fong et al (2003: 150).

The Japanese are domesticating robots faster than in the West, and robots are seen in a wide variety of fields such as house-cleaning, welfare, and communication. One domestication strategy I saw that the Japanese government had, was the educational program of “science communicators”. When the people attending this education goes into society, they are bringing solid knowledge of robots with them, and thus help ease the domestication process. In Japan, the culture puts a positive frame around how they use robots, resulting in a faster domestication process. How we choose to adapt to robots is however, up to each single individual, albeit the Japanese culture is strong when it comes to technology-acceptance.

### ***Further research***

While conducting the fieldwork for this thesis, and researching on both Japan and robots, I saw many unexplored issues that would be interesting to get more knowledge on. Firstly, the robotic gender is a fascinating topic, which has not been researched much on. It is however one of the “darker sides” of the robot industry that is very fascinating, and no less real than the house-cleaning robots. Another topic I wish I could indulge more in is cross-cultural comparison in robotics, as both the US, France, Germany, South Korea, and China are on the robotic rise. Some of these countries share some cultural similarities with Japan, whilst other are very different. To see which types of robots the different countries make, and how they implement them is also worth studying.

A third topic that I would love to look deeper into is the welfare aspect of robotics, the elderly wave is undoubtedly washing hard over Japan, with the annual shrinkage of 1 million in population, and with the other Western nations soon to follow. Who will take care of all these old people, if not robots? And more importantly, how does a “robotification and technologification” of welfare affect the users? Denmark is one of the Scandinavian countries that are far ahead of the rest in this research, and would be an interesting place to look for inspiration. A fourth issue, which I am going to follow, is the wider spread of the asian robotic network, as it will undoubtedly spread to the rest of us whether we like it or not. We can then choose to be *mediators*, or *intermediaries* as the network engulfs us.



## *Epilogue*

My airplane has landed, the journey in Japan is over, and I have returned to my Norwegian home where neither the fridge, the toilet or the vacuum-cleaner have a personality, nor talk to me. There are no commercials of robot-restaurants, and the robot-manga-books are stuffed in a corner of the not-so-convenient Norwegian stores. But do the Japanese trade something away when accepting so much robotification in their society? Is the rise of robots a “farewell to humanity”?

*Sayonara* is a Japanese word meaning “goodbye”. It is stronger than for example the word *itterashai* (please go and come back) which I used in the introduction. *Sayonara* is more terminal, stating that we do not know if this is goodbye forever or not. As the network grows more complex, and the lines between robots and humans become more diffuse, does it imply a farewell to humanity? It might boil down to our attitude towards robots, we can choose to be deterministic and see them as a rival species, children who grew too quick and uncontrollable, or we can choose to utilize their strengths to solve challenges in our society and build a better future. The Japanese have certainly chosen the later, and seems to be thriving very well with it. When making technology, one can not escape culture. Perhaps this is way the Japanese are so successful with robots, since they have chosen to see it as culture and technology intertwined.



# Litterature

## Books

Ancarani, Vittorio (2004) "Globalizing the world. Science and Technology in International Relations" in Jasanoff, Sheila m. fl. (2004) *Handbook of science and technology studies*, Thousand Oaks, CA: Sage.

Araki, S. (1990) *Sanka to kyodo atarashii shimin, gyosei kankei no sozo*. ( EN: "Creation, cooperation and participation of new citizen-government relationships"). Japan: Gyōsei. Not available in English.

Arkrich, Madeleine (1992) "The de-description of technical objects." In Bijker & Law (1992) *Shaping Technology / Building Society: Studies in Sociotechnical Change*. Wiebe Bijker and John Law (editors). USA: MIT Press, Cambridge Mass. pp. 205-224.

Asimov, Isaac (1950) *I, Robot*. USA: Gnome Press

Ask, Kristine (2007) *Ekte liv i syntetisk verden? Sosiotekniske montasjer i et online dataspill*. (Eng: Real life in a synthetic world. Socio-technical montages in an online computergame). NTNU.

Baily, Martin Neil (1991) *Brookings Papers on Economic Activity, Microeconomics*. USA: Brookings Institution Press

Benedict, Ruth (1946) *The Chrysanthemum and the Sword: Patterns of Japanese Culture*. USA: Houghton Mifflin.

Berker, Thomas, Hartmann, Maren, Punie, Yves and Ward, Katie (2006) *Domestication Of Media And Technology*. UK: Open University Press.

Bijker, Wiebe Hughes and Pinch (1987) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. USA: The MIT Press.

- Butler, Judith (1990) *Gender trouble*. US: Routledge.
- Chang, Sea Jin (2008). *Sony vs Samsung: The Inside Story of the Electronics Giants' Battle For Global Supremacy*. USA: Willey.
- Charmaz, Kathy (2006) *Constructing Grounded Theory. A Practical Guide through Qualitative Analysis*. UK: Sage Publications.
- Collins, Harry. M. (2004) “Science Studies and Machine Intelligence” in Sheila et al (2004) *Handbook of science and technology studies*. Revised Edition. USA: Sage Publications.
- Dautenhahn, Kerstin and Saunders, Joe (2011) *New Frontiers in Human Robot Interaction*. USA: John Benjamins B.V.
- DeBaggio, Thomas (2002) *Losing My Mind: An Intimate Look at Life with Alzheimer's*. US: The Free Press.
- Dorigo, Marco (1998) *Robot Shaping: An Experiment in Behavior Engineering*. USA: Massachusetts Institute of Technology.
- Edwards, Paul. N. (2004) “Impact” to Social Process: Computers in Society and Culture” in Jasanoff, Sheila et al (2004) *Handbook of science and technology studies*. Revised Edition. USA: Sage Publications.
- Eliot, Charles (1936) *Japanese Buddhism*. USA
- Ford, Martin (2009) *The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future*. USA: CreateSpace Independent Publishing Platform.
- Friday, Karl (2012) *Japan Emerging. Premodern History to 1850*. USA: Westview Press
- Gibbons, Michael, Limoges, Camille, Nowotni, Helga, Schwartzman, Simon, Scott, Peter and Trow, Martin (1994) *The New Production of Knowledge: The dynamics of science and research in contemporary societies*. USA: Sage.
- Goleman, Daniel (2008) *Destructive Emotions: A Scientific Dialogue with the Dalai Lama*. USA: Bentam.

