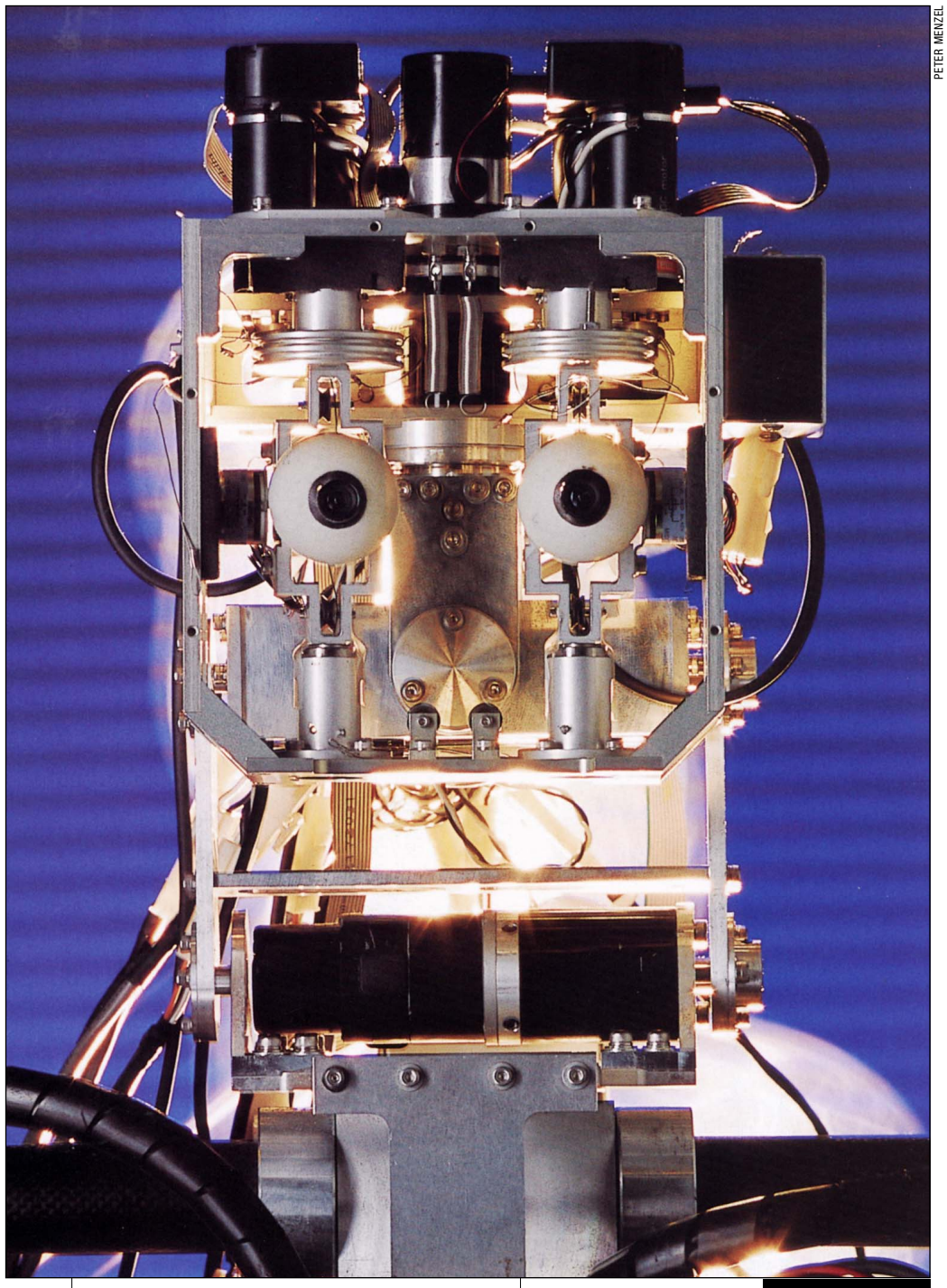
Running with robots

Meet the next step in human-cyborg relations

BY W. KIM HERON



PETER MENZEL

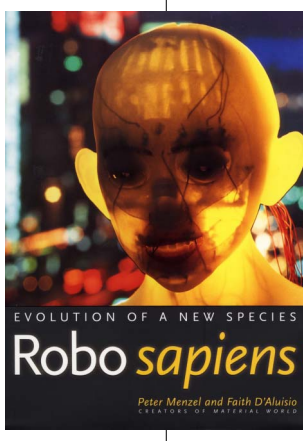
Students at the University of Tokyo are trying to get this robot, the 2-meter-tall WABIAN R-11, to walk like a human.

