

In Japan, robots are people, too

By Jonathan Skillings

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In Japan, robots are more than mere gadgetry--they're practically family.

Unlike the U.S., where the icons of a dawning era of robots tend to be either the faceless, Frisbee-shaped, floor-scrubbing Roomba or the killing machines of the "Terminator" movies, the consensus on the other side of the Pacific tends toward cuddly animals and small children. It was Japan, after all, that gave the world the puppylike Aibo, the toddler-size Asimo and the cartoon figure of Astro Boy.

And it's Japan where the government is making a big push to have, within the next decade or so, a corps of nonthreatening robots ready to assist in office tasks, housekeeping and elder care. Colin Angle, the CEO of Roomba maker iRobot, cites estimates of [39 million household robots](#) there by the end of the decade.

In a new book called "[Loving the Machine: The Art and Science of Japanese Robotics](#)," journalist Timothy Hornyak delves into the reasons behind the country's fascination with friendly, humanoid machines. The roots stretch from 17th-century novelty items on through Japan's pacifist reaction to the atomic bomb blasts of World War II.

Hornyak, a Montreal native who's been in Japan since 1999, recently spoke with CNET News.com while traveling through New York to promote the book. He shared his observations on Japan's robot culture, past and present, and on the challenge of building his own robot. (To see a photo gallery of the robots mentioned in this interview, [click here](#).)

Q: The basic premise of your book is that there is something different about the way the Japanese approach robots. Do you want to elaborate on that to get us started?

Hornyak: There is a major difference in the way Japanese have approached robots. They are far more interested in making robots into partners for human beings. They are very successful at combining engineering and design in robotics. The result is that the robots, particularly the humanoids, end up seeming a lot more like living beings instead of just buckets of bolts. It's much easier to believe that they are coming to life, and it's much easier to have empathy for them--because they are so much like us, we feel a sort of irresistible urge. Japanese, particularly, feel an irresistible urge to treat them like fellow beings instead of just lifeless automatons.

Whereas in the U.S. or Europe there is a kind of Frankenstein tradition, where created beings are monsters or dangerous somehow.

Hornyak: That's right. Certainly philosophies in the U.S. and Europe regarding robots harken back to the old archetype of Mary Shelley's book--also, in the 1920s, Karel Capek and his play "R.U.R." in which robots are perfected as the ideal worker, but whoops, they go wonky and they kill every single human being on the planet except for one last guy. The net effect of this seems to be not only [wariness about robots coming to life](#), but you look at some of the robots here, and they are almost purposefully designed not to look humanoid.

In your book you talk about some of the ways that the Japanese relationship with robots developed. What is it in the traditional karakuri dolls that stands out, making them precursors of robots, a friendlier sort of device?

Hornyak: The karakuri dolls of the Edo period in Japan, 1600 to 1868, were specifically designed as automatons, entertainers. I mentioned in the book the example of the tea-serving doll, which was really a nifty conversation piece. If you were wealthy back then, you could receive a guest in your home, kneel down on the tatami mats with him, you would whip out your handy-dandy karakuri tea-serving doll, put a cup of tea on it, it would scoot over to the guest, he'd drain the cup and then it would autonomously not only stop, but it would do a 180 after the teacup is replaced on its tray and go back to the point it came from.

What is also really relevant to the robot tradition in Japan is the other form of karakuri, which are the stage or float karakuri. They look like Spanish galleons--they are just incredible, these wooden floats that are elaborately carved, being paraded throughout the town, and the puppet shows that are performed on these things. What's interesting is that the automatons seem to move by themselves under their own power, swinging through trapezes, doing elaborate somersaults and that kind of thing, doing costume changes. I saw these shows, and I was just amazed at how surprisingly independent and lifelike some of these



wooden dolls were.

Let's talk now about the modern stuff. You've said that the emphasis in Japan is on cuteness and entertainment, and one thing you point out in particular is the Paro robot, the seal, which is all about cuteness as far as I can tell--the Ifbot as well.

Hornyak: That's right. An important thing to understand about these kinds of robots is the demographic problem in Japan--the population is shrinking. One-third of people (are expected to be) over 60 by 2050, I believe, (in a country) with very low birth rates, very few immigrants, and so the net result is there are no workers coming in to fill the shortage in the work force. Engineering a solution to this in the form of robots is being embraced by not only the population, but the government.

