

[http://www.mercurynews.com/business/ci\\_9800327?nclick\\_check=1](http://www.mercurynews.com/business/ci_9800327?nclick_check=1)

7-6-08

Bay Area researchers in search of the real \$6 million dollar man  
**BAY AREA AT CENTER OF A NEW INDUSTRY TO PROVIDE HIGH-TECH PROSTHETIC DEVICES**

By Steve Johnson

Mercury News

Article Launched: 07/06/2008 01:35:28 AM PDT

The fantastic bionic gizmos envisioned by the old TV series "The Six Million Dollar Man" may be getting closer to reality for people like Shanita Garner of San Jose, who was born missing the lower part of her right leg.

From mechanical eyes and lungs to thought-controlled wheelchairs and limbs, a technological revolution is under way in the Bay Area and elsewhere that some people predict one day will greatly ease the disabilities afflicting the 26-year-old Garner and millions of others.

"It's how much you would let your imagination roam," said Frank Fischer, chief executive of NeuroPace of Mountain View, which is testing a surgically implantable device that electrically stimulates the brain to block epileptic seizures. "For many patients, we have the potential of giving them their lives back."

Making health-related gadgets already is big business. Matthew Gardner, president of the South San Francisco-based trade group BayBio, called Northern California one of the world's top three centers for medical device innovation, along with Minneapolis and Boston. Mark Leahey, executive director of the Washington, D.C.-based Medical Device Manufacturers Association, agreed.

"I would consider that as hot as any area in the world," Leahey said. "We have about 200 members and I would say close to a third are in Northern California."

The industry as a whole has more than 80,000 products on the U.S. market ranging from artificial hearts and hips to brain implants that block the abnormal nerve signals associated with Parkinson's disease.

It also boasts prosthetic legs that are a far cry from the clunky models of the past. Some are controlled by computer chips that sense stairs or other changes in terrain and alter the legs' hydraulic components to adjust how much the knee bends. Garner had Laurence Orthopedic of Oakland make her an artificial leg to accommodate a high-heeled shoe.

"I was determined to wear heels before I left this earth," she said.

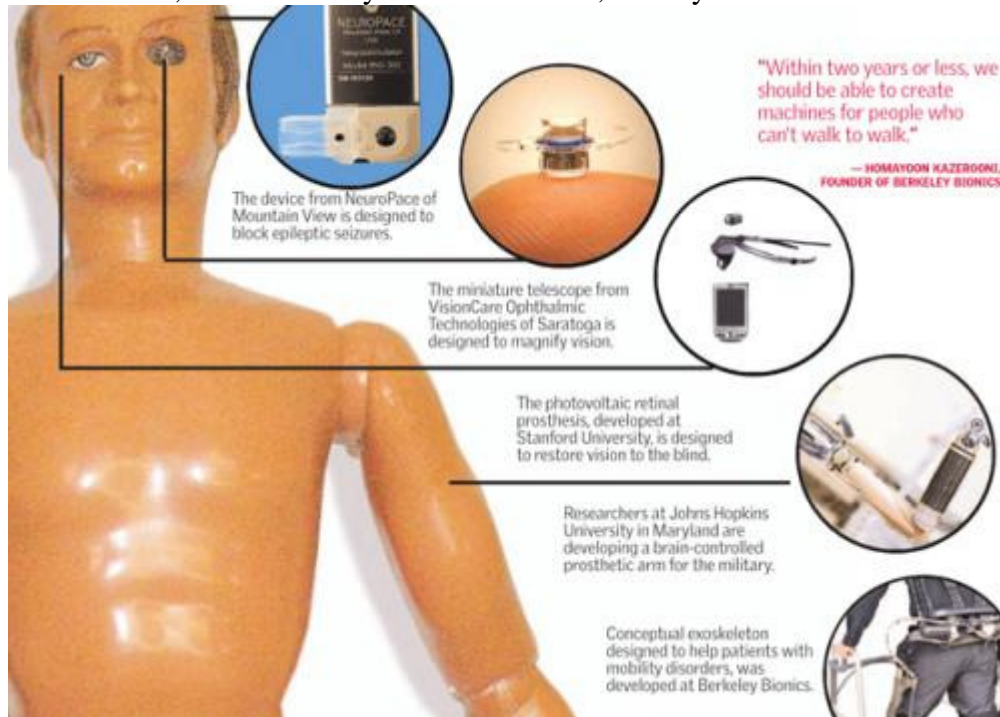
But that's nothing compared with what's in the works.