They walk like people, swim like fish, scramble like cockroaches. They juggle, delicately grasp light bulbs, make eye contact, exchange looks, follow simple commands. Their inventors see them as toys and tools in the short run; some see them as humanity's competitors, perhaps successors, in the long run.

Writer Faith D'Aluisio and writer-photographer Peter Menzel toured robotic laboratories to see an emerging mechanical bestiary, most of which is far too fickle for the outside world — for now. The California-based duo recently spoke with the W. Kim Heron, of the *Current*'s sister paper, Detroit *MetroTimes* about their new book, *Robo sapiens: Evolution of a New Species* (MIT Press, $29.95, 240 pp.).

W. Kim Heron: You write about a moment of revelation seeing the Honda P3 robot in Japan (see "Hardwired help" page 10).

Peter Menzel: We knew that it had taken them 10 years to get to this point where this machine could look like it was walking effortlessly. And it was a very cool sort of deception because the machine is totally programmed. It's modeled after human walking, and it pretty much replicates human walking. But you can't tell it to go over and open the door. It opens the door that it knows how to open; it climbs the stairs that it knows how to climb. If you happen to get in its way, you're going to get kicked.



This machine is amazing, but amazingly limited, too — but you wouldn't really know that if you just walked in on the beginning of the demo: They let this thing go by itself, and it just moves wonderfully. At that point we realized that if the machines get hooked up with the artificial intelligence to a point they can act more on their own, then you really have something.

Faith D'Aluisio: The one thing that I would say about the Honda robot is that it was very glamorous. They pulled out all the stops. You go into this room, and it's this cavernous room that is incredibly secret, and you can just feel the secrecy.

Menzel: All the next-generation robots they're working on are covered with sheets so you can't even get a peek at them.

D'Aluisio: And believe me, I wanted to. I just wanted to pull one sheet off — whoops.

Heron: Were there other moments like that?

Menzel: We saw a robot at the University of Michigan called RHex that doesn't look like much. It's a hexipod — six legs — and it moves like a cockroach. I mean, it scrambles.

D'Aluisio: It skitters.

Menzel: I've just seen a video of the next generation. It's just mind boggling. They put it in the woods in rocky terrain, and this thing just goes wreee-wreee, and it runs all over the place like an animal. And after the kind of motion that you saw on tracked robots or wheeled robots or robots that are so deliberate and slow — this thing is just super cool. It all came out of Rob Full's cockroach research at the University of California; he gave information to several different roboticists through conferences. There are two versions of this kind of machine — one at Stanford and one at the University of Michigan — and this is just going to change the way things move and work and people's ideas of mobile machines.

Heron: Can you talk about Kismet, Cynthia Breazeal's robot at MIT that reacts to facial expressions as a child would?

Menzel: The first couple of times that I saw it, it wasn't working very well. Then the last time … it was just right on the money. It would follow your eyes and act like a decapitated mechanical head stuck on a desk and hooked up to a huge computer.

D'Aluisio: It looks like a cartoon character, though. It's not meant to look like a human, but it certainly has human interaction.

Heron: In the book, Peter talks about it in almost human terms, as being "alive and well" for that visit and being as cute as a human baby.

Menzel: The first time you see these things, you are a little skeptical until they turn them on, and they start moving. And with a lot of them, you immediately make a connection of some kind of life form inside of this thing — which doesn't really exist. But you do anthropomorphize it.

D'Aluisio: You know, it's like something that philosophers say: What really is the essence of life? And what is that spark? And is it something that is really only at face value? I think we're way too far at the early stages to actually say how much like a human something else that we perceive as acting like a human is. Because what are we?

Heron: You say that robots are where computers were 10 years ago and are about to take off. Do you have a scenario?

