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## From 3-D printers to the "bat" cane

### Technology's changing shape

By Setarreh Massihzadegan, Boston.com | March 6, 2007

Picture this: You click "print" on your office computer, walk over to the printer, and pick up, instead of a piece of paper, a three-dimensional model of your work.

Futuristic fantasy? Maybe not. Burlington-based [Z Corp.](#) believes that the release of its 3-D ZPrinter 450 Monday is bringing the device closer to the average workplace, or even your local CVS or Kinko's.

In these days of futuristic 3-D printers, plenty of everyday products are tapping the technology of the future and emerging innovations, some of which promise to change the way we live by mimicking nature, others by tracking it.

"We live more and more in a world that we've designed and planned," said the curator of science and technology at the MIT Museum, Deborah G. Douglas. "If you thought through every thing you've touched and did, you would count numerous innovations that changed things."

The new printer from Z Corp. creates prototype models of architectural, medical, and engineering products being tested by companies like Reebok and schools like Massachusetts Institute of Technology. The 3-D printer has been around for almost 20 years, but the latest model is less expensive and more advanced than ever, says Z Corp.'s Chief Executive Officer Tom Clay.

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"We believe 3-D printing is going to have the greatest impact when

it's as much like 2-D printing," Clay said.

With a \$40,000 price tag, it's unlikely that the individual consumer would buy a printer. But Z Corp. and competitors, including Eden Prairie, Minn.-based [Stratasys Inc.](#), say it's just a matter of time before consumers can send a 3-D image to the local office supply store or pharmacy to pick up their creations like digital photos.

Looking forward, technology will be "small, organic, and connected," predicts Michele C.S. Bowman, managing director of Global Foresight Associates, a futures research and consulting firm in Waltham.

"Small" refers to the use of nanotechnology, or particles as small as 1/100,000 the width of a human hair, which is central to everything from Chino pants to pregnancy tests. At that size, the properties and manipulability of the particles is different and can make for better-designed products.

"Getting into the molecular and anatomic structure of matter means that just about everything that we make is susceptible to being rethought or remade using nanotechnology," said Glen Hiemstra, founder of [Futurist.com](#) and the author of "Turning the Future into Revenue."

But don't be misled into thinking that only tiny things can be affected by nanotechnology, Hiemstra warned. "In fact, very big things can be redesigned using nanotech," he said, citing recent work on nanoconcrete, which would be as strong at 3-inches thick as conventional concrete is at 8 inches.

And as nanotechnology has many applications, so does 3-D printing. [The ExOne Company](#) in Irwin, Penn., has created a faster, more efficient way to make the inner core of a dental crown, known as a "coping," with 3-D printers.

ExOne uses a gold alloy instead of plaster or other particles, and finishes the coping by infiltrating it with another gold alloy that makes the product dense.

"A well-trained waxer can make maybe six to eight copings a day," said Brian Kernan, senior metallurgist for ExOne. "In one of our machines we can make about six parts (copings) an hour on average."

Kernan, who previously worked at MIT, said he believes this to be the first use of 3-D printing in the human body. Imagen, a division of ExOne, began commercializing the printing, last year in nine labs across the country, and plans to expand to more this year.

And just as "organic" is a buzzword for today's lifestyle, the term has weaved its way through science at a more figurative level: "Biomimicry," or efforts to copy nature's efficiency in our own technology.

Janine Benyus coined the term "biomimicry," in her 1997 book with that title. It refers to the concept of mimicking nature's structure, architecture, chemistry, or ecosystem. Nature's waste is always food for something, so should be ours, said Bryony Schwan, executive director of the Missoula, Mont.-based [Biomimicry Institute](#), a nonprofit organization headed by Benyus and dedicated to furthering the use of biomimicry in society.

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"What we really have to pay attention to is that nature's been doing this for 3.8 billion years," Schwan said. "Things that don't work are extinct. Nature's been doing research and development for all these years [and has] perfected these processes," she added.

Biomimicry was recently used to make the [UltraCane](#). The walking cane uses ultrasonic signals bouncing off nearby objects, similar to biological sonar used by bats, to better help blind or vision-impaired users find their way.

But across the innovation landscape, what most technology today has in common is the ability to connect objects and people.

"Pervasive technology is bringing about a partnership between the physical and digital world," futurist Bowman said.

An example of that connectivity, more than the music gadgets and cell phones we carry around, is radio-frequency identification tags, or RFID tags, Hiemstra said.

Bowman described the chip-like tags as "next-generation bar codes." She said one day in the near future we may be able to track where each and every product we own comes from, whether it's a can of soda or a t-shirt.

According to RFID Journal, LLC, an independent media company based in Melville, NY, which focuses on the tags, "Thousands of companies around the world use RFID today to improve internal efficiencies."

Wal-Mart Stores, Inc. is one example. In 2004 the company began tracking shipments to 150 stores with RFID tags, but by the end of this year it expects to have increased that number to 1,000 stores.

Though tags can be as small as the point of a needle or as large as a brick, each contains a transponder with information, and responds to a reader that can access its information from a distance between a few inches to 10 feet away.

"I would guess that virtually everything that is manufactured or now has a barcode is going to have this kind of device in it," Hiemstra said.

With the accelerating speed that we now adopt technology, Hiemstra expects these products to have an RFID tag by 2020. He also predicts that consumer gadgets will continue to miniaturize, "until we reach the point that we're literally wearing them" either in glasses and contact lenses, or in our clothing.

Would you buy an iPod for your eye? ■

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