Nihon-Robotto-Ron: A Deconstruction of the Japanese 'Robot Kingdom' Phenomenon

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Abstract

This paper attempts to deconstruct the image of Japan as the 'Robot Kingdom'. The genesis of this image is analysed and integrated in the nihonron*, an essentialist discourse on Japan, by taking into account the perspectives of different academic disciplines such as computer science and cultural studies. The different strands of the discourse are critically evaluated. In this way, the structure of the image of the 'Robot Kingdom' will become visible and can be analysed in the context of the* nihonron*.*

Keywords: Japan, Robotics, *nihonron*

Introduction

Japan is a country full of robots—or at least that is what popular images of Japan tell us. Robots are taking care of the elderly and educating children, they are becoming partners for golf or even sex. Sony's AIBO, a robotic dog, and Honda's ASIMO, a bipedal robot, have become the ambassadors of Japan's image as a robot-loving country. Engineers like Ishiguro Hiroshi 石黒浩 (b. 1963) and his robotic *doppelgängers* astonish the world with their 'Japanese way of robotics'. However, in the wake of the nuclear accident in Fukushima in 2011, Japan's status as the 'Robot Kingdom'[1] is in doubt, as rescue robots from France and the United States had to be borrowed, which promptly produced headlines in Japanese newspapers that were critical of the self-proclaimed status of a high-tech country.[2]

   This gap between (self-)perception and reality brings up two basic questions: Is Japanese society really more open towards robot technology compared to other countries? And secondly, how is the image of Japan as a robot-loving country constructed? In the following pages I will argue that in times of globalisation, technology is increasingly becoming part of a country's national identity. As such, the robot seems to be the perfect tool for Japan to create an image of its own that connects tradition and modernity. The futuristic images of a Japan populated by robots, suggesting a very advanced integration of this technology in society, are in stark contrast with the reality of everyday life. The present paper aims to deconstruct this image of the 'Robot Kingdom' by answering these questions and connecting them with the dominant discourse on Japanese identity.

   There are numerous publications on Japanese Robots, from authors both in and outside of Japan. As is often the case in the academic discourse on Japanese things, two approaches are found which oscillate between trivialisation and overanalysis: critical enquiries that focus on single aspects of Japanese Robotics, while embedding them into other fields (e.g. Jennifer Robertson in Gender Studies or Yuji Sone[3] in Performance Studies), or academic approaches that create holistic portrayals of Japan while neglecting critical voices (e.g. Alexander Wißnet's *Roboter in Japan – Ursachen und Hintergründe eines Phänomens*). Hence, this paper aims to present a critical insight into the two sides of this body of literature through an analysis of the discourse, as they are at least partly responsible for creating the image of Japan as the 'Robot Kingdom'.

   I aim to approach the abovementioned problems from three different perspectives: first, a theoretical framework will be established in order to connect the dis-

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1   This phrase was coined by Frederik Schodt in his book *Inside the Robot Kingdom*: *Japan, Mechatronics, and the Coming Robotopia* (1988).

2   For a roundup of the media echo concerning Fukushima and robots see Robertson (2011).

3   Since Sone writes only in English, his name will be transcripted according to his own publications. The same applies to below-mentioned authors Harumi Befu, Shingo Shimada, and Toshiya Ueno.

course on Japan's national identity with technology in general and more specifically
with the robot. Second, I will present an insight of the existing literature that tries to
explain the phenomenon of Japanese robotophilia. Third, the arguments found in the
second part will be analysed and finally put in the critical context of Japanese Stud-
ies. Since this paper is a condensed version of my Master's Thesis it will naturally
omit several aspects of an already broad subject. However, I try to include refer-
ences in the footnotes presenting additional literature that could not be incorporated
in this text due to spatial limitations.

Android? Japanoid!

This section will establish a theoretical framework to analyse the means by which
the image of Japan as the 'Robot Kingdom' comes into existence and positions the
robot as the subject of discourse. This process of constructing a Japanese identity
always oscillates between the 'inside' (Japan) and the 'outside' (the so-called
'West'). These constructed images are never stable but, rather, are in constant flux.
The function of time and space in the process of identity-building, where the robot
functions as a medium to imagine Japan's future, is discussed. The history of tech-
nology in Japan, especially the shift from the Tokugawa era (1600–1868) to the
Meiji period (1868–1912), can be seen as an interface that enables 'Japanisation' by
inclusion and exclusion. To see the robot according to this line of thought enables us
to understand its function as more than just a machine, but rather a medium through
which Japan and the Japanese see themselves and are seen from the outside. The
robot and especially its anthropomorphic variation—the android—become a *Ja-
panoid*, an entity that stands between human and machine, inside and outside.

Nihon-Robotto-Ron: A Definition

Japan has a remarkable tradition of a national identity discourse called *nihonron*
日本論. A central aspect of this discourse is 'Japaneseness' itself: What makes
Japan the Japan we perceive? What are the central elements that are specific to
Japan and make it a seemingly unique country? Heated debates in various channels
of communication construct and de-construct images of Japan and try to verify or
dismiss them. However, one point that everyone can agree on is their 'unique
uniqueness', meaning that merely the way the discourse on uniqueness is con-
structed is unique.[4] To analyse the 'uniqueness' of the Japanese robot this discourse
has to be embedded in the *nihonron*. Naturally, with the limited space available in

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4 For an introduction into the discourse on *nihonron*, see, for example, Aoki (1996), Vollmer (2003) and
   Befu (2001).

this paper, a complex topic such as *nihonron* can only be addressed very briefly. Nevertheless, the integration of the robot in the *nihonron*, creating a new sub-discourse one may call *nihon-robotto-ron,* is a good way to analyse the discourse (*ron*) on the Japanese (*nihon*) character of *robotto* (Japanese for robot).

In his study *Die Erfindung Japans – Kulturelle Wechselwirkung und nationale Identitätskonstruktion* (2007) Shimada Shingo points out that the increased contact between different cultures achieved through technological processes and the particularistic re-affirmation of said cultures go hand in hand. Technology as an agent of modernity becomes a vital subject in this process of re-affirmation of cultural particularities, instead of erasing them (Shimada 2007: 17). Whereas the industrial robot undeniably played a significant role in Post-War Japan's economic growth, a new generation of robots is now becoming the centre of attention, often being portrayed as the solution to prevalent problems in contemporary Japanese society. This contrasts with the dystopian images which are a major part of a critical debate. Both sides together make the 'Robot Kingdom' a kind of self-fulfilling prophecy.

Inevitably a fundamental question arises: How did the image of Japan as the 'Robot Kingdom' come into existence in the first place and, furthermore, why and how is it becoming part of the *nihonron*? This perception of Japan often serves as a surface for projections of futuristic images, which create their very own space-time continuum in which Japan suddenly becomes a place in a distant future. Depending on the perspective these images can be positive or negative, but through this discourse they are always connected to a certain reality vis-à-vis Japan. This process of (self-) identification creates a number of misunderstandings, exoticisms, and stereotypes. For Shimada it is important to locate the moment where the other becomes the self and vice versa—the seemingly natural basis of one's own and the other identity has to be defined as a response to a foreign context (Shimada 2007: 33). For the purposes of this paper, this means to analyse not only when and how the robot becomes Japanese, but also to ask why this process was initiated. At the same time it must be noted that there is also the danger of this paper itself inadvertently creating a Japanese robot, or in Shimada's terms, of establishing a difference where there is none. The premise is complicated, but also carries a lot of potential for reflection on a meta-level.