Menzel: You go away for a couple months, you come back, and people have some different cool machines. If you saw the cover of *Wired* magazine [in September], that machine was being built — the M2 walking robot — we showed it in our books as a Styrofoam-and-stick prototype, and a year later they've got one that is taking its first steps. It's a walking machine.

Heron: But what do you see having the biggest impact in the short term?

D'Aluisio: I would not want to hazard a guess about that only because there have been so many false starts. It seems to me that the problem has been and continues to be making a jump from research to marketplace, and there are some like the AIBO that are fairly successful. That's the dog robot from Sony. (Price: $2,500) We went home with a family and just observed them interacting with their robot pet. The dad is just totally, totally caught up with this thing, and the kid, he'd rather play with his Pokémon cards, or play video games. He wishes it would recognize him. But I'm sure that will be the next step.

Menzel: It may be better to spend $1,500 for iRobot's little machine that will run around in your apartment and videotape your compost pile composting or something. But they're coming out with a little machine, and they hope that these will be like the first Apple computers, where people get these things and everybody adds different applications, and, by the collective geekiness of the world, will come up with really dandy uses for these things.

D'Aluisio: I think a lot of stuff is going to end up in the closet, at least for a little while.

Heron: And not on the streets?

D'Aluisio: Think about robots or some kind of avatar out on the street doing your shopping for you. There are dangers that you really have to think about before you can allow that to happen. Can you imagine like on the streets of downtown Kyoto or New York City having robots chockablock along with people? It doesn't seem very feasible to me, but then again it might work on a Mars colony.

Heron: Earlier this year, Bill Joy of Sun Microsystems created a stir with an essay in *Wired* ("Why the future doesn't need us") where he said that with genetic engineering, nanotechnology and robotics, humans may

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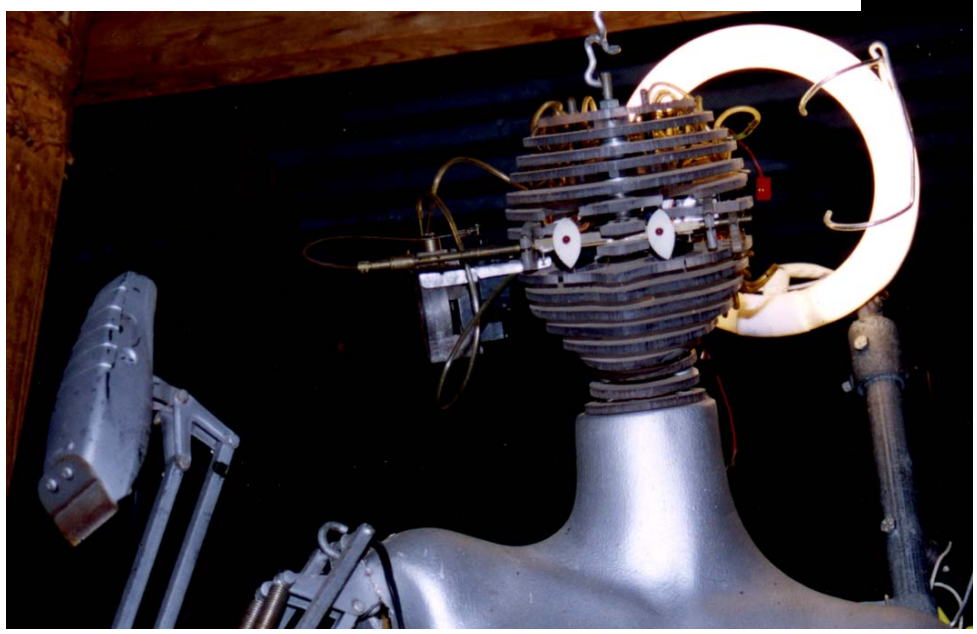
Hexapedal Boris, powered by Fuzbol

BY JOHN DEFORE

You know those rubbery, multi-colored worms sold as fishing lures in sporting-goods stores? You can melt them down at home with a double boiler. And if you take that melted goop and pour it into a mold you've made of your own hand, the texture of the resulting fake worm hand is in some ways very lifelike — you can even see the fingerprints. It's not quite perfect, though — what it lacks is a thin covering to give it the look of skin before it's ready to go around a metal armature controlled by pull wires. Might need another subcutaneous layer of a spongy material, too. Glenn Currie has given this a lot of thought, and is of the mind that an effective solution for android skin is out there somewhere, probably in a totally unlikely place. I am spellbound.