I spoke to a roboticist the other day who said he was traveling in Northern Japan on a train and struck up a conversation with a lady who was over 60, and she asked him, "So what do you do?" and he said "I'm a roboticist." And she said, "Oh, I'm really looking forward to the time when robots are going to take care of me." That was just a random encounter on a train, and it shows you that the people are looking forward to it--some people are, anyway. Meanwhile, the government is making concrete plans to prepare for adding robot (caregivers) to the work force, in a nongovernmental consortium involving Tokyo University and seven companies. They have concrete plans to develop robots that by the year 2008, will be capable of straightening up rooms; by 2013, they will be able to make beds; and by 2016, they will be able to [lift and carry elderly patients](#).

Now, you mentioned Paro and Ifbot--the therapy and the companion robot, which are not able to do things like practical chores, but they are able to fulfill an emotional need. You read articles about lonely old widows who are living in farms out in the rural countryside of Japan--there was one lady who has an Ifbot, I believe, saying how happy she is, because when she comes home from the field late at night she can chat with her Ifbot and it makes her feel good. Paro has been shown, meanwhile, to fulfill a need of reducing stress in patients and old folks homes. The important thing to understand about this aspect of robots in Japan is that not only do Japanese have a love of robots, they have a practical need of robots.

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So the government is taking a leading role, actually trying to make this development happen.

Hornyak: Absolutely. Japan's Ministry of Economy, Trade and Industry has recently set aside \$17 million to support the development of intelligent robots that can make their own decisions in the workplace. It wants to advance artificial intelligence technologies so that these robots can be introduced into the marketplace by--2015, I think, is their goal. Meanwhile, [the government is basically legislating](#) (a variation on) [Asimov's three laws of robotics](#). Robots will have to have obstacle sensors to be able to see if they're going to hit anyone. They're going to have to have soft materials on their exterior so that if they do impact with a human they won't damage that person excessively. And No. 3, they want to have prominent kill switches on the robot, like a really big off button, so you can just slam that and the robot will stop from treading on your foot. These are going to be aimed at robots in the workplace and robots in living spaces, too.

Do you have a sense of how many household robots are there in Japan?

Hornyak: The [number of household robots](#) remains low, but it's expected to grow like crazy. One of the biggest chunks of that would be [Sony's Aibo robot](#), which sold over 200,000 units, mainly in Japan.

And there's a whole Aibo culture, correct? Aibo clubs and things like that?

Hornyak: Aibo clubs--oh yeah. (Some owners) document their lives with their Aibo robots in excruciating detail, really, and they post all kinds of photos of their Aibos. They bake birthday cakes for their Aibos when they turn a certain age, they bring Aibo to visit grandma, they take photos of Aibo and their little baby on the floor together. They dress their Aibos up in wigs, in cute little dolly clothes, they bring their Aibos on dates to Tokyo Disneyland.

Aibo is a story of how much Japanese are really willing to embrace household robots and accept them as members of their own family. When Aibo was terminated earlier this year there was a hue and cry, but as far as I know, Sony is not inclined to reverse the decision to [put Aibo to sleep](#). I think it was quite a shortsighted decision, dictated by the bottom line, really.

And it wasn't just Aibo, it was Qrio, it was the whole entertainment robot unit.

Hornyak: That's right. I think it's interesting that it took a foreigner to be heading the firm, Howard Stringer--it took a foreigner, basically, to put Aibo to sleep. The Japanese just weren't willing to do this.

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So what happened to Sony's robot engineers?

Hornyak: I think they've been shifted to other branches of the company. I believe Sony is still running a kind of AI research unit.

There are other companies that you wouldn't think of as robotics specialists--certainly, Honda and Toyota. Why do companies like that get involved with personal robots?

Hornyak: On the one hand, some of these companies in Japan are getting into this for the PR benefits of having a really nifty

humanoid robot walking around, to showcase their technological prowess. Other companies are more interested in developing robots as bona fide commercial products in the future. Toyota particularly is interested in developing things like helper dogs--instead of Seeing Eye dogs, a sort of robot helper dog, and they're looking at a time frame from, like, 2010 to 2020.