One specific aspect of the *nihonron* is the structure: like a feedback loop, it oscillates between inside and outside, inclusion and exclusion. In the given case of the Japanese robot this means a universal object—a robot—becomes a particularistic subject inscribed with ideological meaning and charged with cultural values. The android as a human-like robot, being both close and far away, becomes the self and the other at the same time by becoming a Japanese robot: it brings the Japanese closer to the robots while separating them from other humans. Therefore this Japanese robot can be analysed through the values it embodies, and in a broader context, can be seen as a medium through which the relationships between nation, culture,

and technology can be deconstructed. The android that seems to become closer and
closer to a human being as technology advances serves as a model of how differ-
ences between humans are articulated: What makes 'us' human? What makes 'them'
Japanese?

As Tessa Morris-Suzuki shows in her book *Re-Inventing Japan. Time Space Na-
tion* (1998) the definition of what is considered 'Japanese' is not stable, but re-
configures itself constantly through the parameters of time and space. For the per-
ception of Japan as the 'Robot Kingdom'—both from inside and outside of Japan—
this means to project geographical distance on the axis of time. Cultural divergence
as distance is not perceived spatially anymore, but through the parameter of time:
Japan as a whole becomes an imagined futuristic hi-tech gated megapolis, a cyber-
punk utopia, where technology and its relationship to humans plays an important
role in its particularistic self-affirmation. The Japanese term for this isolation-
through-technology is *Garapagosu-ka*[5] ガラパゴス化, which means 'turning into
Galapagos', an evolution that is free from outside influence. *Garapagosu-ka* can be
seen as a development that goes against the current of globalism: instead of 'con-
necting' countries, technology here isolates them through a lack of compatibility.

According to Morris-Suzuki, it is especially in science that the difference be-
tween *global formats* and *local contents* is emphasised: since the modern scientific
standards in Japan were adopted mostly from the West, a difference is established
for self-assertion. As Morris-Suzuki shows with examples from early modern sci-
ence, this pattern continues in the present. Where *global formats* of knowledge
permeate everyday life, they will be appropriated to display *local content* for the
sake of national, regional, or ethnic identity (Morris-Suzuki 1998: 161-167). In the
case of robots this means that they too are given a *local content* and thus, become a
medium of displaying ethnic or national identity.

Media theorist Volker Grassmuck describes the process in his book *Geschlossene
Gesellschaft – Mediale und Diskursive Aspekte der "drei Öffnungen" Japans*
(2002). Here the *nihonron* is working as an interface, where the social system called
'nation' is imagined through a connection with the past—in the case of Japan, the
lineage of the emperor that is traced back to the sun goddess Amaterasu—and the
future—through *technological nationbuilding* (Grassmuck 2002: 16). For Grass-
muck, technology is an important aspect in the process of constructing a Japanese
identity. Just as the imported writing system—as technology—from China eventu-
ally became a basis for Japanese identity and for marking a distinction between
inside and outside, the robot can be seen as a contemporary metaphor for techno-
logical progress and therefore as a marker of distinction.

This differentiation works for both sides, in- and outside, as David Morley and
Kevin Robbins show in their book *Space of Identity – Global Media, Electronic*

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5   In the context of robots the term *Garapagosu-ka* is used frequently for example by Kishi (2011: 53).

Landscapes and Cultural Boundaries (1995). On the basis of Edward Said's concept of *orientalism,* Morley and Robbins define *techno-orientalism* as a strategy of the West to cope with the fear of loss of technological hegemony, where an image of Japan as a de-humanised, technological dystopia is created, and where robots naturally play an important part in the narrative. Even twenty years after the first publication of their idea, the perception of Japan as a high-tech country still circulates globally. Moreover, according to Morley and Robbins 'Japan' even became synonymous with 'technological progress'. The perception of Japanese identity is replaced by the rating of the nation's technological status, and thus the stereotypes about Japan are re-packaged in this technological transformation. This imagined Japan transcends the Western idea of modernity and is often portrayed in contrast to Western humanism (Morley and Robbins 1995: 168-169). At this point, the universal question regarding the relationship of man and machine becomes particular: The robot becomes japanised.

For the philosopher Toshiya Ueno this *Japanoid* exists neither *in-* nor *outside* Japan, but works as a virtual image or an interface between Japan and 'the Other'. In his publication *Japanimation and Techno-Orientalism* (2001a) he describes a fusion of Japan and animation, a phenomenon where Japan is perceived through futuristic animated movies and the boundaries of reality and fiction become unclear for the consumer. According to Ueno, these images work like a semi-transparent mirror, through which Japan is viewed but also views itself (Ueno 2001a: 228). For Ueno this results in a double consciousness of Japan as he describes in *The Shock Projected onto the Other: Notes on Japanimation and Technoorientalism* (2001b). Japan has the psyche of both the colonised and the coloniser: having a colonial past and being 'colonised' by Western consumerism (Ueno 2001b: 235). In the dichotomies of man/machine and native/alien the *Japanoid* turns into a mode of distinction and therefore can be seen as a subject of the *nihonron*.

Culture and Technology of the Japanese Robot

When we try to define a 'Japanese Robot' two perspectives arise: we can try to connect the 'Japanese Robot' to the history of technology in Japan in general, or tie the 'Japanese Way of Robotics' to certain elements of Japanese culture. These two seemingly opposite views result in a very complex and dynamic discourse that questions both the elements of 'Japaneseness', and the presumed neutrality of technology.

Japan can claim a unique relationship with technology, or to put it differently, 'a Japanese way of technology'. The two hundred year period of isolation during the Tokugawa era, the high-speed modernisation of the Meiji-Era and the Second World War which made Japan a victim of nuclear bombing are all unique historic events

that profoundly defined the relationship between nation, technology, and culture. As Morris-Suzuki points out in her study, it is very difficult to talk about the relationship between nation and technology without abusing the term 'culture' as a mediator, and therefore creating an aura of mystery that surrounds Japanese society, rather than explaining it (Morris-Suzuki 1994: 3). The three aforementioned events will now serve as case studies that will enable the development of a deeper understanding of the 'Japanese Robot' and show the complexity of the issues of imitation and innovation, which in Japan are not mutually exclusive.

For Morris-Suzuki the Tokugawa era was a very important time for the development of a 'Japanese technology'. Severely limited influence from the rest of the world, a growing number of *rōnin* 浪人 (wandering samurai without a master to serve) who invested their time and energy in technology, and a new political structure that nurtured competition between different parts of the country were all socio-historical conditions that allowed Japan to advance in and through technology (Morris-Suzuki 1994: 5). One of the inventions that is often cited as both typical for the Tokugawa era and deeply connected to the contemporary state of Japanese robotics is the *karakuri ningyō* 絡繰り人形 (mechanical puppet)—little puppets with hidden mechanisms that could perform artistic tricks like shooting arrows, which were popular entertainment gadgets.

