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The Warm Welcome of the Japanese Cyborg

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Profits or Prestige

"Just what do you think you're doing, Dave?" asked the chilling, disembodied voice of HAL as his human passenger sought to disable him in the classic Stanley Kubrick film *2001: A Space Odyssey*. This is a good question, not just for one computer defending itself but for a vast array of artificial beings which have been created only to be destroyed before they could replace humans in a long tradition of Western plays, novels, and films. Does such fictional combat relieve a universal anxiety that besets all post-Fordist societies or is it a therapy for some unique fear specific to a given country? To answer this we will examine the Japanese case because the prevailing notion is that the Japanese people have been exceptionally accepting of technology's alliance with humans. This paper will seek to determine if it is true that the Japanese more readily incorporate machines into their bodies and if so, why? The major technologies to be explored are robotics, entertainment media, Internet, eugenics, body modification, and drugs.

Japan is now an undisputable leader in the robotics industry. Possible reasons for its dominance are that the field supplies practice, economic advantage, prestige (both national and corporate), special benefits for supporters, or psychological support. It is also feasible that religion and/or media have instilled a desire for robots in the Japanese people. Frederik Schodt outlines many of these reasons with his book *Inside the Robot Kingdom: Japan, Mechatronics, and the Coming Robotopia*. The most facile explanation is that robots are the logical next step in any economy and that the Japanese merely managed to catch on to this truth quicker than others. There is a history of Japanese companies insisting on buying ideas but manufacturing the product

locally, and this belief that the increasing reliance of Americans and others on an information economy is a mistake may have caused them to invest more heavily in factory production. Following this reasoning, robots are clearly better investments than workers on the assembly line and thus the outcome was inevitable. While they are still quite expensive investments, their consistency allows for a type of quality control and planning which appeals greatly to companies which prefer to save money on storage by precisely fine-tuning their schedules so that they only have to keep a few days of material on site at any time. There are also specific environments in which a robot is irrefutably more suitable than fragile and flawed humans. Some circuitry is so delicate that it cannot withstand the effluvia of human skin, and human skin is too delicate to handle nuclear waste and volcanic conditions. Still, direct labor costs in Japan and America are only 5-10% of expenses so is it really efficient to use costly robots to replace them? (170) The lack of correlation between labor costs and robot investment, as evidenced by the heavy spending in Korea despite wages being only 1/6th of those in Japan, obligates us to look farther than economic necessity for an explanation (182).

The government agreed with the importance of robots and pushed to include them within its strategy of gijutsu rikkoku, or "building the state with technology", that has been necessary because Japan is resource poor (Schodt, 43). The Japan Industrial Robot Association, the first organization of its kind in the world, strove to promote robots in all industries; MITI even created the Mechatronics and Technopolis tax programs as incentives. Robots have accumulated a symbolic meaning, however, which is often more powerful than profits. The superior machines which American forces used to overcome them in World War II became a marker of what would be needed to catch up to Western powers. The link between government and commercial utilization of this marker for prestige can be best seen in the strategic location of the impressively automated Fanuc headquarters. Set at the foot of Japan's most recognizable symbol of identity, Mt. Fuji, the factory has been used to impress potential investors as well as foreign

dignitaries. Margaret Thatcher was so struck by the sight that once she returned to Britain she urged her country to immediately begin emulation (134). There is also a strong parallel in the way that Japan Industrial Standards stretches the definition of robot so that Japan can achieve a higher per-capita ranking in the world and the way that companies vie for similar but domestic awards. Technicians at Casio beamed with pride when their No. 5 factory won the "prestigious Nikkei Award for implementation of a flexible manufacturing system" and it is a humorous but still accurate joke that the best way for under-funded academic laboratories to get money is to pit their corporate sponsors against each other in some face-jeopardizing competition between robots (46).

An instructive case study for company use of robots as symbols is the much-publicized Asimo developed by Honda. Honda spent vast resources making an anthropomorphic robot, something telling in and of itself, but it is most important to focus on which parts of humanity Honda chose to spend the majority of its time perfecting- its opposable thumb and its bipedal motion. Why was the thumb given so much attention? Not to allow it the advantage in manipulating tools that we gained after millions of years of evolution, but rather to allow it to give better handshakes. And it is hard to say that this was money poorly spent, for Asimo has given hundreds of hearty handshakes as an ambassador for the company. The other trait most sought for Asimo is the ability to walk and run like a human. Masato Hirose, an engineer from Honda interviewed for 7 News about new advances, stressed that "Asimo's run was more human than what was achieved by a smaller robot from…Sony" (Yuri Kageyama, 2004). This proud comment brings the competition between Japanese companies into the open. It must be noted that there are sometimes very important reasons to mimic the motion already used by animals we can observe in nature. There is a reason that animals have evolved their various modes of conveyance; it is often incredibly efficient. In this case, however, it is clear that this efficiency was not the motivating reason for Honda. Bipedal motion is extraordinarily difficult to replicate and brings with it needless complications when engineers had

only to look to dogs or automobiles to find easier ideas. Luckily for us, the very name of Asimo carries a clue for why Honda went to such efforts. Asimo plays off a pun both of Isaac Asimov, the canonical science-fiction writer, and of "ashi', the Japanese word for leg. We have already seen why human legs are so important, and the fact that Japanese conceptions of what is possible and desirable from their technology is so heavily influenced by science-fiction will be examined shortly in this paper.

Competing to develop robots that can perform seemingly impracticable tasks does serve another purpose other than securing recognition; it allows companies to get valuable practice in employing technology that will later find lucrative uses. Yamazki of Tomy company gives both of these reasons for producing the Omnibot. "We don't ignore the profit factor, but one reason we make toy robots is symbolic. They are also one of the best vehicles for the application of new technologies" (106). Besides winning an award and the resulting publicity for their advanced product, Tomy helped out its electronic company connections by trying out some their newest lines of research. The mystery of millions of yen going into bipedal robot research, such as Sony's QRIO, becomes clearer if it is seen as a long-term investment. Professor Yukio Hasegawa conjectures that Japanese companies are able to embark on such farseeing projects because they don't have to "report corporate performance to the Securities Exchange Commission every quarter" and because their managers stay put longer (114). The real mystery, however, is not why commissions and managers allow such projects but why the average worker puts up with them.

American unions are vociferous opponents of robotization, so how can Japanese companies so frictionlessly introduce automated manipulating arms, let alone mobile humanoid robots? One basic reason is that the Japanese workers are not afraid of losing their jobs. They believe that they are protected with lifetime employment and that if they become unnecessary in one area they will just be transferred to another department, a conservation far less common in countries where specialization is demanded.

Japanese companies also take prudent precautions before introducing new projects. For example, a Ricoh plant distributed brochures and a video which reassured that "technology is for human beings, not the reverse" (154). Robots sometimes give an emotional benefit to humans, for instance by alleviating the need to do mind-numbing repetitive tasks and thus freeing workers to focus on more creative projects. On the other side of this coin is a newspaper article entitled "The Isolation Syndrome of Automation" that brings up a detrimental side-effect; it uses the term "technostress" to describe the feeling of loneliness that many workers were feeling after having their coworkers replaced by robots (163). To minimize such side-effects, an historic Robot Agreement was signed in which Nissan agreed to consult its union before any major changes. Even with this protection, it would be inaccurate to say that Japan's workers are free from robot anxiety. Women and seasonal workers are much harder hit than the elite workers with lifetime employment and revolutionary communist groups like Kakamura have been quick to take up their cause. When the national JR lines laid off thousands of workers due to automation, there were a string of violent attacks and suicides. Yet such outbreaks are rare; more common is the harmony American roboticist Joseph Engelberger describes with disbelief: "they were there on their coffee break, polishing the things… they were proud to be able to go home and say they knew how to program the things" (117). They may have been "the things" to Engelberger, but they were named and befriended by the Japanese workers.

The opposition from American unions, epitomized by the 1972 worker riot which led to the violent destruction of General Motors spot-welding robots in Ohio, is reminiscent of the radical Luddites who rampaged through England during the Industrial Revolution. An alternative to current structural economic reasons for Japan's acceptance of robots is that they lack a similarly troubled history with technology. While Western workers were used like guinea pigs in all sorts of automation experiments, the Japanese were introduced to it much later once many of the safety and efficiency problems had been ironed out. European technology was relentlessly advanced in the search for

greater precision and understanding through complex gears and models of human behavior while Japan's history with robots is far more whimsical. Roboticist Ichiro Kato compares early works, such as the famous 17th century doll that could deliver tea a fixed distance and then walk/wheel back, to an art form such as Noh theatre instead of a scientific experiment (65).

Media

Is it possible that the theatre or other media might have prepared the Japanese mind for robots? The Czechoslovakian play R.U.R. in which Karel Capek coined the word robot surely had some impact when it ran in Tokyo, but it is probably the newspaper reviews which had the most influence over public opinion. Even when an unscripted disaster occurred, namely the first reported robot-caused death (of Kenji Urata in 1981), the newspapers kept firm control over any rumors. Even though the communist press tried to spread this obviously newsworthy story, it was "ignored for half a year by Japan's mainstream press, presumably to avoid embarrassing the industrial establishment" (Schodt, 164).