This is the sort of semi-theoretical talk that goes on at the weekly gatherings of Austin's Robot Group, but most of the conversations are a lot more practical. Hobbyists come partly to share specific engineering questions about projects slightly less ambitious than making a life-like android. "You come here with an idea, and somebody can usually tell you how to do it," I'm told. "Either that, or tell you you're crazy." After talking for a couple of hours with members and eavesdropping on the conversations around me, I believe that's true. There's a hell of a lot of technical knowledge in the room, and everybody has stories about what they've tried, why it didn't work, and how the lessons they learned might apply to somebody else's new project.

Some of those projects surround me in the group's rented warehouse/workshop. As space here is limited, most fully-functioning creations are stored in members' garages; I'm treated to glimpses of works in progress. Eric Lundquist, a gregarious guy holding a Shiner Bock, demonstrates a remote-controlled vacuum cleaner with an adjustable-height nozzle. He started it, he says, partly because his wife has a bad back and he wanted to make something practical for a change, as opposed to the "gee whiz" projects that occupy a lot of his time. Propped up against one wall is a huge six-legged pipe frame creation called Boris that has a separate computer mounted on each of its legs — its creator, Edwin Wise, wrote his own computer language (trademarked Fuzbol) to control the legs' movement. Boris is an expensive long-term project that's not yet fully functional, but his most recent operative stage was impressive enough to entertain techies at last year's South by Southwest Interactive festival.



Robo sculptures above and below by Brooks Coleman

In the garage of the warehouse is the project requiring the most attention at the moment — the metal skeleton of an all-hydraulic mobile destruction machine called B3. (That stands for Big Bubba Bot — its prototype predecessors were MiniB, a Lego Mindstorm creation, and WannaB, made with plywood and PVC.) I get the rundown on this behemoth's history from Lundquist and Dave Pike, a boyishly cheerful man who during the day is a dental technician; both are enthusiastic about experimenting with large-scale hydraulics for the first time. B3 was started a while back, when cable TV's Sci-Fi Channel approached Edwin Wise about creating a series resembling *BattleBots* (Comedy Central's show in which robots fight each other) on steroids. The problem with *BattleBots*, evidently, is that there's an audience that must be protected. "It's OK, but kind of inherently uninteresting, 'cause what you end up seeing is just a bunch of wedges trying to flip each other over." Removing the people from the fight area opens the door to all sorts of glorious, life-threatening violence. The network found a suitable location for the fights (an abandoned iron mine) and christened the show *Robo Death*, but not long after the Robot Group started building their metal gladiator they were informed that a network shakeup had left the proposed series in limbo. It's too cool a machine to abandon, though, and the team is sticking with it in hopes that *Robo Death* will someday materialize.

JOHN DEFORE

Even if it goes into production, though, no corporate-sponsored series could ever hope to live up to the apocalyptic standard set by San Francisco's Survival Research Laboratories, a collective of serious maniacs who make flame-throwing, earth-shaking, incredibly loud automatons and then set them loose mere yards away from spectators. A few years ago the Robot Group brought these people to Central Texas to stage one of their "performances," and hundreds of youthful psyches were scarred forever. SRL has influenced not only the robot crowd but cultural hipsters in general, with a hard-to-define but compelling world view in which ceremonial destruction serves some sort of cathartic purpose for our post-industrial consumer society. They have been known to attach animal carcasses to their creations before setting them loose against each other, conferring metaphoric significance on the mindless destruction. Tom Davidson, who helped organize SRL's event for the Robot Group, says that while the spectacle was astonishing and he's glad to have sponsored it, one will probably be enough for his lifetime.

(Note to San Antonio residents harboring too much pent-up aggression: Because SRL's touring events tend to attract negative attention from a town's police and fire departments, they've offered to bring the mayhem for free to any community where a promoter can secure an appropriate venue and make the permit arrangements necessary to ensure the show won't be shut down by the Man. See their inferno-decorated Web site at www.srl.org for details on this offer and the group in general.)