The cultural history of *karakuri ningyō* is often used as an argument to explain the seemingly 'unique' approach of Japan towards robotics. Since the *karakuri ningyō* were only used for entertainment it is often argued that in Japan the research about robots still incorporates this playfulness and naiveté. The advanced mechanisms that were used in building the *karakuri ningyō* are also often cited as the legacy for today's high level robotics in Japan. As we will later see, both of these claims are invented traditions that are used to construct a lineage between the *karakuri ningyō* and the robots of today. This is a common motive in the *nihonron*[6], where historic artifacts are appropriated for a narration, in our case the 'Robot Kingdom'.

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6 For an introduction to invented traditions in Japan see Vlastos (1998).

Picture 1 *Karakuri ningyō* are popular illustrations for books about robots,
as this cover shows
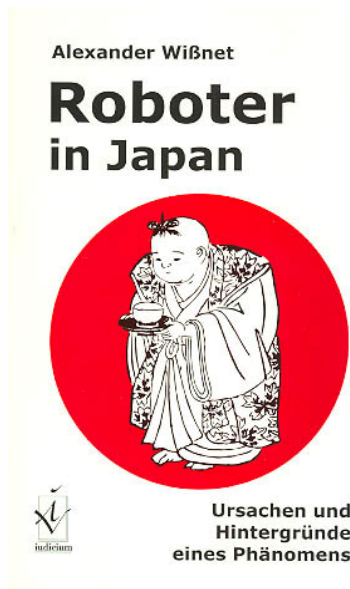
In the Meiji-Era on the other hand, the need for adaptation of non-Japanese technology became evident. A good example of this shift is the watch, which in the Tokugawa era was seen as a gadget like the *karakuri ningyō* that was modified to fit the Japanese time system—with hours of varying length. The Japanese government realised that a mere modification of imported technology was no longer enough, and the technology itself became the motivation for innovation. Together with the completion of the first railroad in Japan in 1873, the Gregorian calendar and the Western time system were adopted. This transition of course provoked resistance and therefore demanded intellectual legitimation, and the phrase *wakon yōsai* 和魂洋才 (Japanese spirit, Western technology) was coined. The idea that no matter how foreign a technology is, it can be made Japanese solely by spirit, can be seen as a motto of 'Japanese modernisation' and is an important tool for understanding technology in Japan.

This relationship between spirit and technology as proclaimed through *wakon yōsai* is not stable as the aftermath of WWII shows, where technology was not only adopted but reframed. The atomic bombs that were dropped on Hiroshima and Nagasaki were a cruel demonstration of technological power from the United States which led to the capitulation of Japan on August 14. The god-like status of Hirohito *tennō* 裕仁天皇 was diminished as his voice was heard nationwide proclaiming

Japan's surrender on national radio—that is, through technology. Surprisingly, however, instead of abandoning atomic technology, the Japanese embraced it.

Besides these history-based argumentations for a unique approach towards technology in Japan there are, of course, also approaches that take 'culture' as the basis for their claims. Robot-Engineer Frédéric Kaplan's text *Who is Afraid of the Humanoid? Investigating Cultural Differences in the Acceptance of Robots* (2005)[7] is an often-cited example of what Morris-Suzuki indirectly warned of, as it takes 'culture' as the root of difference. Kaplan sees Japanese and Western culture both as heterogeneous constructs and also notes a dialectical relationship between culture and technology. For Kaplan, culture influences the way technology is perceived but also vice versa—technological progress shapes the way culture is perceived. Moreover, on an intercultural level this means that the image of Japan as a 'Robot Kingdom' is evoked by the fear of machines in the West. Kaplan claims that a more uncritical approach towards robotics in Japan is interpreted as a 'robot-mania' in the West (Kaplan 2005: 1-2). Kaplan's change of perspective not only shifts the need for evidence from Japan to the West, but also puts them in a dialectical relationship: reciprocally the reason for the popularity of robots in Japan must therefore be found in the unpopularity of robots in the West.

An important aspect for Kaplan is the 'taming' of technology in Japan or the appropriation of foreign technology, without losing a cultural core. Like Morris-Suzuki, he roots this approach in the ideology of adaption in Meiji-era Japan but sees its ongoing influence mostly in contemporary popular culture. He cites the world wide successful videogame *Pokémon* ポケモン as one of his examples; a game where wild creatures have to be studied and tamed before they can be used to fight against each other. Whereas it seems far-fetched to interpret *Pokémon* as a re-indoctrination of Meiji ideology, it reveals a way of argumentation that we will often come across when talking about the 'Robot Kingdom' (Kaplan 2005: 4). Not only the blurring of fact and fiction, but the often uncontested influence of popular culture on cultural consciousness has to be questioned when videogame characters are cited as the main influences for such complex issues as the relationship between a nation and technology.

Another important aspect for Kaplan is the Japanese dichotomy of the natural and the artificial. He cites Augustin Berques' example of the fountain as representative of Japanese robotics. As Berques argues, Western fountains always go against nature by using water-jets whereas their Japanese counterparts try to use cascades to emulate the natural flow of water. For Kaplan this provides enough reason to claim that Japanese engineers merely try to replicate nature by building humanoid robots and they are therefore valued simply because of their 'natural shape'. He continues to argue that only the contact with the outside made it necessary to demonstrate

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7   Kaplan was even published in Japanese as well, see Kaplan (2001).

functionality (Kaplan 2005: 5-6). Kaplan here clearly uses 'culture' as a mode of constructing difference. However, upon closer inspection those claims rapidly lose validity, as Kaplan's analysis of cultural influences is too generalised. Nevertheless, his analysis puts the 'Japanese robot' in an interesting position: The Japanese spirit (*wakon)* that one is looking for inside the Western technology (*yōsai*) can only exist through a lack of Western spirit. Technology here becomes ideology.

The Robot as a Performer

As mentioned before, the robot is often presented in the grey area between science-fact and science-fiction. In other words, the robot is set in a scene, put on a stage. The media scholar Yuji Sone explains this 'liminoid space' of representation in the article *Realism of the Unreal: The Japanese Robot and the Performance of Representation* (2008). The representation of robot technology in popular culture—e.g. *manga* 漫画 and *anime* アニメ—and robot-specific events—product presentations, exhibitions and fairs—are important aspects in our perception of robots in general. Although according to Sone the 'robotisation' of daily life is still far from reality, these stories and events create anticipation from the audience, and thus become an area between realism and imagination. For Sone the anticipation and the representation of robots form a complex loop specific to Japan (Sone 2008: 346).

Robot shows, such as the regular presentation of Honda's ASIMO at the National Museum of Emerging Science and Innovation and the display of Toyota's robots at the World Expo 2005 in Aichi, present robots as objects of desire. Simultaneously, their importance as a contribution to the Japanese nation is emphasised. According to Sone, these images are created and re-affirmed at the same time, and the robots become icons and tangible embodiments of contemporary robot technology. These performances happen outside of the Western dichotomy of man and machine, letting the robots become social actors. A presumed missing critical awareness of the Japanese audience make this game of make-believe possible in the limited frames of a specific cultural setting (Sone 2008: 349-350).

This 'realism of the unreal' is, according to Sone, deeply rooted in Japanese culture. Acts of simulations are for example expressed by the aesthetics of Zen-gardens, where the forms of nature are only hinted at, or *kabuki* theatre 歌舞伎, where male actors represent female characters. This 'social imaging' enables a 'collective fantasy' about robots, where the actual level of technology is made invisible through techniques of mis-en-scène.