In Japan, robotic violence is explored openly, almost obsessively in anime, film, and manga. Cyborgs and giant fighting robots are ubiquitous characters in these voraciously consumed products and it will be worthwhile to examine what purpose they serve. Though the constant battles may seem at best pointless and at worst violence-inducing, I contend that they serve as much needed therapy for children facing a postmodern world. Anne Allison points to a similar benefit from *Robocop* in her article "Cyborg Violence: Bursting and Borders with Queer Machines". Explaining why it is premature for pundits to implicate violent images for causing youth violence, she extols the positive effect of dismemberment and reconstruction in battles by saying, "Playing with cyborgs encourages not only an attitude of flexibility towards an increasingly heterogeneous and fluctuating world, but also a willingness to conceive the world, and one's place in it, as blended rather than anchored to singular and hegemonic essences" (257).

The complex transformations that robot warriors go through before battle probably do prepare Japanese teens for a world in which they will be called upon to struggle in a variety of fragmented roles. There is always difficulty, however, separating emotional and artistic reasons from economic ones. For instance, Nagai admits that he created the combining robots of *Getta Robotto* because, "The toy companies said they needed more characters in each story so they could sell more toys." (Schodt, 84).

When I called Sony to interview the head of student relations, Thomas Apicerno, I noticed a similar blurring of reasons. Mr. Apicerno at first explained that Japan was involved in robotics because, "It is just business. It's a world-wide evolution" but he later displays the strong influence of media on policy. "Remember the Jetsons? That is what we are trying to do, and shows like that help us and the people envision the things that are to come." (2005 Telephone Interview) *The Jetsons* and its glittering vision have long been replaced in America by more popular, darker imaginings of dystopias, but the influence of that bright vision has not faded away entirely in Japan.

More mature animes are often beyond toy tie-ins and so the emotional gratification they give may be a clearer basis for their success. *Texhnolyze*, a 2003 noir series by Madhouse Productions focuses almost entirely on a young man's struggle to incorporate prosthetic limbs and neurons into his body. There is terrible violence against others, yes, but the most important struggle is that of the hero with his new self; his lessons about trusting his mechanical arm are readily applicable to teenagers who are struggling with changing bodies and to people who are frustrated by computers which have become at once both invaluable extensions of their bodies and new vulnerabilities.

There is a sustained androgyny in *Texhnolyze* that is so prevalent in anime that it is only logical to investigate whether it serves a purpose as a coping mechanism similar to the violence discussed by Anne Allison. The hero, even while struggling to forge a settlement between the human and machine parts of his body, must navigate a world bereft of all of the gender cues that normally help us effortlessly

divide the world up into two sexes. People he encounters are mixes of feminine eyes and male voices, masculine aggression and feminine gaits, and every other conceivable combination. This is only a slight exaggeration of the direction that most modern societies are headed after gender has been deconstructed. Teenagers are no longer able to rely on clothing, hair length, or even makeup to determine the sex of their peers and so anime serves to train them for the more nimble categorization they will need to do. Technology's incursion into the sexual realm of Japan is older than gender studies however. While crusading knights were fitting their wives with chastity belts and the Victorians were issuing hundreds of patents for devices to keep libido in check, the Japanese unashamedly employed wide varieties of tools for sexual play. The current widespread use of cellphones in Japan to flirt with virtual women then seems like a natural extension of historically accepted masturbation tools, and the frequent depictions of men falling into lust with androids appears to be a reasonable projection of the future.

And it is a future not far off, as Tatsuya Matsui recently developed a "supermodel bot" named Palette which "can strike glamorous poses" to show of clothing. Though there is no actual sexual contact with the robot, its distinctly feminine curves are certainly intended to arouse interest in perspective buyers. At the same time that robots are being molded into sexual forms, people are molding themselves into more desirable configurations with surgical technology. It would be unsound to point to the high number of plastic surgery procedures in Japan as an indication by itself of a unique cultural acceptance. According to a 2004 study by the International Society of Aesthetic Plastic Surgery, Japan is ranked 10th in the world with only 17,227 procedures a year (less than a third of those in the United States even when corrected for population). The salient difference is not the numbers but the way that Japan and China have welcomed surgery without embarrassment and indeed sometimes with pride. China recently hosted the first ever Miss Plastic Surgery contest with a stated aim to allow society to understand and accept women who have chosen to transform their looks with cosmetic surgery. Japan was implicitly acknowledged as the real root of this new

acceptance because the winner received "a free fact-finding trip to cosmetic surgery salons in Japan" (*China Daily* article, "China braces for first Miss Plastic Surgery", 12/17/2004). There has been much scandal in America over women perceived as "fake", and even though there is no official ban on surgical beautifications, there is certainly no encouragement for it. American Pageant spokeswoman Mary Hilliard McMillan made this clear by refusing to fully stand by a contestant beset by scandal and issuing the statement, "We have absolutely no rules about plastic surgery, it's not something that we encourage, but we don't have any rules banning it" (Bob Kostanczuk, "Scandals temporarily mar pageant memories for some participants").

We should look to the origins of the robot manga, to one of the founding father of anime, Osamu Tezuka, to determine whether robots were the cause or the consequence of a unique Japanese attitude. His creation *Atom Boy* is the immensely popular tale of an eccentric scientist who creates an artificial boy to replace the son he lost to a traffic accident. Dr. Nagamiya Tenma's grief is one which everyone can understand (though his methods of dealing with it appear somewhat outlandish) for automobiles allow us to extend our social networks immensly but can also serve as coffins and weapons. Astro Boy projects an optimistic future for man-machine relations by succeeding in his quest to establish a harmony with his creators. His childlike body and wide, innocent eyes do much to dispel the fear of mankind's replacement. It was not that Tezuka originally intend this effect and then later tried to convince a publisher that it would appeal to readers. Rather, his extensive knowledge of the limitations of contemporary research moved him to create a more cynical story mocking the grandeous claims of science but this was modified because, "In the days after the war, the publishers wanted me to stress a peaceful future, where Japanese science and technology were advanced and nuclear power was used for peaceful purposes" (Schodt, 76).

The idea of resurrecting a loved one with the aid of machines is a part of the wider realization that technology feeds off of humans even as it helps them, in the manner of a

vampire. The connection between vampirism and technological danger in vampire literature is not without support, for in her article *Vampiric Typewriting: Dracula and Its Media*, Jennifer Wicke advances the theory that Dracula was a symbol for the invasion of media in the modern world. Media is used to combat Dracula and to sustain him. Mina Harker aids the battle of the Crew of Light by constructing a coherent narrative out of diaries, newspapers, and the new-fangled phonograph. Yet we are warned that information pathways can often be two-way when Mina establishes her dangerous psychic link with Dracula, releasing a flow that corrupts her while allowing her to track his movements. A question that springs to mind then is whether the Japanese have a similar expression of vampirism in their fiction to deal with this tension.

One example may be another of Tezuka's works, the Phoenix series. In *Phoenix: Resurrection*, the main character Leon is brought back to life as a robot after crashing in a flying car. It turns out that this is no accident, for it is his family which planned his death because they believe he is hoarding the key to immortal blood from the mystical Phoenix. This vampirism is no longer necessary, however, as the Phoenix explains, "But think, Leon. You were brought back to life even though you didn't drink my blood. The science of mankind can now restore life to any creature! There is no longer any need for my blood." This is difficult to interpret but I believe that the message for readers is that soon our relationship with technology will move from parasitic to synergistic. Louis Kaplan notes in her article *Walter Rathenau's Media Technological Turn as Mediated through W. Hartenau's "Die Resurrection Co." An Essay at Resurrection* that media can be vampiric because it continuously uses our energy to revive the past. The audience must exert effort in order to interprete signals from history and keep them alive. Anime such as *Doraemon* display a belief that our relationship with machines can be a more healthy symbiosis. In *Doraemon*, a lovable robot is sent back in time to aid an ancestor so that he can in turn improve the future of his descendents.

If there is any doubt that vampiric machines have an effect not just upon Japanese nightmares or films, but upon the direction of their research, we can look at a Tokyo project covered in an article by IOL, the largest news website in South Africa. ("New fuel cell opens way for artificial hearts", May 13, 2005). Matsuhiko Nishizawa led a team of scientists to develop a fuel cell which can literally feed off of blood by syphoning in glucose as it passes through the body. A description of one of its potential uses stands as a perfect symbol for the man-machine symbiosis. The fuel cell is inteded to monitor its human host to assure healthy blood sugar levels even as it feeds off of the sugar of its host body.