Your blog mentioned a new magazine called "Robot Life." How does that fit in?

Hornyak: There are several magazines like this, and more and more coming out in the market. There are quite a few magazines in Japan dedicated to these hobby robots--putting together your own, do-it-yourself robot kit, and I had that experience myself recently. I put together my own humanoid robot. These magazines like "Robot Life" are really cool because you can keep track of what's going on--the latest robots are all in here, not only the kits, but the more sophisticated humanoid showpieces in research labs and corporations like Honda.

What was the robot that you built?

Hornyak: It's a new product called Manoi AT-01 (from Kyosho, a company known for remote-controlled boats and cars). It's designed as an athlete humanoid robot, and they want to have things like humanoid Manoi tournaments--they'll do obstacle courses, that kind of thing. What's cool about Manoi is it's designed for tinkerers.

They told me it would take, like, 9 hours to put together. It took me more like 25, but that's because I'm maybe all-thumbs when it comes to these kinds of things. It was really tough for me to plow through the 100-page Japanese instruction manual and figure out "Omigod, I've just screwed in the leg assembly in reverse, and it's going to walk backwards now." But what was interesting about putting together this robot, which is composed of 17 servo motors in a plastic shell, you can hook it up to your computer by a USB cable and program it using bundled software and you can do sequences of moves. I downloaded from the Kyosho Web site a sequence that includes bowing and dancing. That's pretty simple to do once you get the hang of it.

With this robot I really got an appreciation of how amazing advanced robots like (Honda's) Asimo are--how much they are just mechanical masterpieces. Putting together a simple robot with 17 actuators for me was really challenging, and let me tell you that at some points I was not loving that machine. I was ready to chuck my little Manoi through the window, but I stuck with it and now I think of him as a little baby in a way, a little child. Especially when you put the plastic frame on him, the shell on him, he really gains a personality. You start thinking of it not just as a collection of over 100 parts but as an entity, as a being--he has this expression, he kind of looks like he needs some robot Prozac or something. He looks like he is little bit down in the dumps, so it's endearing. You have to have empathy for these things.

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The [Wakamaru robot](#) looks kind of like a shop vac for the most part, with arms, but then it's got eyes, too. I believe Wakamaru tracks you, looks at you.

Hornyak: Sure, it can do face tracking and you have those puppy dog eyes in Wakamaru. Again, it comes back to this whole thing of the engineering side of robotics and the design side. Japanese are really strong in uniting both halves. They are really impressive at putting faces on their robots and giving form to their robots, so that they become much more believable as entities and living beings, not just clockwork.

How do think the Japanese relationship is going to change with robots, as more robots come into houses, workplaces?

Hornyak: I think that one issue of concern will be--aside from safety, which they are now addressing--how far really are people are going to be going with their relationship to robots. I think we will need robot psychologists in future, like in the Isaac Asimov books--not psychologists to deal with robots with depression or some kind of other psychological problem, but experts who will deal with people who have developed relationships with robots that are excessive attachments, that kind of thing.

What is the next big breakthrough with Japanese robotics?

Hornyak: AI and costs are the biggest hurdles to the next big breakthrough. I think AI is going to take a lot of work in fundamental research, and a lot of that is going on in the States. But in the States, it's very much of a military-oriented funding scheme. The thrust here is very military in nature, and this is quite horrific to the Japanese. It's really goes against the tradition in Japan.

So I think the next big breakthrough is going to be when cost comes down a lot and when AI is ramped up significantly. When actuators become a lot less expensive than they are. My robot--the household, hobby, do-it-yourself robot kit--cost 150,000 yen roughly (about \$1,300). It's the actuators that make it cost so much.

Do you have favorite robot?

Hornyak: I think my favorite robot has to be Astro Boy. He's a fictional robot, but he remains kind of the ideal that all robots can aspire to, in Japan at least. He fights for peace, he's got a nuclear power core--he was created a couple of years after the atomic bomb hit on Hiroshima and Nagasaki--so he really represents technology used for pacifist purposes. And he is also really cute.

The thing is, he really wanted to be human as much as possible. He really wanted parents like the human school children that he went to class with. He is a mirror for human beings and the way they see themselves. All robots are really a reflection of ourselves in machine form.



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