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The Changing Future
By
Daniel Burrus

When I was a young boy, I would spend time in the summer working on my Grandfather's farm in a small Texas town named Telephone, 97 miles north of Dallas. How small was it? It was so small that the entering and leaving sign was on the same post. One day Grandpa shared a little wisdom with me, and as I think of technological change, his words ring true. He said, "Son, it's easier to ride a horse in the direction it's going."

The Changing Future

When the horses of technological change are not standing still; they are moving faster every day. And when they change direction, you had better pay attention. In the early 1990s, IBM missed the change in direction from mainframes to servers using PCs and almost lost the company. Kodak missed the change from film to digital photography and is still trying to recover. The music industry missed the change from CDs to MP3s, and the phone companies missed the switch from expensive long distance to almost free Internet telephone (VoIP).

When Netscape started to change our world in the mid 1990s by offering a Web browser as a free download, "The Wall Street Journal" interviewed Mr. Gates and asked how the browser would affect Microsoft. His answer was basically, not much. In addition, Mr. Gates had just written a book titled *The Road Ahead* and had failed to mention the Internet. To his credit, he did something very good. He got over it quickly! He stopped defending the status quo, and embraced the new future. He re-directed company efforts to focus on the new future and, as far as his new book, there was a quick re-write to include the Internet.

Seeing The New Big Picture

Technology has the power to change how we live, work, and play. It changes our behaviors. For example, when Apple introduced the iPod, millions of people changed how, and where, they listened to music. In today's world of information overload, it is important to focus on your area of expertise. The problem is that by focusing on one area, you miss everything else. Every now and then, it is imperative to do a broad scan of the technology changes outside of your area of expertise, looking for both potential disruption and opportunity. This will allow you to anticipate when the horses of technological change will change direction.

TECHNOLOGY NEWS HIGHLIGHTS

SELF-POWERED ARTIFICIAL RETINA

Numerous researchers have been reporting success in developing artificial retinas to restore loss of sight due to diabetes and other disorders. Unfortunately, all of these devices require an external power source and an array of electrodes to stimulate cells in the eye, obstacles making miniaturization difficult. Recently, a team of scientists in Japan designed a new type of artificial retina that needs no external power source. It overcomes the obstacle by embedding a photoelectric conversion pigment into a polyethylene film. The film is flexible enough that it can

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be folded and inserted into the eye through a small incision. The pigment then responds to changes in light and generates electrical signals that stimulate the ocular cells. The researchers hope to begin clinical trials within three years.

For information: Oakyama University, 1-1, Tsushima-Naka, 1-Chome, Okayama 700-8530, Japan; Web site: www.okayama-u.ac.jp

BRAIN-CONTROLLED COMPUTER

The Berlin Brain-Computer Interface (BBCI) represents a major step forward in the development of a system that will enable users to control electronic devices simply by thinking about them. Unlike previous systems that used electrodes wired directly into the brain, BBCI measures brain activity through 128 electrodes attached to the scalp. Thinking about specific motions is reflected in the electrical signals generated by brain cells. These signals can be amplified and processed by a computer to be converted into actions. This type of system may someday allow patients to control prosthetic limbs simply by thinking about moving them, and could even eliminate the need for controllers in future generations of computer games.

For information: Benjamin Blankerz, Fraunhofer Institute for Computer Architecture and Software Technology, FIRST, Kekulestrasse 7, 12489 Berlin, Germany; email: first@first.fraunhofer.de; Web site: www.first.fraunhofer.de

FAT-ZAPPING LASER

Researchers at Massachusetts General Hospital may have found a way to remove body fat without harming the skin. Using an infrared laser at varying wavelengths between 800 and 2600 nanometers, they reported that they could successfully break down fatty tissue without affecting the overlying layers of skin. A technique such as this could be used to treat a variety of health conditions, including severe acne, cellulite deposits, and even atherosclerosis.