It is possible to spot the anxiety and tentative optimism discussed above in films by Japanese directors; here the movies *Casshern* by Kazuaki Kiriya and *Avalon* by Mamoru Oshii will be used as representative examples. *Casshern* is a visually stunning film that pauses for long, silent moments in the glow of machines which frequently replace human dialogue with their hum. While the machines in this future world are incredibly powerful, they retain many of the trappings of older technology. To get the viewer to focus on the ubiquitous presence of this technology, there are lasers with bulky gears, airships with unwieldy propellers, and robotic soldiers with superfluous tubes. This is obviously a poor projection of what the future will be like, for the trend is in exactly the opposite direction, towards sleek ipods and electronic notepads which can camouflage to fit seamlessly into human life. It is exactly the seam between man and technology that Kiriya is concerned with; the plot of his movie revolves around a desperate scientist who is searching for a way to integrate "neo-cells" with human cells in time to save his degenerating wife. In a Frankenstein-esque moment, the neo-cells are animated by a bolt of lightning and droves of neo-humans begin to stumble naked out of the vats. Most are brutally exterminated but a few manage to escape and stew in their bitterness until they can plot revenge against the human race. The only one who is able to defeat these cyborg Furies is a man who forges a comfortable bond with a suit of incredibly helpful robotic armor. The lesson here seems to be that we must learn to cooperate with our technology while we still have the chance, for efforts to

suppress or ignore it will only lead to disaster. The unfortunate inhabitants of the world of *Casshern* could not benefit from this lesson because they were wiped out by a doomsday device.

Avalon is another movie replete with gorgeous shots, but Oshii's purpose is not merely the indulgence of the audience's desire for special effects. By portraying the normal life of the heroine as unbearably drab in juxtaposition with the virtual world that she competes in, a ray of optimism is allowed into dark predictions of the future. This prophecy is compelling because it projects a realistic decline in living standards, symbolized by the crowded and grotesque mess halls, crumbling apartments, and pale citizens, but tempers this with the idea that the technology which leads to this also offers an escape from the ravished natural world. The last plot twist on a game level called "Real", in which it is confirmed that the enemy of the heroine is taking his stand over a fake world, loses its importance as this revelation is overwhelmed by the undeniably beautiful opera issuing from singers of this "fake" world.

Though not as strong as the trend in anime and film, Japanese literature has a strong science fiction tradition and so this survey would not be complete without looking at two acclaimed writers, Shinichi Hoshi and Kobe Abe. Hoshi's book of short stories, *The Spiteful Planet*, contains so many insights and lessons that I will reluctantly but necessarily limit myself to three common themes: the illusion of progress, the perfect machine and the flawed human, and the sameness of man and machine.

"The Present Age" is the most obvious story about the impossibility of real progress. A time-capsule is launched into a long decaying orbit and when it does come back earth is at exactly the same point in history. The original launching society collapsed like all those before it and so the earthlings are bewildered by the familiarity of the objects inside, showing that though technology appears to be constantly advancing there is only crushing centripetal force and cyclical history. "Progress" takes up this same idea, though here the more apropos image is that of an asymptote

instead of a circle. In this story, families send their robots to work for them but now have to spend all of their time programming and maintaining them. Instead of getting to enjoy the free time created by their tools they must squander hours reading books about how to get their robot promoted. This is a trap that people in advanced nations like Japan can understand; the way that each new kitchen appliance requires more maintenance time or each new computer program requires new training. Appliances appear as manacles again in "The Spiteful Planet". Colonists try to settle on a new planet but are plagued by the need for the luxuries of home. Every new resource that they bring over only creates more desires and problems until they are forced to go home in defeat. "Enthusiasm" chips away at the idea of progress in a more subtle manner. In the course of the story, travel technology does indeed advance but the intentions of those humans who inherit each new generation of space ships changes. Thus, while greater speed is available, it is impossible for continuous expansion because each new pilot flies in a different direction.

From this idea of well-made spaceships forced into zigs and zags by human will, we begin to see the second important theme for Hoshi, that of human error and machine perfection. "Fine Tuning" forces us to stop and first consider whether the problems that we complain about in our tools aren't really signs of a flaw within our selves. A man becomes frustrated when his robot, fresh from a tuning at the robot shop, keeps dragging its proverbial and metal feet before following an order. Each time he wants it to do something it stalls and finally it becomes apparent that the robot is waiting until it receives an order three times. It actually saves the man some time because in the time that the robot is stalling he often changes his mind. In the end, the robot suggests that the man go in for a tuning to correct his capriciousness. This viewpoint suggests to the Japanese that they should worry about improving themselves before fearing robots. "The Wild Robot" has a similarly resolved mystery; a robot is designed to go berserk periodically to keep its owner's wits and body in shape. As a technician explains, "Therefore, this one is far better for humanity." "Emergency Landing" even suggests that mystery and the

challenges that our technology creates are vital to a healthy life. A man crashes on a barren planet and is going insane with boredom until he finds an intriguing canister with strange goo inside. After months of testing it and trying to unlock its secrets, he is finally rescued and told that the canister was planted on purpose by the government to help shipwrecked humans maintain their sanity. Those who call for a return to simpler times then are forgetting that humans thrive on all the complexities created by their machines. It is more difficult to pin down Hoshi's lesson in "The Universal Evaluator". A man is granted an amazing device which can tell the exact value of everything and goes on to use this to acquire a vast trading empire. However, in the end he loses his pride when he realizes that previous measures of himself where inaccurate because if someone else uses the device on him while he has empty hands he comes out as worthless. This is most probably an admonition to realize that it is really our science which makes us the rulers of our planet, but it could be a farcical critique of the way that human life is being short-changed.

Lastly, Hoshi questions the idea of whether we can even easily separate tools from humans in order to criticize them. "The Difference" eerily explores this from the mind of a psychologist whose new patient is in shock after the arrival of the husband that she had given up for dead. Even though the reader is privy to the psychologist's thoughts, we can sense nothing amiss. Yet, when it is revealed that the husband is a replacement android placed back into the dead husband's life by the insurance agency in order to avoid payment, we learn that the psychologist too was replaced long ago. It is shocking at first, but then we feel foolish for caring about this difference when we could not tell man and machine apart even from the inside.

Kobe Abe's novel *Inter Ice Age 4* asks the difficult question of whether we in the present have the moral right to judge the cyborgs of the future. Professor Katsumi struggles along with the reader to answer this question as he works on a machine to predict the future. At first, Katsumi is able to calmly accept the aid of his machine and happily admit: "It seemed that the forecaster possessed powers beyond my

imagination. It was not unexpected that the child should surprise the parent, that the student should best the teacher" (25). He is proud to collaborate with his creation and appreciates the new abilities that their synergy allows. There is a faint undertone of claustrophobia as the professor begins to perceive his limited role in the new future, but he is still joyful enough to exclaim, "I was now a cog in the machine. All of the reports sent in were to be fed directly to it. They would be automatically classified and memorized, and so my role was simply to respond to the machine's signals, assisting as I was instructed. I was nonetheless proud of my part. For it was I myself and no one else who would give the machine its capacities. You are an enlarged extension of me, I said to it with satisfaction, a part of me magnified" (44). As he becomes embroiled in a murder mystery and a seemingly endless obstacle course that frustrates all of his suggestions to the government, he realizes that he has lost control. He finds that a secret organization, comprised of some of his own trusted staff, has been buying unwanted fetuses and engineering them for life under the water. The final explanation for this is given to Katsumi by his own voice, for the machine now contains his personality and has been giving orders in his stead. After predicting the imminent flooding of the entire world, his machine-self has been organizing the creation of a new race of aquatic humans. The human Katsumi is killed in the end because his machine-self knows that he will not be able to handle this future and will try and condemn it by stirring panic.

The new aquans do not have tear ducts and their emotions are quite alien from their land-living ancestors. If this novel fit into the Western tradition of novels like *A Brave New World,* in which the new emotions nurtured by science are condemned as artificial and inferior to the feelings of natural man, then the reader would be expected here to lament the loss of tears from human experience. Abe, however, adds a careful postscript to his novel to dissuade readers from just this knee-jerk reaction. He explains that he wanted readers only to face the frightening idea that the future exists, "beyond the abyss that separates it from the present, beyond the value judgments of the present" (226).

We have no right to protest against the new humans that our technology will inevitably create, we can only accept them as lovable but unfathomable children. Just as we would not heed the opprobrium of Medieval humans over our new coexistence with ipods and pacemakers, we cannot judge humans of the next century with metal bodies or silicon brain implants.

Are robots for the elderly in Japan?

A robot helper is just what is needed in Japan to alleviate the burden of a growing elderly population. Declining birthrates since the 1950s are bringing the proportion of retired citizens to unsustainable levels with current healthcare policy (Nakamura and Wada, 2). It is exactly this problem which is stressed in the closing line of an article describing a new robot companion for the elderly: “Japan's birth rate hit an all time low of 1.29 children per woman in 2003” (Yahoo News). The robot introduced is a cuddly astronaut named Snuggling Ifbot, and it is designed to speak to lonely retirees at the level of a five year old in order to keep their brains stimulated enough to stave off degenerative diseases like Alzheimer’s. Even before the Snuggling Ifbot hit the stores, the company had 128 pre-launch orders, but there is little thought to brining it to America. “Its makers plan to program the robot in English -- not for export, but to teach the language to Japanese children”. The elderly in America have traditionally been far too uncomfortable with new technologies to allow something like the Ifbot into their homes. In fact, in America only one-fifth of those age 65 and older surveyed had ever gone online looking for health information (Lade).