Picture 2 Ishiguro Hiroshi and his *doppelgänger*. Even in a photograph it is clearly
visible who is human and which is the robot.

Source: http://nauka.rs/wp-content/uploads/2012/09/Hiroshi-Ishiguro.jpg, accessed July 7, 2015

An example of mis-en-scène is the presentations by Ishiguro Hiroshi, who became
famous with his robotic *doppelgänger*. Through his medial presence[8] the real tech-
nological level of the robot becomes unimportant: strictly speaking Ishiguro's
machines are not even robots, as they are remote controlled. Nevertheless, the
images are presented in the media as the future of robotics, and in the case of Ishi-
guro's *doppelgänger,* they even have a Japanese look. The question remains if a
non-Japanese engineer would use the same strategy for marketing his research. Yet
it seems as if Ishiguro knew that the audience expects the humanoid of the future to
have a Japanese face, as predicted by Ueno. The performative display of Ishiguro's
robots evokes a futuristic image that is highly compatible with the stereotype of
Morley and Robbin's idea of techno-orientalism. The exoticness of a Japanese-
looking robot may only work outside of Japan, but is coming back to Japan via
various channels. The fact is that Ishiguro's *doppelgänger* is not the most advanced
humanoid robot, but is clearly the most visible in the media.

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8   He is also the author of numerous books on robotics; see for example Ishiguro (2009) and Ishiguro and
    Ikeya (2010).

The Discovery of the Robot Kingdom

As it is with topics pertaining to the *nihonron* in general, there are often two sides that argue for and against uniqueness in the said area. In this chapter I want to present two different approaches that try to describe or respectively deconstruct the 'Robot Kingdom'. These sources not only give information on the topic itself, but also reveal the different ways of argumentation.

Constructing the Kingdom from a Hermeneutic Perspective

Alexander Wißnet's publication is based on his Master's Thesis in Japanese Studies. While some parts are very well researched (i.e. on *karakuri ningyō*), the overall impression is that Wißnet not only repeats common stereotypes about robotics in Japan but also transfers them into the academic discourse. He tries to provide a coherent explanation of the 'phenomenon' of Robotics in Japan, but fails to escape a holistic view. For this reason, his thesis provides an interesting example of how different characteristics of Japanese culture and society are used to 'explain' a certain phenomenon, by focussing on aspects that thoroughly support his argument and dismissing arguments against or those which would need a deeper explanation totally. Upon closer inspection, he constructs the very phenomenon he wants to explain, thus providing an insight into the construction of a Western view on Japanese robotics.

This image, of course, needs a counterpart, and Wißnet finds it in the negative image of robotics in the Occident. The only evidence he can find is the negative image of robots in Western popular culture that can be contrasted to the 'lovely and helpful' robots in Japan. Not only does this argument subsume the outside of Japan as a holistic entity, it also blurs the boundaries between fact and fiction. An in-depth analysis of the relationship between popular culture and society is left out in favour of an image of 'Good versus Evil' or 'Japan against the rest of the world'.

For Wißnet, the aforementioned *karakuri ningyō* are the link between Japanese tradition and modernity. He claims that every visitor to Japan will somehow come into contact with one of the descendants of the *karakuri ningyō*. Hence from the very beginning he is constructing an image of a Japan that has an unbroken lineage of technology that can be traced back hundreds of years, and is somehow immune to any foreign influence. Ironically, one of Wißnet's most showcased examples of contemporary *karakuri ningyō*, Sony's Robot-Dog AIBO, ceased in production shortly after Wißnet's publication (Wißnet 2004: 4). This example shows that hermeneutic approaches often have little to no connection with the reality of robots and tend to depict a romanticised image.

Another reason for the 'Japanese robotophilia', as Wißnet puts it, is the strong influence of popular culture in Japanese society. According to Wißnet, the positive image of robots in *anime* and *manga* not only influences the general attitude towards robots, but also research, especially that concerning humanoid robots. On the basis of this presumed positive attitude, engineers would not need a justification for research such as Ishiguro's humanoids or the Japanese government's attempts to integrate robots into everyday life, and even attempts in 'weird' areas like humanoid robotics are generally seen in a positive light. While it is true that many Japanese robotic researchers cite *manga* and *anime*, especially the series *Tetsuwan Atomu* 鉄腕アトム (1952–1968), as an influence on their work, it would be naïve to ignore the true motifs, be they capitalist, political or personal, behind this explanation.[9] Yet Wißnet takes these statements as social facts and uses them to portray Japanese robotics research as being different (Wißnet 2007: 46).

Interestingly enough, he neglects the influence of Shintō, Japan's native religion, on the Japanese view on the man/machine dichotomy. He states that the animistic elements of Shintō, which are often cited as influencing factors in regard to the positive image of robotics in Japan, can be found in other religions as well and therefore for Wißnet the concepts of Shintō are often 'abused' in making Japan look different (Wißnet 2007: 41). This statement makes clear that Wißnet does not acknowledge the many layers of the relationship between technology and culture and prefers stereotypic explanations that fit into the image of the 'Kingdom of Robots'. Nevertheless, Wißnet claims to have an insight into the psyche of ordinary Japanese people when he writes about the factory workers who welcomed the robot as a relief from dangerous and monotonous work, in contrast to their American colleges, who saw the robot as a threat (Wißnet 2007: 52). While not having a single shred of proof for this argument, Wißnet sees the positive attitude towards robots deeply connected with Japanese culture on a superficial level, from factory workers and their industrial robots to elderly people and their electronic nurses, which contributes to an exotic image of Japan.

Even though *Inside the Robot Kingdom – Japan, Mechatronics and the Coming Robotopia* (1988) by Frederic L. Schodt was written more than twenty years before Wißnet and bears no academic claims, the author often provides interesting examples that go against popular opinions. He also realises the difficulty of differentiating between industry and fantasy, and furthermore understands the humanoid robot as a performer. According to Schodt, this 'Robot Kingdom' is an imagined place that is constructed by myth, reality, and collective consciousness.

An interesting aspect of Schodt's work is the analysis of the empirical data that is often used to contribute to the idea of Japan as the 'Robot Kingdom'. His research reveals that standards of what actually defines a robot by the Japanese Industrial

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9   See also Leis (2006).

Robot Association (JIRA) and the Robot Institute of America (RIA) differ in such a way that the number of robots in both countries vary greatly by the respective associations' definitions. Since the JIRA's definition of robots had a broader scope than the American counterpart, it resulted in a very high number of robots that circulated through the media, and an objective comparison was empirically not possible (Schodt 1988: 37-40). Nevertheless, these incongruent numbers contributed greatly to the robot-hype in Japan in the 1980s, and the question 'Who has a greater number of robots at hand?' became a symbol of prestige and a topic that was picked up by the popular media. Even if they did not read Schodt's book, the phrase 'Robot Kingdom' became a popular synonym for Japan, and publications like Wißnet's continue to nurture this image.