- Gordon, Andrew (2009) *A Modern History of Japan. From Tokugawa to the present*. USA: Oxford University press.
- Itoh, Mayumi (1998) *Globalization of Japan: Japanese Sakoku mentality and U. S. efforts to open Japan*
- Jasanoff, Sheila (2006) *States of Knowledge: The Co-Production of Science and the Social Order*. UK: Routledge.
- Karwowski, Waldemar and Rahimi, Mansour (1992) *Human-Robot Interaction*. USA: CRC Press.
- Katō, Genchi (1971) *A study of Shinto: The religion of the Japanese nation*. USA: Barnes and Noble.
- Koops, Willem and Zuckerman, Michael (2012) *Beyond the Century of the Child: Cultural History and Developmental Psychology*. USA: University of Pennsylvania Press.
- Klaproth, Julius Heinrich (1834) *Nipon o dai itsi ran:ou Annales des empereurs du Japon*. Paris: Printed for the Oriental Translation Fund.
- Stig Kvaal (2008) *Kulturvitenskapelige innfallsvinkler til integrert produktutvikling* (En: Cultural-scientific approaches to integrated product-development). Work note.
- Kvale, Steinar and Brinkmann Svend (2009/2010) *Det kvalitative forskningsintervju* (EN: The qualitative Science Interview). 2<sup>nd</sup> edition. Norway: Gyldendal
- Latour , Bruno (1992) “Where Are the Missing Masses?”, 1992. In *Shaping Technology-Building Society. Studies in Sociotechnical Change*. Wiebe Bijker and John Law (editors). USA: MIT Press, Cambridge Mass. pp. 225-259.
- Latour, Bruno (1999) *On Recalling ANT*. UK: Oxford University
- Lie, John (2001) *Multiethnic japan*. USA: Harvard University Press
- Lie, Merete and Sørensen, Knut. H. (1996). *Making technology our own?: domesticating technology into everyday life*. Norway: Scandinavian University Press.

- Lu, David J. (2005) *Japan. A Documentary History, The Dawn of History to the Late Tokugawa Period*. USA: East gate book.
- Nietzsche, Friedrich (1882) *Die fröhliche Wissenschaft*: section 108. Germany: Ernstschmeitzner
- Nye, David (2007) *Technology Matters. Questions to live with*. UK: The MIT Press.
- Penrose, Roger (1994) *Shadows of the Mind: A Search for the Missing Science of Consciousness*. USA: Oxford University Press.
- Perrin, Noel (1979) *Giving Up the Gun: Japan's Reversion to the Sword, 1543-1879*. USA: Shambhala publishing.
- Reader, Ian (1991) *Religion in Contemporary Japan*. USA: University of Hawaii Press.
- Reeves, Byron and Nass, Clifford (1996) *The Media Equation: How People Treat Computers, Television, and New Media like Real People and Places*. UK: Cambridge University Press,.
- Russel, Stuart. J. (2009) *Artificial Intelligence: A Modern Approach*. USA: Prentice Hall.
- Shneiderman, Ben and Plaisant, Cathrine (2009) *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Fifth edition. USA: Pearson.
- Schodt, Fredric L. (1983). *Manga! Manga! The World of Japanese Comics*, by Fredric L. USA: Kodansha.
- Schodt, Fredric L. (1988) *Inside the robot kingdom*. USA: Kodansha International.
- Silverstone, Roger and Hirsch, Eric (eds.) (1994). *Consuming Technologies: Media and Information Domestic Spaces*. London: Routledge.
- Silverstone, Roger and Haddon, leslie (1993) *Future Compatible? Information and communication technologies in the home. A methodology and a case study*. SPRU, University of Sussex.
- Singer, Peter Warren (2009) *Wired for war. The Robotics Revolution and Conflict in the 21st Century*. USA: Penguin books.

- Smith, Merritt Roe (1985) *Military Enterprise and Technological Change*. Cambridge, MA: MIT Press.
- Sugimoto, Yoshio (2002) *An introduction to Japanese society*. UK: Cambridge.
- Tesla, Nikola (1990) *Apparatus for transmission of electrical energy*. Applied to the United States patent office, New York.
- Thagaard, Tove (2003) *Systematikk og innlevelse*. (EN: Systematic and empathy). Norway: Fagbokforlaget
- The Holy Bible (1982) The new King James version, containing the Old and New Testaments.
- Toffler, Alvin (1970) *Future shock*. USA: Bentam book.
- Turkle, Sherry (2011) *Alone together*. USA: Basic books.
- Vlastos, Stephen (1990) *Peasant Protests and Uprisings in Tokugawa Japan*. USA: University of California press.
- Wiebe E. Bijker, Thomas Parke Hughes, Trevor J. Pinch (1987) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. USA: The MIT Press
- Woolgar, Steve (1991) "Configuring the user: the case of usability trials." In : John Law (ed.): *A Sociology of Monsters: Essay on Power, Technology and Domination*. London and New York, Routledge: 1991.