Japan’s aging population is a serious concern, but even though it is frequently mentioned in articles about Japanese robotics, it is often more fantastical visions which come through as the most important motivations for research. In an article entitled, “Japan unveils ‘robot suit’ that enhances human power”, we see that two out of seven paragraphs are devoted to explaining the perceived historical reason for the research, “Japan has seen a growing market for technology geared toward the elderly, who are making up an increasing

chunk of the population as fewer younger Japanese choose to start families" (AFP, June 7, 2005). The suit, which detects the electrical impulses of muscles and then amplifies them many-fold, can certainly be used to allow seniors full mobility in their aging bodies, but this is not what those actually working on the project are most excited about. As with the Asimo, the name is an important clue, for it is called HAL-5 in obvious homage to the notorious artificial intelligence which began this paper. In addition, the leader of the project, Yoshiyuki Sankai, gushes exuberantly that "Humans may be able to mutate into supermen in the near future". The prospect of recuperating ailing humans is not nearly as exciting for the Tsukuba University engineers who are looking towards a future when humans transcend their genetic limitations.

Lipservice given to the idea of robots as help for the elderly is extremely common; so many projects are couched in this explanation that one must wonder if there is a deep-seated psychological reason that it must be continuously invoked. The lengths to which people will stretch to cite the elderly as their motivation are made abundantly clear in an article "Shall we dance? Robots offer a hand on the ballroom floor" (BakuToday.net, June, 5, 2005). The Partner Ballroom Dance Robot has the face of a woman and the ability to interpret human touch and to anticipate movement so that it can accompany its partner in formal dances. Its three wheels do not give it the precision or grace of a human dancer but it is free from the clumsy jerks usually associated with robotic mimicry. The practical applications of this robot are extremely limited, which is why I chose it as an example. Even though the logical use of a robot dancer would be as an instructor and practice partner for those who can't find a fellow human willing to have their toes stepped on to further the arts, this capacity is not mentioned in the article. Instead, Kazuhiro Kosuge, the professor who headed the PBDR project, talks exclusively about the way that the techniques they learned could be applied to aiding Japan's aging population. The reporter relays that, "Kosuge said good caregivers needed, like PBDR, to be able to guess what the elderly want them to do using the limited information available" and that such responsiveness will be invaluable

for “important tasks such as holding a hand out before an elderly person stumbles.” Following this is the obligatory citing of population statistics and mention of Japan’s impending demographic crisis. It is possible that this happens so often for a uninteresting reason, for example that reporters are lazy and copy past articles or that readers have short attention-spans and want simple explanations, but I think it just as likely that both researchers and the Japanese public are uneasy thinking about the ways that machines are filling gaps in their own lives. It is easier to point to the way that a machine could aid the degenerating mind or body of an old person than to admit that technology is such a crucial part of their own lives that they would be handicapped without it. This may seem like an exaggeration but it would already be reasonable to say that someone without a cellphone is not a completely functioning member of society in Japan and that some of the younger generation would not even be fully literate without word processors to suggest kanji for them. Thus researchers are far more comfortable talking of the dancing robot as a step towards helping the disabled than admitting that many normal people just might need a machine to guide them through something as primal as dancing.

Deus Ex Machina

The vampire in Japan is defeated with robots instead of crosses and holy water, and so it is germane to examine the differing effects of Christian and Buddhist/Shinto traditions. Christian societies are often held by a fear that creating other beings is a blasphemous encroachment on the Ultimate Creator, and their sense of a unique connection with that God is preserved by maintaining a Manichean distinction between soulful and soulless. Buddhism, and more heavily Shinto, teach that all objects have souls, from the most simple animals to inanimate objects. This is an idea which is intentionally reinforced by the Japanese. Dr. Inaba, head of the Fanuc factory mentioned above, is as tough minded a leader as they come but even he welcomes the divine help not only of Mount Fuji but also two Buddhist deities and local fox god alongside his machines and workers. (Schodt, 195).

We must be careful to distinguish orthodoxy from orthopraxy. Joseph Engelberger reports that he observed "Two Shinto priests…blessing the robots and blessing the general manager and blessing me, with garlands of flowers around the robots" but it seems that this was done more because of novelty than spirituality. A few years later such rituals were almost nonexistent and workers had given up naming their "fellow workers" because there were too many to keep track of (Schodt, 196). Proceeding with caution then we can still find some truly substantial religious influence on fundamental robotics ideology. Masahiro Mori, an unorthodox but highly influential researcher, believes that aspects of Buddha can be found in all robots and that the interconnectiveness of their parts explains the nature of the universe. This is not simply romantic talk, serious thought and money has gone into founding the Mukta Institute on Buddhist principles. A member of the think tank gives one tenant of their philosophy: "To comprehend the soul of a robot, and to understand its potential and limitations, we must think of it as a friend" (209). Everything at the Mukta Institute, from architecture to metallurgy, is infused with this mixture of science and traditional religion. There is a clock with no hands boggling the mind like a Zen puzzle in the main meeting room and an ancient forging technique for katanas was adapted to strengthen the robot arm of Mr. AROS (210, 217). Another member of the Mukta Institute insists that things like the clock are not decoration but integral parts of their research: "You really can't make a good robot without chanting the scriptures" (210).

It is conceivable that religion is not so much working together with technology as being replaced by it. The quite permeable membrane of Japanese polytheism has led Professor Chumaru Koyama to surmise that, "we are actually substituting science for the old type of religion" (202). Marilyn Ivy gives a glimpse of this replacement in *Discourses of the Vanishing*. When the town of Tono tries to become both a utopia and a home of folklore, a city planner discusses preparing for tourists and says revealingly, "There's nothing to see there now- just a pond. We want to make it more mysterious, create an atmosphere where it will seem like a real kappa will jump out of the water- maybe

even have a robot kappa" (117). Water spirits no longer have to be constantly maintained through the telling of stories for they can be seen now incarnated in metal. Ivy notices a similar phenomenon among pilgrims to an sooty holy site, "During the five days of the festival I witnessed, rarely was an actual priest on hand; usually tape-recorded sutras took the place of the priest's voice" (152). Early examples of this trend are described by Schodt, for instance the use of mechanical dolls in religious processions in towns like Takayama (64).

It is immensely important to be aware of the way that science has been taking over the historic role of religion and to take into account the lingering effects that this transition has on Japan even now. We can see this specifically in the way that the belief in namazu (giant catfish which were thought to live deep beneath the earth and disturb it with their turning) continues in the public imagination. There was a strong emotional need for some explanation for the unpredictable and massive destruction which intermittently wrecked cities. The world-shakers were still feared but they were not hated like malicious monsters or unthinkingly chaotic powers, for it was believed that they served a purpose in restoring the natural balance. In fact, city-dwellers began to view themselves as the problem for so dramatically altering their land. "According to Miyata Noboru, among the residents of Edo there was a growing sense of foreboding during the nineteenth century because many regarded the creation of massive cities like Edo and Osaka to be contrary to the laws of nature" (*Topics in Japanese Cultural History*). Fantastical modern stories about Japan sinking, from millennial prophesy to popular and bluntly named novels such as *Japan Sinks*, seem to work out the same guilt and fear. Interestingly, namazu are often joyously painted as redistributers of wealth and it seems that earthquakes, while always dangerous, may have been viewed differently according to social class. While the wealthy property owners soaked most of the financial damage, the poor laborers had their pockets and workday filled with all the reconstruction (*Topics in Japanese Cultural History)*.

The legendary tie between catfish and earthquakes has not been forgotten because the fear is as acute as ever. Not only do temples still conduct a ritual to hold the namazu in place but researchers in Japan are attempting to find a scientific link. "Rikitake also cites the work of Hatai and Abe (1932) in which the behavior of catfish in fish tanks was studied. The researchers did not find noticeable change in catfish behavior due to an impending earthquake alone, however, they did find that the catfish responded differently to a person tapping on the fish tank depending on if an earthquake was about to happen. If an earthquake was about to happen, the catfish reacted very nervously to tapping on the tank, if no earthquake was approaching then the catfish would barely stir when the tank was tapped" (Wilson, *Earthquake Prediction: Methodology and Feasibility*). The legend here is obscuring many flaws such as human inconstancy which could have biased the experiment.

Puppets and Automatons

The concept of the namazu came from a much earlier Chinese belief in earthquake-inducing dragons. During the 18th century these dragons were forgotten in favor of the more familiar catfish, but it is imperative that we not forget this origin in our investigation. If we are to claim that ancient cultural attributes have brought the Japanese to accept robots then we must ultimately look at China, the root of their culture in everything from writing system to religion. Why is modern Chinese society not home to such tight man-machine integration if it shares much of the same cultural history? By looking back to the Tang dynasty, a period in which an immense amount of cultural information was transmitted between the two countries, I think that we will find that the historical roots of Japan's technological situation look less unique.