Deconstructing the Kingdom from an Empirical Perspective

The study *Does Japan Have a Robot Mania? Comparing Attitudes by Implicit and Explicit Measures* (2009) by robot-engineer Karl MacDorman and his team of researchers tries to demystify Japan as the 'Robot Kingdom' through empirical analysis. Their presumption is that the Japanese robot-hype in the mass media—both in and outside of Japan—is a product of different factors that range from religion to government policy. MacDorman et al. also note that the perception of robots is indeed culturally specific, but the factor of culture should not be overestimated, as global trends and the exchange of knowledge internationally also play an important part. MacDorman et al. hint that this fact does not prevent the instrumentalisation of this cultural particularism for certain interests, for example to facilitate government funded research in the area of humanoid robotics (MacDorman et al. 2009: 487).

MacDorman et al. see individual variations regarding the attitude towards robots and assume that these are not predetermined by society as a whole. These individual variations are influenced by a persons' experience and of course the images in the media. Nevertheless the frequency and quality of the experiences with robots are shaped—and to a certain degree also controlled—by the economic structure and technological level of the respective nations. MacDorman et al. distinguish between a person's individual attitude and the values that are presumed by a group. They cite the influence of popular culture and also Shintō as explanations that have emancipated themselves from the discourse, which are being uncritically repeated in the media and by individuals, becoming self-fulfilling prophecies in the process (MacDorman et al. 2009: 492).

In their empirical study MacDorman et al. could confirm the hypothesis that the Japanese people are having more contact with robots than Americans. Whereas in America most of the contact with robots was by male probands, they discovered that in Japan almost no gender-gap regarding the experience with robots exists (Mac-

Dorman et al. 2009: 501). The hypothesis that Japanese people generally experience robots as 'warm' and Americans as 'threating' could not be verified. Although the Americans showed a stronger association between robots and weapons, they felt humans to be more threating than robots in general (MacDorman et al. 2009: 501-502). MacDorman et al. note that this contradiction shows that the American probands do not adopt a negative attitude towards robots and their answers do not necessarily express a personal opinion (MacDorman et al. 2009: 502-503). A possible explanation for this phenomenon of implicit fear could be the lack of specific knowledge and also the way Americans experience robots, namely in relation to the military. These different settings influence the overall attitude of a person towards robots according to MacDorman et al. (MacDorman et. al 2009: 501-503).

Another empirical study, *A Cross-cultural Study on the Attitude towards Robots* by Christopher Bartneck et al. (2005), who like MacDorman et al. have an engineering background, defies the common image of Japanese robotophilia through empirical methods. In their empirical study, Bartneck et al. are interested in the attitudes of people regarding the interaction with robots in their social and emotional dimensions. Bartneck et al. could not find evidence for a Japanese robotophilia, and the Japanese probands even showed significantly more concern towards the possibly negative influence of robots on social life. Bartneck et al. conclude that the reason for this growing concern might be the higher exposure of Japanese people to robots and therefore a higher awareness of them (Bartneck et. al. 2005: 2).

Besides these settings, the appearance of the robot itself also has a great influence on its perception as Bartneck et al. conclude from their study *My Robotic Doppelgänger – A Critical Look at the Uncanny Valley* (2009). The Uncanny Valley is a concept developed by the Japanese engineer Mori Masahiro 森政弘 (b. 1927) that describes the relationship of the human-likeness of a robot and the influence on its perception as shown below.

In their study Bartneck et al. made an interesting discovery. The Japanese probands (test persons) prefer a more 'robot-like' robot, which means the more antropomorph the appearance of a robot is, the lower the empathy towards it. This means that whereas there is no difference in the overall perception of robots per se, a culture-specific difference appears regarding the various shapes of robots. Bartneck et al. see a possible explanation for Japanese people's rejection of humanoid robots in the appearance of robots in popular culture, which shapes a certain basic conception. According to Bartneck et al. these empirical results will very likely change in the future as technology advances in different countries. As simple as this statement seems, Bartneck et al. are one of the first to define the attitude of people towards robots as non-static (Bartneck et. al. 2009: 269-276).

Picture 3 This graph explains the Uncanny Valley: if a robot reaches a certain point of resemblance with a person, probands start to get irritated.
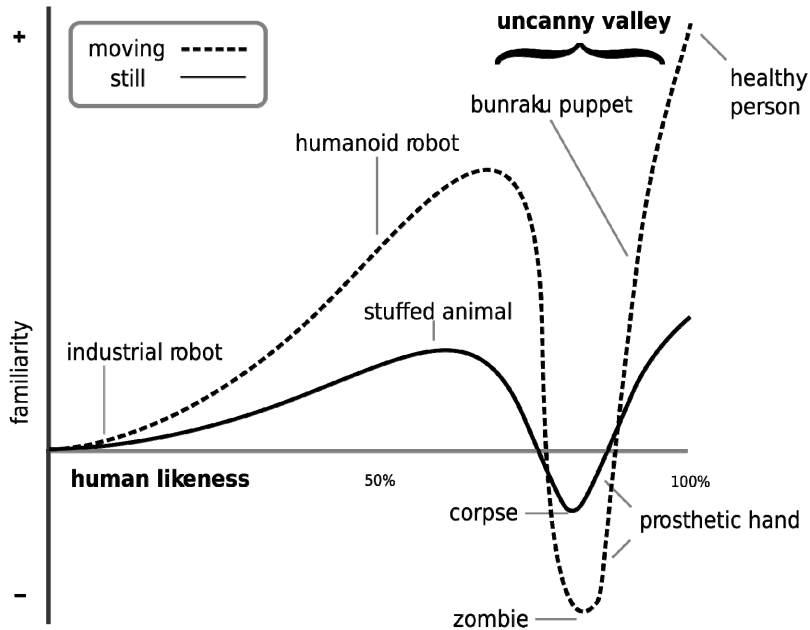
Source: http://jaja-alea.blogspot.co.at/2012/01/uncanny-valley.html, accessed Juy 7, 2015

Critical Perspectives

After presenting a theoretical framework and two different approaches to describing the relationship between Japan and robots, I want to hint at the critical voices concerning the topic. First, I will point out the most common stereotypical explanations and the misunderstandings commonly found in the discourse. Second, a critical approach towards a better understanding with a focus on the hegemonic side will suggest a direction for further research, where technological blueprints are opposed to possible realities.

Karakuri ningyō, Shintō and *Tetsuwan Atomu* Demystified

As previously stated, the *karakuri ningyō* are often used to create a connection between the spirit of the Edo-era and contemporary Japanese robotics, especially the research on humanoids. As Erich Pauer shows in his article *Japanische Automaten (karakuri ningyō): Vorläufer der modernen Roboter* (2010), this connection is again

an invented tradition. Many publications analyse the *karakuri ningyō* with their presumed connections to contemporary robots in great detail—e.g. Wißnet or Umetani Yōji 梅谷陽二 (b. 1932)[10]—and project elements of the *karakuri ningyō*—i.e. playfulness and anthropomorphism—onto them. A wide variety of publications use the *karakuri ningyō* as illustrations—Wißnet puts a *chahakobi ningyō* (puppet serving tea) on the cover of his book—and Japanese scientific publications also make reference to them in their headlines. According to Pauer this uncritical usage led to an acknowledgement of an invented tradition as a fact, which became a vital part of the discourse on Japanese robotics (Pauer 2010: 323-324). Whereas some publications use the *karakuri ningyō* as illustrations to please the audiences' desire for exoticism, Pauer describes instances where these illustrations are utilised to create a traditionalistic ideology.