## **Journals**

- Atkeson, Christopher. G., Hale, Joshua G., Pollick, Frank, Rilei, Marcia et al (2000) "Using humanoid robots to study human behavior, in Intelligent Systems and their Applications" in *IEEE*. Volume: 15, Issue: 4.
- Borody, Wayne A. (2013) "The Japanese Robotist Masahiro Mori's Buddhist Inspired Concept of "The Uncanny Valley" (Bukimi no Tani Genshō, 不気味の谷現象 ) in *Journal of Evolution and Technology*. Volume: 23, Issue: 1, pgs. 31- 44.

- Black, Paula & Sharma, Ursula (2001) “Men are real, Women are ‘made up’: beauty therapy and the construction of femininity” in *The Sociological Review*. Volume: 49, Issue: 1, pgs. 100–116.
- Craig, Albert (1959) “The Restoration Movement in Chōshū” in *The Journal of Asian Studies*. Volume: 18, Issue: 02, pgs. 187-197.
- Drury, Jill. L., Scholtz, Jean and Ianco, Holly (2003) “Awareness in human-robot interactions in Systems” in *IEEE International Conference on Man and Cybernetics*. Volume:1, pgs. 912 – 918.
- Edwards, Walter (1996) “In Pursuit of Himiko. Postwar Archaeology and the Location of Yamatai” in *Monumenta Nipponica*. Volume: 51, Issue: 1, pgs. 53-79.
- Floyd, Kori (2000) “Affectionate Same-Sex Touch: The Influence of Homophobia on Observers' Perceptions” in *The Journal of Social Psychology*. Volume: 140, Issue: 6.
- Fong, Terrence, Nourbakhsh, Illah, Dautenhahn, Kerstin (2003) “A survey of socially interactive robots” in *Robotics and Autonomous Systems*. Volume: 42, pgs. 143–166.
- Fujigaki, Yuko (2009) “STS in Japan and East Asia: Governance of Science and Technology and Public Engagement” in *East Asian Science, Technology and Society: an international Journal*. Volume: 3, Issue: 4, pgs. 511-518. USA: Duke University Press.
- Hall, Robert B. (1931) “Some Rural Settlement Forms in Japan” in *Geographical Review*. Volume: 21, Issue: 1, pgs. 93-123.
- Harraway, Donna (1991) “A Cyborg Manifesto. Science, Technology, and Socialist-Feminism in the Late Twentieth Century” in *Simians, Cyborgs and Women: The Reinvention of Nature*. pgs. 149-181. USA: Routledge.
- Hasegawa, Nobuko (1985) “On the so-called “zero pronouns” in Japanese” *The Linguistic Review*. Volume: 4, Issue: 4.
- Horton, R and P. (1991) “A model of willingness to become a potential organ donor” in *Social Science & Medicine*. Volume: 33, Issue: 9, pgs. 1037–1051.



- Ishiguro, Kazuo (2005) “Android Science - Toward a new cross-interdisciplinary framework” in *cognitive Science Society*. July 25-26, Italy, pgs. 1-6.
- Keally, C. et al (2004) “Chronology of the beginning of pottery manufacture in East Asia” in *Radiocarbon*. Volume: 46, Issue: 1, pgs. 345–351.
- Klamer, Tineke & Allouch, Somaya Ben (2010) “*Acceptance and use of a social robot by elderly users in a domestic environment*” at The Conference on International Conference on Pervasive Computing Technologies for Healthcare, PervasiveHealth.
- Latour Bruno (1996) “On actor-network theory: A few clarifications” in *Soziale Welt*. 47. Jahrg., H. 4 (1996), pgs. 369-381.
- Lu, John (2005) exert from Mootori Norinaga's “Complete Works of Great Thoughts of the World 1927” in *Japanese thought*. Volume: 54, pgs. 17-22. Tokyo: Shunjuusha.
- Masahiro, Mori (1970) “The Uncanny Valley” in *Energy*. Issue: 7(4), pgs. 33-35.
- Martin, B. And Richards, E. (2004) “Scientific Knowledge, Controversy, and Public Decision Making” in Jasanoff, Sheila m. fl. (2004) *Handbook of science and technology studies*. Thousand Oaks, CA: Sage.
- Murphey, Tim (2004) “Participation, (Dis-)Identification, and Japanese University Entrance Exams” in *TESOL*. Quarterly Volume: 38, Issue: 4, pgs. 700–710.
- Myklebø, Sigrid (2007) “Innvandrere på arbeidsmarkedet” (EN: Immigrants in the labor market) in *Arbeid og velferd*. (EN: Work and welfare) Issue: 4.
- Olsen, Wendy (2004) “Triangulation in social research: qualitative and quantitative methods can really be mixed” In *Developments in sociology*. UK: Causeway press.
- Nishioka, H. et al (2005) “Population Projections by Prefecture in Japan 2005 – 2035 Outline of Results and Methods” in *The Japanese Journal of Population*. Volume: 9, Issue:1.
- Prince, Virginia (2005) “Sex vs. Gender.” in *International Journal of Transgenderism*.

Issue: 8(4).