One clue tracing back to the machines of China can be found by looking through a beautifully illustrated guide for an art exhibit in London, entitled *Karakuri Ningyo: An Exhibition of Ancient Festival Robots From Japan* (London, Barbican Art Gallery, 1985).

Karakuri Ningyoo are a type of puppet still popular in Japan that usually accompany floats during processions and were probably first used in "representing humans in their supplications to the gods" (7). The etymological clue for a Chinese origin is that the most common form of puppet, named karako, contained the character kara from the word for the T'ang dynasty. These karako, with their strange hairstyles and round faces, were exotic marvels to the citizens of Edo (8). To further support this, the Konjaku Monogatari tells us that based on a story that the Chinese had used a mechanical man to water their crops, "in the year 850, the imperial prince Kooyooin ordered the construction of a mechanical device in human form to water paddy fields. Known as mizugoi ningyoo…" (11). It is unclear, and probably very unlikely, that this robot was ever made to work, but it is clear that the T'ang did have real expertise with similar devices which they transferred to the Japanese along with the stories and excitement necessary to spur their development. Perhaps here we can find the first examples of the robots role in prestige negotiations. As mentioned above, modern companies often compete against each other to produce useless but impressive robots, and the Japanese Emperor was no exception. How could he allow the Chinese Emperor to have a machine that he did not?

The Chinese Emperor, as early as the fifth century BCE, was using a mechanical doll to help him continuously face south as was considered proper. This doll was suspended on a tall poll atop a cart which followed any procession and it pointed in the correct direction without magnets as most compasses used but rather by relying on expertly crafted cog wheels. Chinese immigrant Chiyuu reportedly delivered the first model of this cog compass, called a shinan-sha, to the Japanese "Emperor in the years 666 AD" (11). Later, sophisticated clock-making skills were brought to the country by foreigners, which greatly accelerated "the development of the karakuri ningyoo and we can see here the roots of Japan's technological achievements of the twentieth century" (12). The festival guide admits that there are multiple possible reasons for "the transformation from simple dolls to moving puppets", such as the powerful impression of the daimyoos' expensive mechanical gifts, but

it clearly believes that the most likely explanation is that "the contemporary thirst for the new technological wonders, such as clocks, led to the idea that puppets might also be made to move" (13).

Is it possible that the causative chain that *An Exhibition of Ancient Festival Robots From Japan* creates should actually be reversed? There is certainly a correlation between clock and karakuri ningyoo technology, but it is not a simple matter to tease out which one, if either, first fueled the other. This ambiguity in history can be found in one of the most important steps towards Japan's technological development; not an engineering technique or scientific principle at all but rather a new way to record and teach the knowledge that was already acquired. The Karakuri Zui, "Japan's first mechanical design handbook", was published in 1796 with precise illustrations and instructions for building machines. Unfortunately for this investigation, though most assuredly not for historians and readers in general, the beautiful illustrations are of both clocks and karakuri ningyoo so this will not tell us which first spurred the growth of the other.

The second point of correlation to be examined is a geographic one; both clocks and karakuri ningyoo flourished first and most strongly in the city of Nagoya. Tsuda Sukezaemon made the first Japanese clock there in 1598 while the first dashi karakuri was forged later in 1620. This establishes at least the chronological preeminence of the clock, but because there is only a 22 year difference I do not feel comfortable taking this as conclusive evidence. The fame that came to Nagoya because of their puppets was so great (they even awed the few resident Dutch along with thousands of tourists) that they could easily have been what drove the leading edge of technology in the drive to further impress (12).

What is fascinating for our cyborg discussion is that what was most important to the Japanese was not really the engineering of complicated automatons, but rather the *appearance* that machines alone were responsible for the motion of their puppets. An impressive apparatus called a zenmai, filled to bursting with pointlessly rotating cogs and

other superfluous gadgets, was often placed prominently on the chariot next to the puppet. While the zenmai was sometimes a laudable example of craftsmanship as well as showmanship, it was the puppeteers who adroitly pulled the strings from their hidden compartment who deserve the true praise. The puppeteers, called ningyoo-kata, are usually men who learned the difficult technique in a long chain of parent-son lessons, and they repay their ancestors by maintaining and cleaning the puppets as well as operating them. Just operating them is a monumental task; consider the amount of control necessary to perform even the easiest technique, ito ayatsuri, which involves the use of silk strings. "To allow a doll to walk backwards and forwards, turn round and perform a variety of complex movements, over twenty strings and four to five manipulators may be needed" (8).

If it takes five men to move one diminutive puppet, one must ask for what purpose this inefficient man-machine dance is done. To this end, we will look at three of the arguably most popular acts which puppets are made to perform: actions which are impossibly difficult for humans to carry out, fantastic transformations of the human form, and mundane tasks. A prime example of the impossibly difficult performance can be found in the Gonowari chariot for the town of Toda. The lead role is given to a daring puppet called the ayawatari karako, which swings from bar to bar with what seems like the greatest of ease. "As it moves the karako appears almost to be flying" (33). The cooperation between the karako and its manipulators is a celebration of the way that technology can expand the boundaries of human ability, even while acknowledging the fact that such an alliance required immense effort on their part. The Edo Japanese were well aware that their machines were inefficient, their ships took hundreds of laborers to mimic what a fish did naturally for example, but just the idea that they were no longer strictly bound by human limitations must have been a heady thought.

Dramatic transformation is also an important act in the puppet's repertoire. The shoojoo puppet made for the Rikijin-sha chariot in the 19th century uses this act in a dramatic fashion to please the crowds. At first the puppet appears to

be an innocent child, holding a fan and dancing merrily. Then, when one of its whirling steps has its back to the audience, a hidden compartment in its chest is opened and a startling red mask is donned. The new being is a shoojoo, a legendary Chinese beast distinguished by its passion for alcohol. A similar performance is made on the Ryuujin-tai chariot for the spring festival. A scene based on the *noo* play *Chikubujima* is enacted using three karakuri ningyoo. An innocent orphan boy finds an old man lying by the road and takes it upon himself to look after him. The old man, as ungrateful as he is mean, drinks every waking minute and continues to lash out violently. When the child finds out that the old man is really a dragon god, he tries to dump the old man on a deserted island in a big vase but the old man realizes what is happening and "the vase suddenly reveals the ryuujin, twice as tall as the vase, with red face and tangled hair" (48). More significant than the obvious entertainment value, I believe that this metamorphosis serves a function similar to the way that robot violence and transforming toys help the youth of Japan today. While the blurring of gender lines and the body/machine border are the anxieties most in need of relief now, one of the most frightening transformations for earlier Japanese must have been the sudden change from sober to drunk. The transition from a jovial man sipping sake to an obnoxious, raging drunk can be disturbingly sudden and unpredictable, and so the chariot performance might perform a valuable social service by preparing audience members for the change.

One reason why it seems likely that karakuri ningyoo served a vital purpose is the resilience the tradition showed in surviving to the present day. After the Meiji Restoration, militaristic pressures dampened the festivals, and "during World War II more than 80 percent of the chariots were destroyed by fire" (13). And yet, the tradition has perennially been renewed and "today there are 181 chariots containing 421 kinds of karakuri ningyoo taking part in festivals in 50 place" (13). In addition, "Even when the Tokugawa government banned festivals throughout Japan, the festivals of the Nagoya area were still able to continue" (9).

Tang China and the Root of the Japanese-Machine Relationship

The cyberneticist Andy Clark brought to the often wild speculation about the future marriage of man and machine the sobering argument that this union was already consummated in the deepest history of our species, leaving us quite ready to handle the computer age. I would like to try and locate the "natural-born cyborgs" whose existence Clark extrapolates by reaching back to Tang China and looking for any evidence of technology's importance in human life. I will show that the Chinese who lived in this era already had a relationship with the tools they used to navigate time and space that was approaching the tight bond between Japanese teenagers and their cellphones. Though many of these technologies drift from the scientific principles that we now operate by into the realm of magic, they share deeper principles guiding the way that humans ever strive for mastery over their environment. In the end I hope to get the reader to agree with Clarke when he said:

Certainly I don't think this tendency toward cognitive hybridization is a modern development. Rather, it is an aspect of our humanity, which is as basic and ancient as the use of speech and which has been extending its territory ever since. We see some of the 'cognitive fossil trail' of the cyborg trait in the historical procession of potent cognitive technologies that begins with speech and counting, morphs first into written text and numerals, then into early printing (without moveable typefaces), on to the revolutions of moveable typefaces and the printing press, and most recently to the digital encodings that bring text, sound, and image into a uniform and widely transmissible format (4).