Berkeley-based Berkeley Bionics has a \$2.6 million grant from the National Institute of Standards and Technology to develop what it calls the Human Universal Load Carrier to help patients with mobility disorders reduce their reliance on wheelchairs. It's composed

of a mechanically powered and computer-controlled exoskeleton that fits onto a person's legs.

The company initially was financed by the military, which is pursuing advanced prosthetics to help soldiers who've lost limbs in Iraq and Afghanistan.

"Within two years or less, we should be able to create machines for people who can't walk to walk," said Berkeley Bionics' founder, Homayoon



(CLICK TO ENLARGE)

Kazerooni, who directs the Human Engineering Laboratory at the University of California-Berkeley. "It's not that hard."

Some of the most remarkable prosthetics being designed are controlled by thought. One was described last month in the journal *Nature* by scientists at the University of Pittsburgh and Carnegie Mellon University. After two monkeys had tiny sensors implanted in their brains, the researchers said, the animals could control a robotic arm with their thoughts to feed themselves marshmallows and chunks of fruit.

Researchers at Johns Hopkins University in Maryland also are developing a brain-controlled prosthetic arm for the military.

Another device developed by Cyberkinetics Neurotechnology Systems of Massachusetts has enabled a paralyzed person in tests to operate a computer by thought to control a wheelchair and read e-mail, according to the company's founder, John Donoghue.

"For people who have lost limbs or become paralyzed, the idea would be to return them back to just an everyday person," said Donoghue, who directs the Brain Science Program at Brown University in Rhode Island.

Bionic devices also are being touted to improve sight.

VisionCare Ophthalmic Technologies of Saratoga has developed a miniature telescope that it proposes to implant in one eye of patients suffering from age-related macular degeneration, to magnify their vision. An advisory panel of the U.S. Food and Drug

Administration has raised concerns about the device's safety and effectiveness, but is studying it.

Stanford University scientists also have developed a retinal prosthetic system for restoring a blind person's sight. It consists of a small video camera mounted on goggles and a thin photovoltaic array that would be placed under the person's retina. The system resembles the gadget Lt. Geordi La Forge wore in "Star Trek: The Next Generation." Images captured by the camera would be processed by a tiny computer and projected by the goggles into the person's eye using infrared light. Photovoltaic pixels in the implant would turn the infrared light into electrical current to stimulate the person's retinal neurons.

"It's all very exciting and very promising," said Daniel Palanker, an associate professor who oversees the project. But he's had trouble raising money to continue developing it, which he finds disappointing given that people who lost their sight due to retinal degeneration have no other hope for restoring their vision. "I'm getting tons of e-mails from people crying for help," he said.

Another implantable device designed to restore vision, which was developed in part by a University of California-Santa Cruz researcher, is undergoing tests in blind people.

A lot of people have breathing problems, too. With them in mind, the FDA last month approved an implantable device made by Synapse Biomedical of Cleveland. By stimulating a person's diaphragm, the FDA said, it can enable people with spinal injuries to breathe for several hours without having to rely on a bulky mechanical ventilator.

Another breathing aid has been developed by MC3 of Ann Arbor, Mich. It is a soda-can-size device a person wears outside their body that attaches to their blood vessels. As their heart pumps blood through it, the device removes carbon dioxide while adding oxygen, like real lungs.

Using throat muscles and a pacemaker-like device, German researchers also reportedly have made a bionic tongue for people who've lost theirs to cancer or accidents.

But not every invention will prove useful or affordable.

"Some of these things are so technical that the cost is almost prohibitive for 98 percent of the people," said Robert Jensen, who designed the leg Garner uses for her spiked shoes. Indeed, computer-controlled prosthetic legs sell for \$40,000 or more.

Even so, another Jensen customer, 34-year-old Creighton Wong of Danville, who has a prosthetic leg for walking and another one specially designed for biking, said he is happy about the push to create increasingly sophisticated medical devices.

"It's just a matter of getting it less expensive and more accessible," he said. "People need help."

---

Contact Steve Johnson at [sjohnson@mercurynews.com](mailto:sjohnson@mercurynews.com) or (408) 920-5043.