- Ribbe, M. W. et al. (1997) “Nursing homes in 10 nations: a comparison between countries and settings” in *Age and Aging*. Volume: 26. 3-12.
- Shahbazi, Hamed, Jamshidi, Kamal and Monadjemi, Amir Hasan (1973) “Industrial Robot: An international Journal” in *ISSN*. Volume: 39, Issue: 2.
- Stafford, R. Q. et al. (2010) “Improved robot attitudes and emotions at a retirement home after meeting a robot” in *IEEE International Symposium on Robot and Human Interactive Communication – ROMAN*. pgs. 82-87.
- Stanyon, Roscoe, Sazzini, Marco and Luiselli, Donata (2009) “Timing the first human migration into Eastern Asia” in *Journal of Biology*. Issue 8, part 18.
- Sullivan, Jeremiah (1986) As explained in “Human Nature, Organizations, and Management Theory” in *ACAD. manage rev*. Volume: 11, Issue: 3, pgs. 534-549.
- Temple Daniel H. and Clark S. Larsen (2007) “Dental caries prevalence as evidence for agriculture and subsistence variation during the Yayoi period in prehistoric Japan: Biocultural interpretations of an economy in transition.” in *American Journal of Physical Anthropology*. Volume: 134, Issue: 4, pgs. 501–512.
- Turing, Alan M. (1950) “Computing Machinery and Intelligence” in *Mind*. Volume: 49 pgs. 433-460. UK.
- Wada, K. (2006) “Robot therapy in a care house - its socio-psychological and physiological effects on the residents” at *IEEE International Conference on Robotics and Automation*. Orlando, US.

### **Internet sources**

- Alderson, Andrew (2008) “Prince Charles meets Asimo the robot on Japanese tour”, in *The Telegraph online*, from:  
<http://www.telegraph.co.uk/news/uknews/theroyalfamily/3272562/Prince-Charles-meets-Asimo-the-robot-on-Japanese-tour.html>. Accessed 19.May.2014.
- Aoki, Ichiro (2008) *Decentralization and Intergovernmental Finance in Japan*. From:  
<http://www.eaber.org/node/23074>. Accessed: 10.08.2014.

- Hiroshi Ishiguro Laboratories ...ATR (?) *Geminoid project homepage*. From:  
<http://www.geminoid.jp/en/index.html>. Accessed 19.May.2014.
- Borghino, Dario (2012) *Water strider microbot can walk – and jump – on water*. From:  
<http://www.gizmag.com/water-strider-robot/23493/>. Accessed: 10.08.2014.
- Helmenstine, Anne Marie at Chemistry.about.com (?) *How to turn water into wine or blood*.  
From:  
<http://chemistry.about.com/od/chemistryhowtguide/ht/waterwine.htm>. Accessed:  
10.08.2014.
- Chang, Su-Hsien and Fang, Miao-Zhun (2004) “The Elderly Living in Nursing Homes: Cross-Culture Comparison” in *Tzu Chi Nursing Journal*, 2004; 3:2, 41-49”. Available from:  
<http://www.tzuchi.com.tw/file/divintro/nursing/content/93-2/6.pdf>. Accessed: 22.05.2014.
- Chien, Wei-chi, Diefenbach, Sarah, Hassenzahl, Marc (2013) *The whisper pillow: a study of technology-mediated emotional expression in close relationships*  
From: <http://dl.acm.org/citation.cfm?id=2513512>. Accessed: 22.05.2014.
- CIA (2013) *The World Factbook - Atheist demographics data*. From:  
<https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>.  
Accessed: 10.08.2014.
- CIA (2013) *The World Factbook – Country comparison: Total fertility rate*. From:  
<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html> Accessed: 22.05.2014.
- CIA (2014) *The World Factbook – Europe - Norway*. From:  
<https://www.cia.gov/library/publications/the-world-factbook/geos/no.html>  
Accessed: 22.05.2014.
- CIA (2013) *The World Factbook – Field listing: median age*. From:  
<https://www.cia.gov/library/publications/the-world-factbook/fields/2177.html>.  
Accessed: 22.05.2014.
- CNET (2006) *Sony puts AIBO to sleep*. From  
[http://news.cnet.com/Sony+puts+Aibo+to+sleep/2100-1041\\_3-6031649.html](http://news.cnet.com/Sony+puts+Aibo+to+sleep/2100-1041_3-6031649.html).

Accessed: 15.May.2014.

CNN (2013). *Fortune Global 500*. From:  
[http://money.cnn.com/magazines/fortune/global500/2013/full\\_list/?iid=G500\\_sp\\_full](http://money.cnn.com/magazines/fortune/global500/2013/full_list/?iid=G500_sp_full). Accessed: 15.May.2014.

Dautenhahn, Kerstin, Woods, Sarah, Kaouri, Christina, Walters, Michael L., Koay, Kheng Lee, Werry Iain (2005) *What is a Robot Companion – Friend, Assistant or Butler?* From: <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.63.9643>  
Accessed: 30. May. 2014.

Future timeline.net (2014) *Latest version of ASIMO makes debut*. From:  
<http://www.futuretimeline.net/blog/2014/04/18.htm#.U2rhZ62SzvY>. Accessed 19.May.2014.

Geekout.blogs (?) *Manga grows in the heart of Europe*. From:  
<http://geekout.blogs.cnn.com/2012/01/26/manga-in-the-heart-of-europe/>.  
Accessed: 10.08.2014.

Harrington, James (2000) *Hole in the Heart or Hole in the Head?* From:  
<http://www.qualitydigest.com/dec06/columnists/jharrington.shtml>.