It is difficult for each generation to fully examine the technologies which have been most deeply integrated into their lives, precisely because these technologies have become so thoroughly incorporated. It is in the transitional moments when technology can be viewed with the greatest perspective; it is those people who traveled both before and after the mass production of the automobile who could best illuminate the existential difference. There are other ways to

gain perspective, of course, such as looking back through the centuries, as historians must. In addition to this, I would like to utilize the perspective gained when making a spatial transition, specifically the move from Japan to China. To this end, the largest single primary source to be used will be the diary of the itinerant Buddhist monk Ennin, who made the arduous journey in the late 9th century. It is hoped that his eye will note those things which the Chinese would not have found noteworthy and that his choice of what and how often to record will indicate the importance he placed on such observations.

The first fecund part of Ennin's diary is his account of the voyage that he embarks on with a group of four dubiously sea-worthy vessels heading off from Japan. It is immediately apparent that communication was a perennial problem on any journey far from familiar land; "there was much shouting back and forth" because of the near-impossibility of carrying conversation along the chain of ships (Reischauer's translation of Ennin, 16). If the human voice is frail, the mind is not, and Ennin describes messages being carried over the waves with drums. "All night drums were beaten. It is the custom of this land to have watchmen who, when night comes, beat drums in order to guard government property" (17). It is not clear why watchmen on land would need drums to guard (perhaps to periodically report to superiors that all was safe), but their use in coordinating vessels, which frequently drifted far apart, is obvious. When both drums and vocal cords are unable to compete with the crashing waves, signal fires are employed. The importance of these fires can be gleaned from the way that Ennin compares them to the stars which have been the guides of sailors for long ages: "At 10 P.M. the ships were in contact by fire signals, which were like stars in appearance"(3). The separation of a ship at dawn gives further evidence for the acute reliance on fire, for when it is found again by its flame there is an almost mystically ecstatic joy shared by the crew: "far to the west we saw the light of a fire. The men faced toward it, and there was none but did rejoice. Throughout the night we gazed at it. We saw no mountains or islands, but only the light of the fire" (7).

The concept of stars as guides brings to light one of many points at which the divide between science and magic has been worn thin- namely the blurry blending of astronomy and astrology which persists even into the 21st century. When Ennin sees a comet on the twenty-second day of his journey, he is informed by Shen Pien that, "When comets appear, the nation greatly declines and meets with military disturbances" (47). What is most fascinating about the prophesy that unfolds is that it actually relies on sophisticated measurements to link together comet-induced disasters. "Previously, on the night of the twenty-third day of the third moon of the night year of Yuan-ho, a comet appeared in the east, and in the tenth moon of that year there was, accordingly, a revolt of the Ministers…" (47). This measurement is so reliable that Dr. Dorrit Hoffleit has been able to identify the sighting as Halley's comet.

The drive to measure and catalogue the natural world formed a solid base for Tang technology. The sky was carefully monitored, allowing Ennin to witness a winter solstice celebration- "Moving by degrees, the sun has reached its southern extremity", but the earth and sea were measured just as vigorously (58). When limping across the ocean after a vicious storm, safe anchorage is found as they "proceeded haltingly, measuring [the depth of] our course with poles" (112). Water is measured not only as a thing to be traversed but as a resource to be consumed. When their ship is battered mercilessly across the sea and no human effort seems capable of controlling it, the crew is still able to painstakingly ration water according to rank and thus recover at least a modicum of agency (115). While distances over land were sometimes stretched and exaggerated, whether by Ennin's sources or his own sloppiness, there was a clear sense of the restrictions space could impose on human movement. Everywhere the Japanese embassy turns it is confronted by government restrictions on their travel. Ennin is rebuffed over and over in his attempts to visit a distant temple, because, as one rejection letter patiently explains, "It is a long way from Yang-chou to T'ai-chou, and, if the monks were to go there, it is felt that they would not be back in time for the date of your departure" (86). Ennin struggles ceaselessly against this restraint, understandable

for one who has risked his life to cross the wild and retrieve the Word of Buddha (though his frequent lying pushes the bounds of what is acceptably "efficacious" under religious auspices), but he is thwarted for months by obstinate officials. It is not this obstinacy which is noteworthy, for bureaucracy has long sought to approximate the viscosity of molasses, but rather the impressive way that officials far-removed are able to keep such tight control over the movements of outsiders. Through the adroit and liberal use of paper, a post service, and human agents the demographic technique of Tang officials was truly developed. They were not only able to extend their control across the empire but also into the marketplace. Ennin notes that the buying and selling of copper was banned because the government needed to leave some for minting instead of allowing it all to drain into copper utensils. The seriousness of these metal injunctions is frighteningly displayed when a Japanese monks gets arrested for selling iron which he didn't realize was prohibited (48-49). The grand markets in Chang'an were the most extensively regulated, having carefully specified quality assurance and operating hours, but even in remote village markets there are monitors. Ennin's notes also reveal that these remote markets had measuring devices which were meticulously employed: "The market determined the weight to be one large ounce and seven…" (44).

How aware were Tang citizens of both the crucial role of technology in their lives and the paradoxical way that it inevitably constrained human activities even as it expanded them? The case for the heavy reliance on technology will continue to unfold in this paper, but here a succinctly demonstrative piece of evidence should be mentioned. Chinese monks describe for Ennin a holy stretch of days in which "no smoke is produced throughout the empire, and only cold food is eaten" (81). The fact that smoke is given up as the chosen symbol of religious sacrifice certifies that this sign of human industry was highly appreciated and that its absence would be immediately noticeable. It is probably too late for a similar holiday to have any effect in today's smog-chocked cities, but in the Tang the contrast between the pollution of the industrious and the nostalgically primitive was still high.

Ennin certainly enjoyed his fair share of warm food and would have only reluctantly given up fire for a holy day, but he understood too the way that seemingly wonderful innovations could create new problems. For example, the transportation system in China was quite advanced and allowed the embassy to bring tons of invaluable equipment and gifts with them far in to the country, but this could lead to the previously inconceivable problem of getting stuck with more than one can carry in the middle of a journey. Ennin is forced to waste days stranded in the countryside while others help them "look for a baggage donkey, because there are no places that rent donkeys here" to help them transport all the gear that they have amassed (106). Ennin also mentions "an Imperial edict banning wheelbarrows throughout the land" which displayed concern over the damage that transportation technology could wreck on the environment and even the human spirit. "Since the Emperor believes in the teachings of the Taoist priests and wheelbarrows break up the middle of the road, he fears that the hearts of the Taoist priests might not be at ease" (385)". While this is in part the product of a deranged mind, probably poisoned by potions or poor nutrition, it does prove that the Tang were aware of the potentially deleterious marks which their technology was making on the landscape.

Technology imposed time constraints as well as spatial limitations. These can be explored by surveying Tang poetry for instances in which man-made devices are used to portray time as an oppressive and unstoppable force. Li Shang-yin's "Dragon Pool" uses the relentless beat of drums and the inexorable movements of a waterclock to contain the feaster's revelry:

the rams-hide drums play loudly,
all other musicians cease.
At midnight they come back from feasting,

The waterclock drips on—

The beat which underlies this poem would have been familiar to the denizens of Chang'an. Strict curfews were enforced at both the outer walls and the divisions between districts. Citizens out late were kept aware of the impending time limit by the dozens or sometimes hundreds of beats which were sounded to signal each closing time. These relentless drums must have become associated in many minds with the inexorable intrusion of time upon their enjoyment. There are times of course when it *seems* that time has slowed, when the party feels as if it can last forever, but with calendars, clocks, and drums everywhere committing men to strict schedules, such escape is only a deceitful mirage. Li Qi bemoans this in "Spending the Night at Reverend Ying's Meditation Cell and Hearing Sanskrit Recited"

Immortal Sanskrit sutras in the Precinct of Flowers
Too faint in the distance,
The moon shadowed by the high wall,
The water-clock's dripping slows
…
Now I realize that this life adrift
Has nowhere to stop and lodge

Here Li Qi notes that slowing the clock is only a momentary relief possible in the monastery, not something available to those who must travel out in the real world. The theme of time devices intruding upon a religious stasis is further addressed by Li He in "The King of Qin Drinks Wine". Here, gods and kings freeze the sun, rewind the moon, and reset the guard watch, but in the end the passage of time is still evident from the progress of human devices.

Xihe strikes the sun with her whip
…
past and present pacified
…
tipsy with ale he [the King of Qin] hoots at the moon
and makes it go backwards
…
at the palace gate the Watchman
announces the first watch of night.
…

From the immortals' candelabra
The waxy smoke is light,
At the clear zither, drunken eyes
Shed tears in floods

The King may send the moon backpedaling, but hoot as he will at candles there will only be so much light from the wick, and the wax will flow as surely as wrinkle-drenching tears for all of the lost years.