For Pauer the origin of interest in the *karakuri ningyō* dates to the government funded research programme about *monozukuri* 物作り (the making of things) that started in the 1990s in Japan. In the beginning the programme focused on 'typically Japanese' ways of manufacturing objects by focusing on companies like Toyota or Komatsu, but soon the interest shifted to the *monozukuri* of the Edo-Era. For Pauer the *karakuri ningyō* were the perfect illustration for the beginning of the humanoid robotics at that time and evoked a 'Japanese spirit' that was desired in contemporary Japanese technology (Pauer 2010: 324). This mode of appropriation of historical technologies for ideological purposes is, according to Pauer, by no means limited to Japan but is in fact an important part of the process of creating national identities. In this context the use of the *karakuri ningyō* to create a 'Japanese way of robotics' can be seen as a reaction to the view that Japan was totally dependent on Western technology for modernisation. By linking the *karakuri ningyō* historically to contemporary technology, the image of a Japanese way of technology is created. The humanoid robot then becomes an ideologically charged object that symbolises technological progress in Japan, and because of its features it is also able to actively perform this role.

Pauer proves his hypothesis of the *karakuri ningyō* as invented tradition by citing the lack of historical evidence. The term *karakuri ningyō* is not mentioned in *Gijutsu-shi* 技術史, one of the first publications on the history of technology in Japan published in 1940. Furthermore, no trace of them can be found in the *Nihon kagaku-gijutsu-shi* 日本科学技術史 from 1962, even though both publications aim to find historical predecessors of Japan's important industry sectors. For Pauer this historical discontinuity is an indication of an invented tradition, which is also supported by the fact that apart from the shape of the *karakuri ningyō* and the humanoid robots—which after all are modelled after their human counterparts—no tradition of mecha-

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10 Umetani's publication (2005) looks for connections between the *karakuri*-manufactures and robot-engineers.

nisms or material is evident. However, for Pauer the narration of the *karakuri ningyō* being the predecessors of the humanoid robots in Japan is 'too good to be true' and therefore hard to argue against (Pauer 2010: 326-328).

Like the *karakuri ningyō*, the *manga* character *Tetsuwan Atomu* often plays a key part in explaining the seemingly positive image of robotics in Japan and almost becomes a 'national icon' as the Japanologist Cosima Wagner explains (Wagner 2007: 7). Most of these explanations lack a critical analysis of the role of popular culture in shaping public opinion and it seems that certain characteristics of the fictional character Atom are transferred directly to their counterparts in real life, without differentiating between fact and fiction. A popular theory is that because the Japanese engineers designed their robots after childhood heroes like Tetsuwan Atomu, who are per see 'good', these real robots must also be good. As strange as this argumentation sounds, it is a widespread argument that dismisses the ethical problems of robotics in a very superficial manner.

For Schodt, who dedicated a whole book to the research of Tetsuwan Atomu, this particular character is not only used as a symbol for state-of-the-art technology in Japan, but like the *karakuri ningyō*, is also used to embody Japanese values regarding technology. He notes that when Tezuka Osamu 手塚治虫 (1928–1989) created Tetsuwan Atomu, a real Japanese robot was far away from becoming reality and the 'technological inferiority complex' of the postwar era was still strong (Schodt 1988: 98). The stories in *Tetsuwan Atomu* therefore not only became symbols for technological progress, but the utopian visions of society nurtured dreams of a higher standard of living.

At the same time Schodt sees a connection between *Tetsuwan Atomu* and the focus of Japanese robotic research on humanoid robots, since many researchers active in this field state their childhood memories of *Tetsuwan Atomu* as one of the motivations[11] for their work. This explanation of the scientist following his childhood dream of a bipedal robot is of course naïve, but it is often used as a narrative to explain the seemingly playful studies happening at Japanese laboratories. Wißnet goes so far as to claim that the popularity of *Tetsuwan Atomu* in Japanese society frees the researchers from any kind of justification pressure concerning their projects (Wißnet 2007: 46).

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11 See for example Schodt (1988).

Picture 4 *Tetsuwan Atomu* is illustrated as a human boy with a mechanical body.
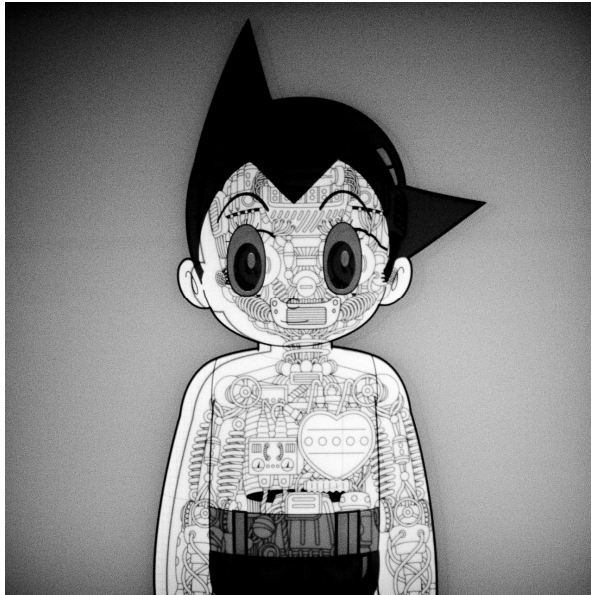
Source: https://dailygeekette.files.wordpress.com/2014/11/tetsuwan-atomu.jpg, accessed
July 7, 2015

Whereas *Tetsuwan Atomu* is used to display an archetype of the Japanese robot,
which is friendly and helpful, Itō Kenji 伊藤憲二 claims in his study *Vor Astro-Boy
– Roboterbilder in Nachkriegsjapan 1945–1952* (2010) that the portrayal of robots
in popular culture underwent many changes. Like Bartneck's prediction that the
attitude towards robots in general is shifting with time, Itō shows that the image of
robots in popular culture in Japan is not static as well. For Itō the positive image of
Tetsuwan Atomu is the result of the high expectations towards technology in general
and atomic power in particular (Itō 2010: 356). This means that *Tetsuwan Atomu* is
the result of and not the reason for the positive image of robotics in Japan.

Cosima Wagner goes one step further in her text *Der Astro-Boy-Diskurs: Von
einer populärkulturellen Technikvision zum Roboterleitbild* (2011) and tries to
excavate the moments where *Tetsuwan Atomu* gets exploited in the sense that the
popularity of the comic is used to spread a positive image of robotics in society. She
cites the EXPO 1970 in Ōsaka as an example, where Tezuka was asked to design
three playful and entertaining robots for the visitors that should demonstrate the
peaceful co-existence between man and machine. This shows that these images of
robots are politically controlled and are not reflecting a certain attitude in society, as
it is often claimed. These can also be seen in the many popular publications in Japan

on robotics, where the playful characters not only demonstrate aspects of robotic science, but indirectly communicate certain sets of values, like those of the traditional Japanese family system (Wagner 2011: 8-9). Similar to the *karakuri ningyō,* the popularity of *Tetsuwan Atomu* was not constant and had to be reanimated in 2003, the fictive year of birth of the character. Major newspapers like the *Asahi Shinbun* 朝日新聞 picked up the story and asked for a pursuit of the *Tetsuwan Atomu*-dream, condemning the militaristic use of robot technology outside of Japan. For Wagner this is a perfect example of 'cultural engineering' as the postwar spirit of the affirmation of science and technology gets rejuvenated through *Tetsuwan Atomu* (Wagner 2011: 10).