It's not all about ultraviolence, though. The Robot Group was once contacted by a gallery in New York about a show of "robot-made art." Intrigued by the idea, Lundquist and others started figuring out how to get a mechanical arm to hold a sponge and manipulate paint effectively. As the thing had no vision, the resulting paintings are pretty haphazard, but the eye-pleasing effort did get mentioned in the *Village Voice*'s listings.

Less random are the creations of Brooks Coleman. Coleman sticks out a bit in this crowd; very thin, with long, scraggly hair and a sharp nose under animated eyes, he's my choice for the role of Mad Scientist. He makes part of his living selling custom-made metal bras to musicians and celebrities; one of his Road Warrior-esque creations was recently featured in a pin-up calendar of the "Wild Women of Wrestling," and every now and then he has a party at a local strip club with the dancers modeling his creations. He makes matching eyeglasses — with metal mesh where the lenses should be — that would be at home in one of Terry Gilliam's films, especially *12 Monkeys*. Coleman seems equal parts sculptor and machinist — in the front room of the warehouse I see one of his smaller robots, a strangely beautiful abstracted human head made of wood and metal that was an exhibit in the local children's museum until its gears wore out. His father is an "honest-to-God rocket scientist" who helped build a testing facility that set the Guinness World Record as the largest concentration of sonic power in the world — Dad was obviously a significant influence on little Brooks.

Coleman aside, these folks are a lot more normal than one might expect. Visitors with images of the *X-Files*' Lone Gunmen might be disappointed; while the Robot Group has expertise to burn, they are also fully-functioning human beings; apparently, most of them even have girlfriends or wives. Their hobby requires more space than a love of baseball, but having one of them bend your ear about gizmos is not unlike hearing a Mets fan talk about a player's career stats. Strike that — it's a lot more fun, actually, even if sports are a more socially acceptable male obsession.

Since funding comes out of members' pockets, with occasional donations and random windfalls like robot rentals to movie crews, it would take a major commission to get some of the group's more ambitious ideas off the ground. Given the eclectic nature of the club, though, a major commission is not out of the question. Until then, they'll happily welcome and entertain visitors at their Thursday night meetings — even those who don't know a logic board from a servo mechanism. ■

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be engineering our own extinction. Do you see your book contributing to that debate?

D'Aluisio: Certainly his ideas are pretty dire. I think we are an entrant into the dialogue. I tend to think that we as journalists provide a more even hand bringing in different points of view. And hopefully people will understand the whole process a little bit more, and hopefully understand themselves a little bit more. I certainly understand myself a little bit better.

Heron: In what way?

D'Aluisio: I guess I'd never really thought about how much human life is a social construct, and talking to people like Paul MacCready, who is in his 70s, who have had a lot of time for reflection, and people like that, who are working on these very scientific problems and also very esoteric and artful projects as well. He doesn't lose sight of the fact of our humanness.

Heron: When you hear people talking about, for instance, machines spontaneously achieving consciousness, do you find yourself asking: "Where am I?"

Menzel: Sometimes you almost start to believe that.

D'Aluisio: Maybe you do. I don't know. ■

W. Kim Heron is managing editor of the Detroit MetroTimes.

Hardwired help

No dream of the future, robots are already becoming part of our lives

BY JON M. GIBSON

As the night sky makes way for the morning sun, an observant human eye might catch a glimpse of thousands of birds flocking against the summer landscape. Yet closer examination might show these graceful creatures are not flesh and bone at all, but a concoction of balsa wood and synthetic brain neurons.

A *Jetsons* pipe dream? However implausible this automaton sparrow might sound, experiments in southwest England have taken shape to create such an artificial organism.

Robots are no longer an untouchable reality reserved for fantasy novels. Just 10 years from now, experts predict, a rod-and-steel mechanism could even be flipping your cheeseburger at McDonald's.

In the meantime, our microchip-wired world has, or is rapidly developing, synthetic equivalents for nearly everything. Here are some of the hot 'bots already out there, or soon to be on the way.

"Robots are more repeatable than workers, more consistent and usually perform nasty environmental and generally undesirable jobs," explains Robin Schmidt, engineering specialist at Nachi Robotic Systems, Inc. in Japan.