It may seem a stretch to some readers to argue that Tang citizens dwelled so heavily on the signs of time's passage made unavoidable by their machines, so I will pause here to give a sense of their obsession with elaborate time-telling devices. Edward Schafer shows us some of the most elegant of these in *The Golden Peaches of Samarkand; A Study of T'ang Exotics.*. He mentions that "A special form of the incense candle was the graduated candle" and uses to poet Yu Chien-wu to explain their use (Schafer, 160):

By burning incense we know the o'clock of the night,
With graduated candle we confirm the tally of the watches

Much more intricate were the "aromatic seals" which often drew as much attention as a courtier's personal seal. These aromatic seals were prepared by finely spreading powdered incense along a path leading between time-denoting characters. Once one set alight the beginning of the path it was difficult to take ones eyes from the flame as it marched steadily to the symbol of each period. Wang Chien sorrowfully describes the way that his machine's uncompromising progress left him depressed yet unable to turn away as it became clear his hoped-for rendezvous had turned to ash.

I sit at ease, burning a seal of incense;
It fills the doorway with breath of pine and thuja.
The fire is used up all round- and clear-cut now
Are the letters on that blue-mossed stele.

Chemical processes were far from the only clock design, for *Shorter Science and Civilization* notes that: "from Thang times onwards, official records also note the appearance of

other marvels, especially the arrival of clepsydrae (water-clocks) from the West, float clocks of a type familiar to the Chinese but with novel and complex striking mechanisms, many of which allowed golden balls to drop one by one into a receptacle to mark the passing hours, a design that seems to have been a continuation of an original Byzantine tradition."

Wang Wei too was preoccupied with the passage of time (though he marked its passage through the discoloration of hair not incense) and he states quite bluntly the futility of employing tools against time in "Sitting Alone on an Autumn Night":

I sit alone grieving for the hair at my temples…
This white hair will never change,

The golden elixir cannot be made

The golden elixir may not have ever been found, but the search, though it led through the claptrap of alchemy, brought the Chinese a long way towards sound tenants of chemistry. It is not enough to dismiss the deadly ironic Taoist use of cinnabar in longevity potions as an amusing misstep; the mistake must be viewed alongside the strides alchemists made with chemical taxonomies and experimentation. *Science and Technology in China* by Needham allows us to see the emergence of one of the most important vehicles for progress, the science book. This was "the first printing of a book on a scientific subject" recorded in the world, the culmination of a lifetime of work by the alchemist Hokan Chi (Volume 5 Part 3, page 167). Unfortunately this momentous book did not survive into the present age. but Fan Shu gives us a tantalizing account of it in his *Discussions with Friends at Cloudy Pool*.

It is worthwhile to ask why there are no extant copies of Hokan Chi's magnum opus; is this because it never became popular or perhaps due to the shoddy work of later historians? The best answer is that duplication technology had very low fidelity in Tang times. Kanji are not inherently of a lower fidelity than alphabetic systems, but copying anything by hand was at that time an arduous process with

expansive room for errors. There is a second reason for transmission oversights which becomes a more significant problem for poetry; collections of poetry were copied in a piecemeal fashion by admirers according to individual taste. Thus there were not only misplaced words but entire poems and anthologies that were left out by those who didn't feel inclined to copy them along with the rest. Proof that at least some Tang poets were aware of and concerned with flawed transmission lies in the preface to Bai Juyi's *New Yuefu*. Here, Bai Juyi is extremely careful to include a precise record of the structure of his work in the first line, a point before which even the most slothful or distractible of copiers would not have given up. By making clear that there are "9252 words in all, divided into fifty poems", all future versions could be checked for purity with speed and surety. Using this same device, I mentioned before this tangent that a reference to the first alchemical work did in fact exist and so forgetfulness cannot bring me to fail to faithfully reproduce a section of *Discussions with Friends at Cloudy Pool* here:

A certain minister named Hokan Chi had given more than fifteen years' arduous study to the preparation of the dragon-and-tiger elixir. When he was in charge to the right of the River, he sent invitations to a large number of magician-technicians. He also composed a 'Biography of Liu Hung' and had several thousand copies of it printed, which he sent out to all those who were devoting themselves to alchemy.

Clearly the networking of a scientific community and the distribution of texts was a great advancement. The fact that the specific information was almost uniformly false is overshadowed by the benefit that new methods of enquiry afforded. It is difficult to see the scientific method in convoluted explanations such as, "Now the Metal holds the Water within its womb. To keep the Water at ease one has to maintain the Metal. The Wood holds the Fire within its womb. The Water is needed to control the Fire. Hence the Water within lead answers to the same Water within mercury…", but there were in fact carefully run experiments during the Tang (Needham, 172). One such experiment was overseen by the Emperor himself to determine whether a

female alchemist in his court was a charlatan. He used the imperial seal to secure an envelope from tampering and then charged the alchemist with transmuting the contents within without the use of fire. Later, he further tests her by asking if she could strengthen the camphor that he liked to add to his wine. He stared attentively through the entire process and Needham says this was "a Chinese emperor watching what was essentially a Soxhlet continuous extraction process, the formation of a strong solution of camphor in hot alcohol" (170).

The emperor participated again, if not in person then in name, in another experiment in the field of biology. This was set in motion by a speech given by the Prefect Hon Yue to the crocodiles of the Hon Kong River. He ordered the crocodiles to leave for more suitable regions and gave them an ultimatum backed by the authority of the emperor. Hon Yue determined that the crocodiles may justly be killed if they don't relocate within the time limit because they are either possessed of an intellect sufficient to understand the command and thus defying the Emperor or are bereft of spiritual intelligence and thus are not protected in the moral order. While it has been argued that this was a tongue-in-cheek performance, the level of seriousness is really irrelevant for my endeavor to find evidence of the scientific method. Even if this was something of a joke, it derives its humor from the fact that the rigorous procedure which normally brought such reliable results could not be used to make sense of the fantastic claims of the emperor's power. Loyal revisionist historians later tried to obscure the issue by recording that the crocodiles left on schedule, but the challenge issued retains its importance because it began to test the hypothesis that the emperor held ultimate power over all sentient beings in his domain. This use of natural observation to challenge the establishment was in keeping with Taoist tradition. *Counter Culture Through the Ages* agrees with Joseph Needham that Taoists were the first scientists despite their often frenzied attacks on epistemology (Goffman and Joy, 75). This seems a stretch when one reads Lao-tzu's advice that the happy and wise, "enjoy the labor of their hands and don't waste time inventing labor-saving machines" but Alan Watts explains

the contradiction with his qualifying interpretation that, "what is important is to understand the winds, the tides, the currents, the seasons, and the principles of growth and decay… The Taoist attitude ia not opposed to technology per se… The point is that technology is destructive only in the hands of people who do not realize that they are one and the same process as the universe" (75). Seen this way, Taoists were actually in favor of embracing cyborg technologies instead of insisting on a fundamentally illusory distinction between man and machines.

"Any sufficiently advanced technology is indistinguishable from magic" spoke the astute writer Arthur C. Clark. Is it possible then that any sufficiently advanced magic is indistinguishable from technology? It most likely felt that way in the Tang when elaborate religious systems and magical rituals offered a powerful way to control or at least survive natural forces which must have seemed inscrutable and terrifying. Compared to the limited cartographic and navigation technologies available to Ennin on his sea voyage, magic was a potent alternative indeed. At one point they are so embattled by a storm that they are unable to tell the direction of the wind or even of their own ship with conventional means but they were able to still execute a very precise and comforting ritual to the Dragon-Kings. "In order to get a favorable wind, we arranged offerings of the five grains to the Dragon-Kings of the five directions in accordance with the Kanjoogyoo, and we recited scriptures and incantations" (114). There is no mention of any sailor with specialized navigation skills but the efforts of the resident diviner are given frequent attention. "They had the diviner divine upon it, and he called it China and then later said that it was Korea" (116). The tools of diving were not compasses or telescopes but rather mystically significant objects which could be read if one understood their language. A black bird is seen as a sign from the gods and a tortoise shell is burned to trace messages from the cracks that form (127, 130).

Religious texts were another tool which specialists (usually priests) could employ. Professor Stephen Owen of Harvard University once described Tantric Buddhism as a

technology because of the prescriptions it had for taking control of the mechanisms which were thought to underlie the universe. Kenneth Ch'en explains in *Buddhism in China* that this esoteric new import "involves a number of props, such as the mantras, mudraas, mandalas, and abhishekas" (327). Mantras are formulas for the precise combination of syllables that can produce extremely powerful magical effects if handled correctly, a skill which required just as much or more training than what was necessary for other technological professions such as blacksmithing or carpentry. Though less attention is paid to these more mundane professions, Ennin does mention the mythical sword which Kan Chiang of Wu forged. The fact that this name has been passed down with fidelity through centuries, that Ennin mentions it on two separate occasions, and that Ennin discounts the story of a fisherman finding a sword in favor of making that strangely named island Mo-yeh the place where Kan Chiang worked to forge it all point to the fact that artisans could gain fame (134, 142).