Another interesting example presented by Wagner is a text she found in a catalogue of the *Nihon Kokuritsu Kagaku Hakubutsukan* 日本国立科学博物館 (Science Museum of Japan). According to this publication, *Tetsuwan Atomu* incorporates the spirit of being born on Japanese soil and being impacted by the climate and the unique geographical position. Furthermore he stands in the tradition of animism and the 'mechanical puppets' (*karakuri ningyō).* The story itself is not futuristic, but displays 'the pathos of the robot' (ロボットという物の哀れ; *robotto to iu mono no aware*), and the illustration is in the tradition of the *ukiyo-e* 浮世絵 painting (Wagner 2007: 12). This short description in the exhibition catalogue can be read as a 'best of *nihonron*', where Japan's 'unique' geographical position is cited as the reason for its seemingly 'unique' psyche that becomes visible in 'unique' aesthetic ideals. At this very moment the Japanoid is coming into existence, a robot between fact and fiction that is different from all the other robots: because he is Japanese.

Besides the *karakuri ningyō* and *Tetsuwan Atomu*, religion is often used to construct a Japanese robotophilia. Buddhism and Shintō both have animistic elements that are often taken out of their context and appropriated. Of course, there are examples that try to stay objective, and one of them is the text *Naze nihonjin ni wa robotto arerugī ga nai no ka* なぜ日本人にはロボットアレルギーがないのか (*Why the Japanese Have no Allergy Against Robots*) (1983) by Yamamoto Shichihei 山本七平 (1921–1991) that was published in an issue devoted to robots in the magazine *Gendai no esupurī* 現代のエスプリー. Nevertheless, Yamamoto also fails to avoid a dichotomy between a holistic West and Japan when he contrasts the Christian theology of creation against the neo-Confucian teachings of Zhu Xi, which were popular with the samurai class of the Edo-era and also compatible with the materialistic view of the elites of the Meiji-era (Yamamoto 1983: 136-143). While Yamamoto uses a lot of sources to underscore his claim, the factual influence on contemporary robotics remains unclear. Other Japanese sources are not so objective, as we see with the analysis of Kawamura Koichi's 川村晃一 article from the *Oriental Economist* (1983). Kawamura argues that Buddhism and Shintō were the main factors that allowed Japanese society to embrace robotics and accept them 'like the sword to protect them from enemies or catastrophies' (Kawamura 1983, cited in

Schodt 1988:195). Most of the arguments that cite Shintō as an influence follow one
of the two patterns: they either create a dichotomy, where a Western fear of robots is
opposed to the Japanese view, or they fabricate an image of Japan that relies on
stereotypical depictions. An objective analysis of the influence of religion on tech-
nology in the case of robots and Japan remains a challenging, and maybe therefore
until now unfulfilled task.

Robots and Gender

The American Japanologist Jennifer Robertson published two texts on robots and
Japan, namely *Gendering Humanoid Robots: Robo-Sexism in Japan* (2010) and
Robo Sapiens Japanicus: Humanoid Robots and the Posthuman Family (2007). As
both of these titles indicate, she has a very critical view on the integration of robot
technology in Japanese society. Quoting Donna Haraway's *Cyborg Manifesto*
(1985) as a major influence, Robertson's research is concerned with the reconstruc-
tion of gender through robots and their performative role in society. Contrary to
Haraway's ideas, Robertson states that the connection between body and gender is
reinforced by these robots and therefore conservative values are re-established rather
than diminished.

During her fieldwork in Japan between 2007 and 2008 Robertson conducted in-
terviews with bureaucrats, engineers, and academics, mainly on the topic of the
boom of care- and household-robots. She discovered that a common explanation of
Japanese researchers for the growing market for these robots was the stereotype that
Japanese people would prefer humanoid robots to migrant workers. Especially in the
field of geriatric care, robots would not establish a cultural gap or, in the case of
Asian migrants, evoke war memories (Robertson 2010: 8-10). For Robertson, the
robot becomes a tool to enforce the ideology of ethnic homogeneity and the 'Japa-
nese robot', as Robertson sees it integrated into Japanese society, becomes a conser-
vative way to handle the topic of immigration, or in other words, to try to com-
pletely avoid it.

Another aspect Robertson deals with is the sexually determined division of la-
bour as portrayed by the predominantly male robot engineers through their designs.
For Robertson it would be natural that women with jobs of robotic nature, like the
infamous elevator girls in department stores, would be replaced with real robots. She
confronted some Japanese engineers with this idea, and most of them considered this
idea 'typically Western' and were amused by it rather than concerned. For Robert-
son this shows the backwardness of the usage of robot technology in Japanese
society. On the one hand, humanoid robots are preferred to migrant workers, espe-
cially in the fields of child and elderly care, on the other hand typically female roles
like receptionist and the aforementioned elevator girl are expected to be executed by

women, no matter how easy it would be to replace them with robots. Both tendencies indicate for Robertson that robots are used to enforce conservative values through gender and racial stereotyping (Robertson 2010: 7). As we will see, Robertson shows that this process can happen unconsciously but can also be controlled by an elite.

For Robertson an example for unconscious stereotyping would be the prototype *Actroid Repliée* by Ishiguro Hiroshi, where not only the shaping of the body of the robot duplicates and potentiates stereotypical images, but also the design of the voice perpetuates the idea of a gendered way to speak Japanese. The high-pitched voice of the *Actroid Repliée* confirms a constructed cultural norm, which has nothing to do with the everyday tongue of Japanese females. Yet, the robot is unconsciously used to replicate and reinforce this aspect of the idea of Japanese femininity not only in its appearance, but also in its performative role in society.

Picture 5 *Actroid Repliée* greeting the visitors at a robot-exhibition.

Source: http://www.businessinsider.com/the-sexiest-robots-2013-10?op=1, accessed July 7, 2015

The image above is a screenshot taken from a video, which shows the *Actroid Repliée* at a Robot-Fair, where it used to greet the visitors. According to Robertson the robot not only greeted the customers, but also proceeded to warn them in a cheeky voice that they should not touch its upper body, as even for a robot this would be sexual harassment. For Robertson this is a prime example of how the objectification of women is reproduced through actual objects, namely robots. Whether this display of femininity is a specific Japanese phenomenon remains unanswered. Robertson assumes that the engineers designing the robot maximise all

the elements that let the robot appear as feminine as possible for the presumably predominantly male visitors (Robertson 2010: 10).

An example of robot-technology that is consciously used to nourish a traditional-istic ideology is the government-funded campaign *Innovation25* that actively promotes robots as solutions to problems of contemporary Japanese society. For Robertson *Innovation25* is a prime example of the usage of advanced technology in preserving traditional and/or conservative values. Contrary to Haraway's thoughts, these new technologies are not used to transcend ethnocentrism, sexism or paternalism but paradoxically to preserve them (Robertson 2010: 28).