For information: Rox Anderson, Wellman Center for Photomedicine, Massachusetts General Hospital, 55 Fruit Street, Boston, MA 02114; phone: 617-726-2000; Web site: www.massgeneral.org

PRODUCING HYDROGEN WITH LIGHT

Finding efficient ways of producing hydrogen in large amounts is key to its widespread use as a primary source of fuel. Photocatalysts, which use light to liberate hydrogen ions from water molecules, are a promising alternative. Recently, researchers at Penn State achieved an efficiency rate of over 12 percent hydrogen production using titanium dioxide nanotubes. However, these catalysts only work in the presence of ultraviolet light, which makes up a mere 4 percent of sunlight. Continued experimentation of adding carbon to the nanotubes enabled the researchers to change the absorption characteristics of the catalysts so that they respond to wavelengths closer to the visible light spectrum, broadening the spectrum in which the catalysts can function to nearly double their efficiency. The goal is to produce a high-efficiency photocatalyst that will work in the visible light spectrum. The researchers calculate that an average U.S. rooftop covered with 12-percent-efficient, visible-light photocatalysts would generate enough hydrogen to power a car for one day.

For information: Craig Grimes, Penn State University, Department of Electrical Engineering, 129 Electrical Engineering East, University Park, PA 16802; phone: 814-863-2788; email: cgrimes@engr.psu.edu; Web site: www.psu.edu; fax: 814-865-7065

SPEEDING UP TRAFFIC

A new system already in use in Japan could greatly reduce the time spent waiting for traffic lights. A single camera designed to detect the presence of vehicles with an accuracy of 90-95 percent was placed at intersections. When traffic is detected, the system uses advanced sensing and control technology to fine-tune the signal intervals to optimize the actual volume based on vehicle movements.

For information: Omron Corporation, 3-4-10 Toranomon Minato-ku, Tokyo, 105-0001 Japan; phone: +81-3-3436-7011; fax: +81-3-3436-7035; Web site: www.omron.com

PAY-PER-CALL INTERNET ADS

Pay-per-click advertising generates millions of sales leads for companies. But many small businesses prefer phone leads to clicks, and are willing to pay more to have a conversation with their prospective clients at a time and place when they are more apt to buy. Instead of a URL, the search results return a toll-free number, allowing prospective customers to call the company directly. AOL already offers this service to its advertisers, and Google and Yahoo! are expected to follow suit this summer. While click leads cost about $1.50 on average, call leads can run as high as $8 to $10 each. Many companies feel it's worth the extra cost to receive highly qualified, timely contacts directly from their customers.

For information: Ingenio, PMB#331, 100 First St., Suite 100, San Francisco, CA 94105; Web site: www.ingenio.com

DIVING WITHOUT AIR TANKS

Scientists are taking a lead from our underwater ancestors to develop a system that will allow divers to "breathe" underwater without the use of cumbersome air tanks. Patterned after fish gills, the artificial gills are made up of hundreds of microchannels that remove small amounts of air dissolved in solution as the water flows over them. In order to generate enough oxygen to sustain a person for extended periods of time, the number of channels needs to be increased from the prototype to about 250,000, but the project is well on its way to becoming a reality.

For information: Harihara Baskaran, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106; phone: 216-368-1029; email: harihara.baskaran@case.edu; Web site: www.cwru.edu

BIOPRINTING ORGAN TISSUE

A new development in tissue engineering may enable replacement organs to be grown in a laboratory more quickly and easily than ever before. Current methods rely on building three-dimensional scaffolds of the desired shape and seeding them with cells. This process can take several weeks to produce a viable organ for implantation. A new technique uses droplets of "bioink" – made up of clumps of cells – to increase the density of cells in the structure and create viable organs faster. To create the structures, layers of bioink are extruded through printing heads with alternating layers of "biopaper" – a supporting gel that gives the organ its structure. In this way, virtually any shape can be printed. The cells quickly produce the function that they would have in a normal organ. For example, a chicken heart that was printed using the technique began to beat synchronously after only 19 hours.

For information: Gabor Forgacs, University of Missouri, Physics Department, 420 Physics Building, Columbia, MO 65211; phone: 573-882-3036; email: forgacsg@missouri.edu; Web site: www.missouri.edu

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CARBON "NANOPODS"

A new peapod-shaped nanocarbon material has been developed that can be readily dispersed in water or resins. Measuring 50-70 microns in diameter and 700-800 nanometers in length, the hollow structures may have a variety of applications. Unlike carbon nanotubes that are made using metal catalysts, the "nanopods" are fabricated from nanoparticles of polyacrylnitrile, so they are free of metal contaminants. This would make them useful in medical applications, for example, delivering targeted therapy by filling them with medicine and releasing them into the bloodstream.