HONDA (?) *ASIMOS's Technical manual*. From:  
<http://asimo.honda.com/abstract-technical-information/>. Accessed 19.May.2014.

IEEE (?) *IEEE Inaba Technical Award for Innovation Leading to Production*. From:  
<http://www.ieee-ras.org/awards-recognition/society-awards/69-awards-recognition/society-awards/59-ieee-inaba-technical-award-for-innovation-leading-to-production> Accessed: 15.May.2014.

IMDB (?) *List of Ghibli movies*. <http://www.onlineghibli.com/films.php>. Accessed: 10.08.2014.

IMDB (?) *Top 250 movies*. From: [http://www.imdb.com/chart/topref\\_=nv\\_ch\\_250\\_4](http://www.imdb.com/chart/topref_=nv_ch_250_4).  
Accessed: 10.08.2014

IRF (2013) *World Robotics 2013 - Industrial Robots*. From:  
<http://www.worldrobotics.org/>. Accessed: 10.08.2014.

iRobot (?) *Roomba specifications*. From:

<http://www.irobot.com/us/learn/home/roomba.aspx>. Accessed: 15.May.2014.

Japan-101 (2003) *The Tokugawa Shogunate of Japan*. From: [http://www.japan-101.com/history/history\\_tokugawa\\_shogunate.htm](http://www.japan-101.com/history/history_tokugawa_shogunate.htm)

Japan daily press (2013) *Sales of adult diapers in Japan surpass those for babies*. From: <http://japandailynews.com/sales-of-adult-diapers-in-japan-surpass-those-for-babies-1132153/>. Accessed 02.06.2014.

Japan-guide.com (?) *Shinto*. From: <http://www.japan-guide.com/e/e2056.html>. Accessed: 10.08.2014.

Japan-guide.com (?) *Unzen onsen*. From: <http://www.japan-guide.com/e/e4453.html>. Accessed: 10.08.2014.

Japanese Ministry of Justice (?) *Data on immigration*. From <http://www.moj.go.jp/ENGLISH/index.html>. Accessed: 22. 06. 2014.

Japan Ministry of Justice bureau (2009) 平成20年末現在における外国人登録者統計について (EN: Registered foreigner Statistics in 2008 at year's end). From: [http://www.moj.go.jp/nyuukokukanri/kouhou/press\\_090710-1\\_090710-1.html](http://www.moj.go.jp/nyuukokukanri/kouhou/press_090710-1_090710-1.html). Accessed: 22. 05. 2014.

Kuwamura, Kaiko, Sakai, Kurima, Minato, Takashi, Noshio, Shuichi and Ishiguro Hiroshi (2014) Hugvie: Communication Device for Encouraging Good Relationship through the Act of Hugging. From: [http://www.omicsonline.com/open-access/Hugvie\\_communication\\_device\\_for\\_encouraging\\_good\\_relationship\\_through\\_the\\_act\\_of\\_hugging.pdf?aid=24445](http://www.omicsonline.com/open-access/Hugvie_communication_device_for_encouraging_good_relationship_through_the_act_of_hugging.pdf?aid=24445). Accessed: 22.05.2014.

Latour, Bruno (1976) *Technology is society made durable*. From: <http://www.bruno-latour.fr/sites/default/files/46-TECHNOLOGY-DURABLE-GBpdf.pdf>. Accessed: 10.08.2014.

Lego.com (?) *Lego-mindstorm*. From: <http://www.lego.com/en-USA/mindstorms/?domainredir=mindstorms.lego.com>. Accessed: 15.May.2014.

- Nakanishi, Junya, Kuwamura, Kaiko, Minato, Takashi, Nishio, Shuichi, Ishiguro, Hiroshi (2013) *Evoking Affection for a Communication Partner by a Robotic Communication Medium*. From: <http://haiconference.net/ihai2013/proceedings/pdf/III-1-4.pdf>. Accessed: 30.May.2014.
- Nishiwaki, Hirotooshi (2009) *Formation History of the Japanese Islands* . From: <http://www.glgarcs.net/others/about.html>. Accessed: 10.08.2014.
- Oxford dictionary. (?) From <http://www.oxforddictionaries.com/>. Accessed: 10.08.2014.
- PwC Economies (2013) *World in 2050. The BRICs and beyond: prospects, challenges and opportunities*. From: [http://www.pwc.com/en\\_GX/gx/world-2050/assets/pwc-world-in-2050-report-january-2013.pdf](http://www.pwc.com/en_GX/gx/world-2050/assets/pwc-world-in-2050-report-january-2013.pdf). Accessed: 10.08.2014.
- Robotbooks (?) *Sony AIBO robot dog*. From: [http://www.robotbooks.com/sony\\_aibo.htm](http://www.robotbooks.com/sony_aibo.htm). Accessed: 15.May.2014.
- Scott, Shane (2011) *Coming Soon: The Drone Arms Race*. From: [https://agriculturedefensecoalition.org/~agricum4/sites/default/files/file/drones\\_517/517K\\_2\\_2011\\_Coming\\_Soon\\_The\\_Drone\\_Arms\\_Race\\_October\\_8\\_2011\\_NYTimes.pdf](https://agriculturedefensecoalition.org/~agricum4/sites/default/files/file/drones_517/517K_2_2011_Coming_Soon_The_Drone_Arms_Race_October_8_2011_NYTimes.pdf). Accessed: 10.08.2014.
- SONY (?) *AIBO sales data*. From: <http://www.sony-aibo.com/aibos-history/>. Accessed: 15.May.2014. 100 YEN = 1 USD = 6 NOK circa.
- SONY (2002) *AIBO software information*. From: [http://www.sony.net/SonyInfo/News/Press\\_Archive/200205/02-017E/](http://www.sony.net/SonyInfo/News/Press_Archive/200205/02-017E/). Accessed: 15.May.2014.
- SONY (2004) *AIBO user guide*. From: <http://www.aiai.ed.ac.uk/project/aibo/documents/ERS-7M2/AIBO-Basic-Manual.pdf>. Accessed: 15.May.2014.
- SSB (2014). *Immigration*. From: <http://www.ssb.no/en/innvbef/>. Accessed: 22.06.2014.
- Statistics Japan (2014) *Population Estimates*. From the Statistics Bureau, Director-General for Policy Planning (Statistical Standards) and Statistical Research and Training Institute. From: <http://www.stat.go.jp/english/data/jinsui/tsuki/index.htm> Accessed: 23. 05. 2014.