In her analysis of the 'posthuman family' Robertson uses the original material by *Innovation25* to show the Japanese governments' vision of a future with robots. Part of the material published by the government consists of a graphic novel that describes the life of a family in the future. This family is called 'Inobe', a pun on the Japanese word for innovation, and consists of a heterosexual couple, a son, a daughter, the parents of the father and a male-gendered household robot. The wife has the closest relationship with the robot, for it is used as a surrogate housewife. For Robertson this is an attempt to reinstall the traditional, virilocal family system of Japan, where the robot's prime function is to free the wife from her duties, making her willing to bear children (Robertson 2007: 382-383). Here it becomes evident that the robot is used as a way to stop the current trend of the childless, nuclear family in Japan: it seems that the utopian qualities of new technology are used to preserve conservative values, not only in aspects of gender but society in general.

Robertson's critique continues as she analyses the illustrations that accompany the text. The wife prepares the breakfast in a pink apron, and although she is working from home she is also the one responsible for the household. The robot seems to only be there to help her fulfil her role. The father, though working as a freelancer, is never shown to do any chores. At this point, Robertson's interpretation of the gender aspects of these narratives of robotics becomes a bit far-fetched, but the publication of the graphic novel was criticised by the Japanese public as well and has been called a 'twenty year old science-fiction-story' (Robertson 2007: 379–390).

Science-fiction or not, Robertson seems convinced that we are witnesses to a process she calls *gijutsuteki sakoku* 技術的鎖国, a technological isolation, hinting at the isolation policy of the Tokugawa era. She writes that the Japanese government is the first that tries to organise society around robot technology, to compensate the problems of a declining birth rate and an over aging society without relying on immigration (Robertson 2007: 391). Robertson's generalised suspicion of Japanese robotics being chauvinistic as a whole aside, the concept of *gijutsuteki sakoku* provides an interesting perspective from which to observe the recent technological developments in Japan.

Conclusion

The present paper points out numerous links between discourses on robots in Japan and national identity. The highly complex interaction of factors such as history, religion, culture, and politics with technology and the role of this interaction in pertaining a Japanese identity make the robot an interesting subject of study. The influence of technology through culture and vice versa poses intriguing questions, especially in times of globalisation, which seem to be bundled in the appearance of the Japanese post-industrial robot.

This paper aims at understanding the robot not solely as a main acteur in the Japanese self-perception through technology, but also aims to establish a cross reference between the technological discourse and discourse about national identity. The image of Japan is being constructed through the interplay of inside and outside, self and foreign. The stereotype of Japan as a country with a special—conspicuously positive—attitude towards robots obstinately remains in the non-critical discourse even though no evidence for a unique affinity can be named. Still, those arguments are being held together mainly by three factors: a general affinity towards robots conceived in Japanese everyday culture (in particular *Tetsuwan Atomu*); a (dubious) connection between present day tendencies in robotic research and traditional Japanese technology (such as the case of *karakuri ningyō*); and lastly the influence of religion—where the complex situation created by the co-existence of Shintō and Buddhism is often oversimplified and instrumentalised. The three abovementioned factors are being utilised in order to create the image of Japan as the 'Robot Kingdom'.

Through the robot, Japan is imagined as a place in the future, creating a techno-orientalistic identity. In these visions of Japan's future the contemporary currents and problems of Japanese society become mirrored: declining birth rates and an over-aging population, and the ambivalent position towards migration. This so-called reactionary postmodernity, where new technology is used to reinstate old values, creates a Japan between science-fiction and reality. Globalisation accelerated through technology and the self-assertion of identity through culture create the framework through which the Japanese robot can be identified. It remains an exciting task to compare the actual development of robotics in Japan and its integration into society with the predictions and visions of the various voices of this discourse. I hope that the material I presented in this paper can be useful as a basis for this venture.

LIST OF ABBREVIATIONS

AIBO	Artificial Intelligence Robot, homonymous with aibō 相棒 'pal' or 'partner' in Japanese is a series of robotic pets designed and manufactured by Sony, starting in 1998.
ASIMO	Advanced Step in Innovative Mobility is a humanoid robot, designed and developed by Honda in 2000.
JIRA	Japanese Industrial Robot Association
RIA	Robot Institute of America

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GLOSSARY

aibō	相棒	'pal' or 'partner'
Amaterasu / Amaterasu-ōmikami	天照大神	a part of the Japanese myth cycle and also a major deity of the Shintō religion; Goddess of the sun and also the universe
Anime	アニメ	Japanese animated movies
Asahi Shinbun	朝日新聞	a large Japanese newspaper and publishing company
Edo jidai	江戸時代	Edo or Tokugawa period between 1603 and 1868 when Japanese society was under the rule of the Tokugawa shogunate and the country's 300 regional Daimyo. The period was characterised by economic growth, strict social order, isolationist foreign policies, and popular enjoyment of arts and culture
Garapagosu-ka	ガラパゴス化	'turning into Galapagos', an evolution that is free from influence of the outside
Gendai no esupuri	現代のエスプリー	a Japanese popular scientific journal
Gijutsu-shi	技術史	one of the first publications on the history of technology in Japan published in 1940
gijutsuteki sakoku	技術的鎖国	literally: 'closing the country with technology'
Ishiguro Hiroshi	石黒浩	robot engineer (b. 1963)
Itō Kenji	伊藤憲二	author
kabuki	歌舞伎	traditional Japanese theatre form
karakuri ningyō	絡繰り人形	Japanese mechanised puppets or automata, originally made from the seventeenth century to the nineteenth century
Kawamura Kōichi	川村晃一	scholar
manga	漫画	Japanese comic books
Meiji ishin	明治維新	Meiji Restoration; chain of events that restored practical imperial rule to Japan in 1868 under Emperor Meiji.
monozukuri	物作り	literally 'making things' with an emphasis on 'Japanese ways' of production/invention
Mori Masahiro	森政弘	author (b. 1927)
nihon kagaku-gijutsu-shi	日本科学技術史	an encyclopedia from 1962
Nihon Kokuritsu Kagaku Hakubutsukan	日本国立科学博物館	Science Museum of Japan

nihonron	日本論	literally 'theories/discussions about Japan and the Japanese'; the discourse on Japanese national and cultural identity
Pokémon	ポケモン	name of a video game
robotto toiu mono no aware	ロボットという物の哀れ	'the pathos of the robot'
rōnin	浪人	a samurai with no lord or master during the feudal period (1185–1868)
Shintō	神道	indigenous religion of Japan
Tetsuwan Atomu	鉄腕アトム	Astro Boy; title of a Japanese manga series written and illustrated by Tezuka Osamu from 1952 to 1968
Tezuka Osamu	手塚治虫	comics author; creator of Tetsuwan Atomu (1928–1989)
tennō	天皇	Japanese emperor
Tokugawa jidai	徳川時代	Tokugawa Era, see Edo Era
ukiyo-e	浮世絵"	'pictures of the floating world', art genre of woodblock prints and paintings
Wakon yōsai	和魂洋才	Japanese spirit and Western technology
Umetani Yōji	梅谷陽二	scientist (b. 1932)
Yamamoto Shichihei	山本七平	author (1921–1991)