A brief tour of the company's workshop reveals nearly a dozen varieties of automotive robots designed to spot weld, arc weld, laser cut, grind or even work with tiny parts. A premier distributor of assembly plant 'bots to Chrysler, among other international companies, Nachi made history in 1980 when it implemented the first fully electromechanical spot welding robot in Japan.

Spectators were stunned when Honda Japan unveiled its newest design this June: The 1.6-meter-tall, 130-kilogram machine wasn't an automobile.

The pudgy, humanoid skeleton of this prototype, dubbed "P3," is a product of Honda's attempt to simulate the complexity of walking upright — a breakthrough appropriately labeled the "evolution of robotics."

This sci-tech innovation can only walk at a top speed of 2 kilometers (about a mile) per hour, yet such a machine might have many uses for the car industry in years to come. In particular, thousands of lives could be saved if these 'bots were used during crash tests, as they would be able to give testers more accurate information about the aftermath of mock collisions.

Robots are traditionally thought of as Herculean-sized incarnations. Intuitive Surgical, Inc. has already shifted that perspective. On July 12 this year, the Food and Drug Administration granted approval to the company's tiny "Da Vinci Surgical System," making it the first operation-oriented robot to be approved for use in medical practice.

"When you sit down and operate with this system, it almost feels like you've climbed inside the space you're operating in," says Dr. Barry Gardiner of the San Ramon Regional Medical Center, who led clinical trials of Da Vinci.

Although the miniature, three-armed assistant was designed to create tiny incisions in the abdomen (known as laparoscopic surgery), the creators of the device are already thinking ahead. Heart bypasses and heart valve replacements are only a small sample of what Da Vinci will likely accomplish in years to come.

Medical magazines and Web sites have also been booming lately with editorials about surgical robots which would travel through a patient's bloodstream. Even though the idea far exceeds current technology, industry professionals insist that there will eventually come a day when even single cells could receive individual attention.

A pill-dispensing, CD-playing alternative to home health care might be on the way as well. Engineers at the University of Pittsburgh and Carnegie Mellon University recently announced the completion of their pet project, "Flo, the robot nurse."

Minus a human heart and an hourly pay scale, the robot reminds people when to take their medication, checks their vital signs and e-mails statistics to the patient's doctor. And communicating with physicians is as easy as using a remote control, since a TV monitor is built into Flo's metal frame.

Just 10 years from now, experts predict, a rod-and-steel mechanism could even be flipping your cheeseburger at McDonald's.

However, controversy regarding the replacement of human care is in an uproar: "I fear that the thinking behind Flo reflects a truth about the public's perception of nursing, namely that it is fundamentally about schedules and pills and nagging," writes Diane Sussman, assistant managing editor at *NurseWeek* magazine in a recent article.

"Human contact and consideration — now that's something that's not going to come from any robot, no matter how many CDs it plays or pills it counts."

At the Carl T. Hayden VA Center in Arizona, a device named "Robot Rx" is also capturing the attention of pharmacists. Collecting a dozen medications in one minute and filling prescriptions with "near-perfect accuracy," this automated store clerk might not be far from mainstream adaptation.

What would you do with 30 extra hours each year? Friendly Robotics, a European technology facility, recently began promoting the time-saving wonders of its newly imported product, the Robomow, a yellow-plated yard robot that, simply, mows the lawn.

"After working long hours each week, I prefer to spend my weekends doing as few household chores as possible," says John Floeter of Dallas, an avid user of Robomow. "Instead of pushing a lawnmower and getting covered with clippings and fumes, I now delegate it to the robotic lawnmower and take care of other tasks around the yard."

For a mere $795, the 42-pound, 12-inch high robot is possibly the most widely useful 'bot yet.

As another 20 years pass, robots will probably be as common in households as goldfish. But for those who can't wait, Tiger Electronics offers an interactive cyber-dog called "Poo-Chi."

For about $30, it barks, sings, and dances on tiptoes. And it won't leave anything on the lawn that might challenge your Robomow's turtle-like momentum. ■

Jon M. Gibson writes about technology for the Detroit MetroTimes.