- Sumioka, Hidenobu, Nakae, Aya, Kanai, Ryota and Ishiguro, Hiroshi (2013) Huggable communication medium decreases cortisol levels. From: <http://www.nature.com/srep/2013/131023/srep03034/full/srep03034.html>. Accessed: 22. 05. 2014.
- The Baltimore Sun (1992) Japan's lonely may rent 'family' for home visit. From: [http://articles.baltimoresun.com/1992-08-06/news/1992219046\\_1\\_strangers-japan-actors](http://articles.baltimoresun.com/1992-08-06/news/1992219046_1_strangers-japan-actors). Accessed: 22. 05. 2014.
- The Economist (2007) Jobs for life Japanese employees are working themselves to death. From: <http://www.economist.com/node/10329261> Accessed: 22.05.2014.
- The Free Library (?) *Honda Celebrates 25 Years on New York Stock Exchange; - Honda's Humanoid Robot 'ASIMO' Rings Opening Bell*. From: <http://www.thefreelibrary.com/Honda+Celebrates+25+Years+on+New+York+Stock+Exchange%3B+-+Honda's...-a082842367>. Accessed 19.May.2014.
- The International Federation of Robotics (2013) *Industrial Robot Statistics*. From: <http://www.ifr.org/industrial-robots/statistics/>. Accessed: 30.May.2014.
- The National Post (2014) Obama meets ASIMO. From: <http://news.nationalpost.com/2014/04/24/domo-arigato-mr-obama-u-s-president-meets-japanese-robot-asimo/> Accessed: 17.August.2014.
- Ohnuki-Tierney. Emiko (1991) *The Emperor of Japan as Deity (Kami)*. From: <http://anthropology.wisc.edu/ohnuki-tierney/files/1991-emperor.pdf>. Accessed: 10.08.2014.
- Toshio, Kuroda (1981) *Shinto in the History of Japanese religion*. From: <http://www.jstor.org/discover/10.2307/132163uid=3738328&uid=2&uid=4&sid=21104111769613> Accessed: 10.08.2014.
- Travel and leisure.com (2012) *Worlds most-visited sacred sites*. From: <http://www.travelandleisure.com/articles/worlds-most-visited-sacred-sites/11>. Accessed: 10.08.2014.
- Turing Church (2013) *Can science resurrect the dead?* From: <http://turingchurch.com/2013/01/23/can-science-resurrect-the-dead/>. Accessed: 10.08.2014.

Web-Archive (?) *Manga industry in Japan*. From:  
[https://web.archive.org/web/20120406232125/http://www.jetro.org/trends/market\\_info\\_manga.pdf](https://web.archive.org/web/20120406232125/http://www.jetro.org/trends/market_info_manga.pdf). Accessed: 10.08.2014.

Wikiraider (?) *Tomb Raider wiki*. From:  
<http://www.wikiraider.com/index.php/Himiko>. Accessed: 10.08.2014.

Wiktionary (?) *Android etymology*. From: <http://en.wiktionary.org/wiki/android>

Wiktionary (2014) *Kanji for king*. From: <http://en.wiktionary.org/wiki/%E7%8E%8B>.  
Accessed: 10.08.2014.

WHO (2014) *Definition of an older or elderly person - Proposed Working Definition of an Older Person in Africa for the MDS Project*. From:  
<http://www.who.int/healthinfo/survey/ageingdefnolder/en/>. Accessed at:  
23.05..2014.

Xu, D, Kane, RL and Shamliyan TA (2013) Effect of nursing home characteristics on residents' quality of life: a systematic review. From:  
<http://www.ncbi.nlm.nih.gov/pubmed/23623273>. Accessed: 22. 05. 2014.

## **Speeches, quotes and songs**

Kennedy, John F. (1961) Anti-war-speech in the UN general assembly, 25.sept.

Shozan, Sakuma (Meiji era) “Japanese spirit, Western technique” policy speech.

Harbisson, Neil on “How it feels to be a cyborg”. From  
<http://motherboard.vice.com/blog/what-its-like-to-be-a-cyborg-as-explained-by-a-cyborg>. Accessed 19.May.2014.

Scott ,Matthew (2003) *Litihum Flower* on the album “Ghost in the Shell: Stand Alone Complex O.S.T.”

Senbon sakura (2011) Written by Kurousa-P, performed by Hatsune Miku.