For information: Mitsubishi Chemical Corporation, Daiichi Tamachi Building, 5-33-8 Shiba, Minuto-ku, Tokyo 108-0014, Japan; Web site: www.mitsubishi.com

MOLECULAR MOTOR

Several months ago, nanotechnology experts constructed a "nano-car" that was powered remotely by an electromagnetic field. Recently, they installed a "nano-engine" that will allow the tiny vehicle to propel itself using nothing but light for fuel. The tiny motor consists of a pair of bonded carbon molecules that rotate in a specific direction when illuminated with a particular wavelength of light. Through the use of magnetic resonance imaging, the team was able to confirm that the engine was running by monitoring the position of hydrogen atoms within it. They estimate that the car (which measures just three by four nanometers) would be capable of traveling at speeds of up to two nanometers per minute. The only problem is that, because of limitations in microscopy technology, they won't be able to see it!

For information: James Tour, Rice University, Chemistry Tour Lab MS222, 255 Dell Butcher Hall, Houston, TX 77005; phone: 713-348-6246; email: tour@rice.edu; Web site: www.rice.edu

NEW CANCER MARKER

Korean scientists have developed a new method of screening for cancer that should enable earlier, error-free detection of the disease through simple blood or urine tests. The method, called NeoNovo, is a new marker found only in cancer-stricken cells, and it is capable of differentiating between normal and diseased tissue with a high level of accuracy. When NeoNovo is embedded into protein chips, it can easily screen for the presence of cancer-causing cells in a sample. The researchers expect that it will increase the effectiveness of diagnosis by as much as 70 percent. It covers as many as 10 different cancer types, including gastric, pancreatic, liver, breast, kidney, prostate and colon. The tests are currently in clinical trials and the marker could be available commercially in two years.

For information: Yoo Nae-chun, Yonsei University, College of Medicine, 134 Sinchon-dong, Seodaemun, Seoul 120-752, Korea; phone: +82-2-2228-2034; fax: +82-2-393-4945; Web site: www.yonsei.ac.kr

SOLAR WALLS

A new building under construction in Matsudo, Japan, is expected to be able to generate its own electricity for nighttime lighting without conventional lighting sources . The building incorporates glass walls that contain a .002mm silicon solar battery and 320 light-emitting diodes (LEDs). The wall converts about seven percent of daytime solar energy into electricity and stores it to illuminate the LEDs, lighting the building for an average of 4.6 hours each night.

For information: Shimizu Corporation, Seavans South, 1-2-3 Shibaura, Minato-ku, Tokyo 105-8007, Japan; phone: +81-3-5441-1111; Web site: www.shimz.co.jp

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About Daniel Burrus

Daniel Burrus is one of the world's leading technology forecasters and business strategists, and is the author of six books, including the highly acclaimed Technotrends, which has been translated into over a dozen languages. He is the founder and CEO of Burrus Research Associates, Inc., a research and consulting firm that monitors global advancements in technology and consumer trends to help clients better understand how technological, social, and business forces are converging to create enormous, untapped opportunities.

In 1983, Burrus became the first and only futurist to accurately identify the twenty technology categories that would drive two decades of revolutionary change. Since then, he has established a worldwide reputation for his exceptional record of predicting the future of technological change and its direct impact on the business world. He has helped hundreds of clients identify new opportunities and develop successful competitive strategies based on the creative application of leading-edge technologies, and has delivered over 2,200 keynote speeches to corporations, associations, and professional organizations worldwide.

In his presentations, Mr. Burrus blends timely and provocative knowledge with just the right amount of humor and motivation. He is a master at tailoring his presentations to his audiences as he addresses relevant trends and offers powerful, practical guidance for turning rapid change into a competitive advantage.

Burrus' client list encompasses a wide range of industries, and includes many Fortune 500 companies such as GE, IBM, Oracle, Microsoft, DuPont, Yahoo!, Toshiba, American Express, Northwestern Mutual, ExxonMobil, and Sara Lee. He has been the featured subject of a PBS Special, has appeared on programs such as Larry King, CNN, and Bloomberg, and is quoted in a variety of publications, including USA Today, Fortune and Industry Week.

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-- Wenda Millard, Chief Sales Officer, Yahoo!

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