Nevertheless, few blacksmiths were invited to the Imperial Court while Tantric masters were often asked after personally by the emperor and sometimes valued so highly that they were held against their will to give a lifetime of service. The third Tantric master, Amoghavajra, fashioned a formula so powerful that in 758 it was presented to the emperor Su-tsung with the request that he always carry it with him on different parts of his body" (335). Not only was it dear enough to be kept in contact with divine skin, but the Emperor also ordered it to be inscribed on pillars throughout China and demanded a yearly accounting of how many times priests had recited it, bookkeeping which draws the image of religion as rational device quite clearly. A previous master, Shan-wu-wei, also stayed in Chang'an until his death and, "One of the occult powers that he possessed which was particularly valued by the emperor was his ability to pray for rain by uttering a Sanskrit formula of several hundred syllables" (334). With the supply lines for the teeming capital always tenuous, this must have been a most prized power.

As mentioned previously, these puissant mantras were only one of the tools available to the Tantric initiate. There

were kinesthetic formulas too, one to invoke each deity. For these, the caster used his own hands to form the secret signs. Mandalas operated like charts to help Buddhists navigate and even manipulate the great machine they were bound to. Ch'en explains that mandalas were not just beautiful art but were "really a diagram that shows the deities in their cosmic connections" (328). All of these tools are extremely significant because their use marks the first time that man was thought to have the power to manipulate the previously unalterable wheels of karma and rebirth. Under this new paradigm, one could commit immoral acts and then escape the consequences if adept enough with Tantric tools. Thus, one could shrewdly repeat mantras to improve the afterlife just as one could take medicine to improve life on earth. The fact that neither of these methods was effective should fade into the background as we focus on the way that cultures need to acquire such technologies in order to feel secure. Religions for millennia afterwards throughout the world used similar props (Christianity's use of Hail Mary's and indulgences for example) to fulfill a fundamental need.

We have succeeded in finding the natural-born cyborg in the Tang. There was a driving need to manipulate and measure space and time which brought about the use of everything from market scales to incense clocks, as well as a profound understanding of the way that these devices affected everyday life. Technology was appreciated for the new abilities it granted mankind but also scrutinized for the novel problems that it brought along with solutions; most importantly, whatever the moral connotation, technology was understood as a integral part of Tang life.

7. Return to Schodt

Schodt overreaches at times in striving to show the relation between robots and religion. He elevates quality control circles to a religion and thus criticizing them to a heresy simply by playing with the connotations of language instead of supplying evidence. Instead of seeing robot combat as a palliative for post-modern anxiety, he makes the unsupported claim that, "giant warrior robots are closer to

being an antidote for a deep-seated fear of elemental destruction, a high-tech version of the Nio…stand at the gates of Buddhist temples and protect the faithful from evil."

It is equally possible that technology is being used to bolster or attack religion instead of assimilating it, two alternate views found in a compilation of essays entitled *Japanese Cybercultures*. The Jehovah's Witnesses "have proudly availed themselves of the latest technology for the propagation of their message" and have both English and Japanese descriptions of many of their beliefs on a website (224). Members are not encouraged to use the Internet themselves, however, because it is one of the main causes of defection. There are as many detracting as supporting websites and there is even a counter group called *yoogoha* which provides an online forum for those who grew up with Witness parents to air their grievances. Seichoo no Ie, a native religion founded by Taniguchi Masaharu in 1930, has had more unambiguous success with a large group of horizontally connected websites under less strict control. The group "explicitly promotes the use of computer networks for both internal communication and external representation" (227). These two examples are far too little evidence to ascertain whether Japanese religions can capitalize on a synergistic alliance with technology any better than Western religions, so this paper must look farther to discover any unique uses of the Internet in Japan.

8. Marketing Innocuous Cyborg Technologies

The most striking difference between the Internet in Japan and America is not the quantity or content of sites but that the majority of Japanese are using their cellphones to surf it. This could be for very practical reasons, namely the ridiculously long commute that many employees have to battle boredom through and the fact that the state-owned infrastructure charges a high rate for using bandwidth. Alternatively, the carrying of the technology close to the body instead of using home computers could be the unique behavior we have been searching for. The constant modification and decoration of these phones through casings and personally picked graphics furthers the impression that the Japanese see these phones as extensions of their bodies.

They often have multiple separate phones, each "corresponding to different roles and personas" (27). There is even a phone addiction called *keitai-izon* with separation symptoms strangely similar to that of a phantom limb felt through proprioception. The tsunami of *kawaii* which indundated Japan with cute Hello Kitty graphics may be the way that otherwise lifeless artificial objects are easily incorporated into the body. "Techno-cute merges the two esthetics/ethics of cold , complicated contraptions, unfeeling objects, and serious efforts and labor, with war, understandable social relations, emotional connections, and playful times and leisure" (26).

Not everyone is going along with techno-cute advertising; a look at the "Tech Know" section of the online Japanese magazine *Metropolis* reveals the conflicted reactions to the machine invasion of charming. The review of a new robotic Hello Kitty displays very real anger and cynicism about any attempt to "upgrade" such a cherished figure. The reviewer snarls a mock apology for waiting a week to mention the product, saying that it just might be "because we don't like our beloved Kitty-chan being stuffed full of circuits and wires" (J Mark Lytle, 2005). The cry of abomination is quite strong and the reviewer predicts a price that will be "as *monstrous* as this hunk of plastic" (italics added for emphasis). Despite such vehemence, another article by the same reviewer on the same day displays an ambivalence in the protest. Video Eyewear, a pair of petite black glasses which use Liquid Crystal Displays to project images directly onto the user's eyes, is given the thumbs up and shown in a display photograph as just another cute accessory for a cute young Japanese girl. It is also important to note that in such a cool, fashion-conscious article the glasses are called something, "Trek fans have long dreamed of". Star Trek has come a long way from the quintessential symbol of geek-dom to a vision of desirable fashion.

There are many other technologies which seek to extend and modify the Japanese body, some less apparent than bulky robots on the factory floor. Vending machines sell an astounding amount of energy drinks to sustain busy city denizens. Also, despite many protestations that Japan

never experimented with eugenics, Jennifer Robertson throws an inescapable light on multiple projects in the early 20th century in her article "Japan's First Cyborg?: Miss Nippon, Eugenics, and Wartime Technologies of Beauty, Body, and Blood". Not only were the Japanese people encouraged into certain marriages in order to boost racial purity but in addition**,** "They were encouraged to think of their bodies as plastic, in the sense of being capable of being molded, and as adaptable, pliable, and transformable through new hygienic regimens of nutrition and physical exercise" (196). This brought with it a host of fears about such modifications coming back to haunt them which can be seen in current urban legends.

There is a widespread fear among students in Japan of a ghost that seeks revenge for the plastic surgery mistake that doomed her. There are multiple versions of this legend still circulating. A foreign teacher in Japan writes in her blog about the spread of panic in her school :

> *Quiet whisperings at first, I actually had several girl students crying. I sent them out of the room to be comforted by the Korean teachers. Here's the deal: Apparently, 20 years ago an urban legend was started somewhere in Japan and has moved into the minds of Korean youngsters. A female ghost, suffering from a botched cosmetic surgery job, kills young girls by stretching open their lips, into a wide distorted smile from eye to eye. Children's Day, May 5th, is supposed to be the birthday of this woman, and she only attacks young, beautiful girls. If you write the Chinese character for dog … you are protected from harm. As the story goes, the Red Mask is afraid of dogs.*

(The Second Layer, May 23, 2004, http://www.thesecondlayer.com/blog/2004_05_01_thesecondlayer_archive.html)

Another thread in a discussion about fear in Japan yields:

> *There **is** one about an old lady who wears a mask, but when she removes it (always in front of children walking home from school it, seems) she is found to have no mouth. She chases the children on foot at high speed (and, I believe) waving a knife. I've heard some say that this fear actually resulted in students needing to travel to school in groups or accompanied by adults*

(Japan Today Forum, http://forum.japantoday.com/m_143419/tm.htm)

The images of a woman with no mouth and the cosmetic surgery accident almost certainly have roots in much older traditional tales such as "The Wife Without a Mouth" (*Ancient Tales in Modern Japan*, No. 108). In this legend, a man's search for the ideal wife leads him to find someone who appears to have no mouth and thus no costly appetite. Too late he discovers that she has been hiding a demonic mouth which is perfectly suited for eating men as well as prodigious quantities of rice. The fear expressed here is that women who are forced to fit into molds of perfection by altering themselves can become anguished haunters. This was just as relevant for the painstaking preparations of Geisha long ago as it is for plastic surgery today.

8. Conclusion

In the end, while we may be unable to isolate the exact reason for Japan's acceptance of cyborg technologies, the sheer number of factors discussed above makes it clear that their attitude is exceptional rather than the only rational economic behavior. Whether there is a ghost in the machines or not, they certainly have room inside for a myriad of meanings. They are symbols of prestige, of spirituality, and of relief from the anxiety of post-modernism. The anxiety is not unique, but anime and manga embody distinctive solutions to the vampirism of technology and the past, and the therapeutic power of karakuri ningyoo shows that such views of technology were already forming centuries ago. The solution may be different because of everything from resource paucity, union cooperation, the absence of growing pains like the European Industrial Revolution, or Buddhism.

It will take another few decades of monitoring the spread of cyborg technologies in both Japan and other countries before some of these theories can be ruled out.

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