## **Laws and constitutions**

Ancient Japan's 17<sup>th</sup> article. From:

<http://www.duhaime.org/LawMuseum/LawArticle-1182/604-The-Seventeen-Article-Constitution-of-Japan.aspx>. Accessed: 10.08.2014

Imperial Japan's constitution.From:

[http://japan.kantei.go.jp/constitution\\_and\\_government\\_of\\_japan/constitution\\_e.html](http://japan.kantei.go.jp/constitution_and_government_of_japan/constitution_e.html). Accessed: 10.08.2014.

Post-war Japan's article 9. From:

[http://japan.kantei.go.jp/constitution\\_and\\_government\\_of\\_japan/constitution\\_e.html](http://japan.kantei.go.jp/constitution_and_government_of_japan/constitution_e.html). Accessed: 30.May.2014.

## **Movies and TV-series**

*A.I (Artificial Intelligence)* (2001) by Steven Spielberg.

*Animatrix* (2003) by the Wachowski siblings.

*Battlestar Galactica.*(2004-2009) Michael Rymer

*Repo! The Genetic Opera* (2008) by Darren Smith Bousman.

*The Big Bang Theory* (2007-) Mark Cendrowski,

*The Matrix* (1991) by the Wachowski siblings.

*Terminator* (1984) by James Cameron.

## **Pictures**

Page i “Machine and his creator” from:

<http://phillipedia.files.wordpress.com/2013/09/robot-human-hand1.jpg>. Accessed 18. June. 2014.

Page 2 “R.U.R” from: <http://www.howstuffworks.com/10-evil-robots1.htm>. Accessed 18.June. 2014.

Page 3 “Robot VENN-diagram”. Made in OpenOffice 18.June. 2014.

- Page 20 “Emperor family” from:  
<http://deens-japan.com/photo/p-wonderjapan-25-04.jpg>. Accessed 18.June. 2014.
- Page 22 “Class-system” from:  
<http://thisisprobablynotwhatyougoggled.weebly.com/feudal-japanese-social-classes.html> Accessed 18.June. 2014.
- Page 24 “Samurai” from:  
<http://burnhamcoaching.com/wp-content/uploads/2013/01/samurai.jpg>. Accessed 18.June. 2014.
- Page 26 “Meiji shrine” from:  
<http://userdisk.webry.biglobe.ne.jp/007/126/23/N000/000/001/126023408076716206954.jpg>. Accessed: 10.08.2014.
- Page 33 “Tetsujin” from:  
[http://www.timetravelturtle.com/wp-content/uploads/2013/09/Japan-2013-1382\\_web.jpg](http://www.timetravelturtle.com/wp-content/uploads/2013/09/Japan-2013-1382_web.jpg). Accessed: 10.08.2014.
- Page 35 “Ghibli” from:  
[http://technabob.com/blog/wp-content/uploads/2010/09/090610\\_rg\\_MiyazakiLaputaRobot\\_01.jpg](http://technabob.com/blog/wp-content/uploads/2010/09/090610_rg_MiyazakiLaputaRobot_01.jpg). Accessed: 10.08.2014.
- Page 39 “AIBO” from:  
<http://3.bp.blogspot.com/NpIWRHz3aDM/Tf0EuZlYzEI/AAAAAAAAAAAs/FuXft8JXNk/s1600/aibo111.jpg> . Accessed: 15.May.2014.
- Page 43 “Miku and Gaga” from:  
[http://3.bp.blogspot.com/-HTUYIVIrFDw/U1B9TGtunqI/AAAAAABLtU/ji-oeCV5ATU/s1600/10168131\\_10154074679450637\\_4171149338695925713\\_n.jpg](http://3.bp.blogspot.com/-HTUYIVIrFDw/U1B9TGtunqI/AAAAAABLtU/ji-oeCV5ATU/s1600/10168131_10154074679450637_4171149338695925713_n.jpg). Accessed: 22. 06. 2014.
- Page 45 “Geminoid robots” from: <http://www.geminoid.jp/en/index.html>. Accessed 19.May.2014.
- Page 45 “Uncanny-valley” from:  
[http://ichef.bbci.co.uk/wwfeatures/624\\_351/images/live/p0/1g/09/p01g0922.jpg](http://ichef.bbci.co.uk/wwfeatures/624_351/images/live/p0/1g/09/p01g0922.jpg). Accessed 19.May.2014.

- Page 47 “Geminoid girl” from:  
<http://readmorewritemorethinkmorebemore.blogspot.jp/2011/03/uncanny-valley-7-sonzai-kan.html>. Accessed 19.May.2014.
- Page 50 “Geminoid diagram” from:  
Picture copied from: Nishio, Ishiguro & Hagita. (2007: 347). Accessed 19.May.2014.
- Page 53 “Ghost in Shell” from: [http://ontologicalgeek.com/wp-content/uploads/2012/06/ghost\\_in\\_shell.jpg](http://ontologicalgeek.com/wp-content/uploads/2012/06/ghost_in_shell.jpg). Accessed 19.May.2014.
- Page 65 “Japan's population pyramid” from:  
<http://www.indexmundi.com/graphs/population-pyramids/japan-population-pyramid-2013.gif>. Accessed 19.May.2014.
- Page 66 “Japan's population graph” from:  
[http://upload.wikimedia.org/wikipedia/commons/c/c6/Population\\_of\\_Japan\\_since\\_1872.svg](http://upload.wikimedia.org/wikipedia/commons/c/c6/Population_of_Japan_since_1872.svg). Accessed: 22. 05. 2014.
- Page 69 “PARO picture” from: <http://www.japantrendshop.com/PARO-robot-seal-healing-pet-p-144.html>. Accessed: 22. 06. 2014.
- Page 71 “Hugvie hugging” from:  
[http://www.geminoid.jp/projects/CREST/img/hugvie\\_title.jpg](http://www.geminoid.jp/projects/CREST/img/hugvie_title.jpg). Accessed: 22. 06. 2014.
- Page 73 “Telenoid” from: <http://spectrum.ieee.org/image/1664206>. Accessed: 22. 06. 2014.
- Page 77 “Telenoid hugging” from:  
<http://i584.photobucket.com/albums/ss283/crazyrobots/telenoid1.jpg>. Accessed: 22. 06. 2014.
- Page 77 “PARO hugging” from:  
<http://ecofrenhealth.files.wordpress.com/2012/08/enhanced-buzz-5196-1340307930-14.jpg>. Accessed: 22. 06. 2014.

## ***Dictionary***

This thesis contains many words from Japanese and the robotic field. Please refer to this dictionary for a definition, as foreign words are mostly explained only the *first* time they occur in the text.

### *A.I.*

An american movie depicting an *android's* struggle for finding identity and love.

### *AIBO*

A *robot* dog, made by SONY. The word means “friend” in Japanese.

### *AIST*

### *algorithm*

Rule(s) for step by step solving of a problem(s).

### *android*

A machine made to look human.

### *anime*

Japanese animation movies. In Japanese, a term for all animated movies.

### *Animatrix*

An animated movie (Hollywood) showing humanity's struggle with the machines.

### *ASIMO*

An *android*, made by Honda.

### *aru*

A verb meaning “to be” (inanimate objects).

### *Battlestar Galactica*

An American TV-series depicting humanities survival when chased by *android*-armies.

### *cyborg*

A *human* who has been modified by machine parts.

### *Dakimakura*

A person-sized hugging-pillow.

*Dr. Ishiguro*

Inventor of the *Geminoid*-, *Telenoid*- and *Hugvie* robots.

*Dr. Takanori Shibata*

Creator of *PARO*, the robot seal. Employed by *AIST*.

*Fridgeezoo Fridge Pet*

A Japanese robot-penguin that lives in your fridge.

*Geminoid*

An *android* copy of a specific person. Made by *Dr. Ishiguro*.

*Ghost in Shell*

An *anime* focusing on cyborg-android identity and crimes.

*Hatsune Miku*

A hologram singer in the Vocaloid series. Immensely popular in Japan, with a growing fan base overseas.

*Himiko*

A shaman queen (170 – 238) who ruled in ancient Japan.

*iru*

A verb meaning “to be” (animate objects).

*Kaiten-sushi*

Sushi on an mechanically moving conveyor belt.

*kamikaze*

“divine wind”, a term first use to describe bad weather who prevented the mongol's attempt to invade Japan. Later used by pilots in WW2 when dieing for their country.

*kazoedoshi* – actual (Eastern) age, calculated in a combination with your date of conception and the chinese zodiac calendar, can make +2 in difference with actual (Western) age.

*Key-keepers*

An *STS*-term for people who can help you gain access to what you want to research or

where you need to go.

*Key-hiders*

My own definition of an anti-key-keeper, i.e. someone who willingly or unwillingly hinders you in reaching your goals.

*kimochi warui*

a bad-wibe feeling

*Kimono*

The traditional clothing of Japan, a big, colorful “morning gown” with a bow in the back.

*KGU*

Kwansei Gakuin Daigaku. A prestigious private university in Nishinomiya, west in Japan, where I enrolled.

*machine*

A thing that uses energy to perform an action, differ from robots in that they need to be operated.

*manga*

Japanese cartoons. In Japanese, a term for all cartoons.

*ninja*

Spies and assassins in Japanese history.

*Panopticon*

A thought experiment on what happens to humans under constant surveillance.

*Repo! The Genetic Opera*

A musical movie depicting organ-dealing.

*robot*

*A machine that is autonomous, controlled with electronics.*

*samurai*

Warrior class of medieval Japan.

*Sharp Cocorobo Vacuum Cleaner Robot*

A Japanese vacuum-cleaner robot.

*Senbon sakura*

A Japanese song about the contrast of old and new Japan, sung by *Hatsune Miku*.

*sonzai kan*

Human presence. A term studied by extending the framework of android science.

*SONY*

Robot manufacture compan, created AIBO. 94<sup>th</sup> largest company in the world.

*Smart-board*

An interactive board used in educational purposes mostly, e.g. at KGU elementary.

*Star Wars*

A franchise and movie series with many cyborgs (like *DarthVader*), androids (like *C-3PO*) and robots (like *R2-D2*).

*teleoperation*

Controlling a *robot* from afar.

*Terminator*

American movie-series depicting the struggle between man and machine.

*The Big Bang Theory*

A TV-series depicting four geeks and a girl, which often depict robots.

*The Japanese Intelligent System Research Institute.*

Large research facility, that created PARO, the robot seal.

*The Matrix*

American movie-series depicting the struggle between man and machine.

*Tokyo robot-restaurant*

A restaurant in Shinjuku, Tokyo where girls in minimal clothing do battle on robots.

*Vacuum-cleaner robots*

Robots that keeps your floors clean. One type that is big in Japan is the Sharp Cocorobo Vacuum Cleaner Robot.

*Vocaloid*

A voice-synthesizer program, creating hologram singers such *Hatsune Miku*.

*Washlet*

A Japanese smart-toilet that opens automatically, flushes, and dries you.