

# TECHNOTRENDS<sup>®</sup>

## Newsletter

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### Acceleration<sup>3</sup> (Part 2)

By  
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We are all just now entering a new technology- driven change curve that will create more personal and organizational change than you have seen since 1990. Unlike the past 15 years, this change curve is much steeper and will cause far more disruption *and* opportunity. Last month I introduced you to three digital accelerators that are driving this new change curve: computer processing power, bandwidth, and storage.

#### *Processing Power*

Let's take the three accelerators one at a time. "Moore's Law" states that computer processing power doubles every 18 months. It has been that way since the mid-1970s (when the rate slowed somewhat) and, thanks to constant innovation, it shows no convincing evidence of abating again for at least another decade or more. Gordon Moore, the co-founder of Intel, first made this observation in 1965, and his name has been attached to it ever since. What's driving PC growth? Moore's Law. What's driving the computer-like functions of cell phones? Moore's Law. The ever-increasing ability of a car to diagnose its own impending repair problems? Photo-realistic computer gaming? Moore's Law.

#### *Storage*

The second digital trend accelerator is storage. The capacity to store digital data is doubling every 12 months, even faster than computer processing power. Have you seen an Apple computer television ad lately? No? That's because the I-Pod, basically a smart music storage device, is their newest cash cow driving profits and, as a major benefit, increasing Apple computer sales.

#### *Bandwidth*

Finally, there's bandwidth. A full page of English text is about 16,000 bits. A dial-up modem can send 56 kilobytes in 1 second. In contrast, many offices, as well as homes, have a broadband connection clocked at 1.54 megabytes a second. Screamingly fast bandwidth, which is doubling every 9 months, is primarily being generated by advances in fiber-optic technology, and implementation of new wireless broadband technology.

#### *Sweeping Change*

The relentless doubling of processing power, storage, and bandwidth form the epicenter of sweeping large-scale innovations that will transform how we live, work and play for the next two decades. Does that mean that the recent buzz about nanotechnology, biotech, robotics and the like has been a lot of hype? Not at all! Those are destined to be extremely potent change agents, and their development will be accelerated by decades, thanks to the concentrated force of processing power, storage, and bandwidth.

#### *Transformation*

A statistical model showing the doubling of the number 1 every year would display data points on a curve that rises gradually for the first 5 years, turns sharply steeper at 10 years out, then quickly blasts off toward a 90-degree ascent and goes straight up and off the chart. In the case of processing (**Continued on Page 2**)

**Acceleration<sup>3</sup> (contd. from p.1)**

power alone, this exponential growth rate has been occurring for 40 years. For example, to go from a 5-megahertz chip to a 500-megahertz chip took 20 years; however, the jump from 500 megahertz to 1gigahertz (1000 million hertz) took place in only 8 months, and that was several years ago. The pace is astounding. The other two technologies have been at it for a couple of decades and are racking up even hotter numbers. For example, companies such as Motorola and Cisco have recently crated methods for increasing broadband speed between 400% and 1,600%. What the resulting vertical lines on the chart tell us is that transformation is about to replace change as the business headache du jour. Disruptive change is only disruptive if you didn't know about it ahead of time. Now that you know the forces that will drive the change curve higher, it is imperative that you take advantage of the opportunities for creating new products and services that are coming our way.

**TECHNOLOGY NEWS HIGHLIGHTS****PICTURE THIS!**

A new entertainment system called *duo* – expected to be released in May – will literally redefine how we view television. By combining "blue-screen" visual effects with interactive video technology, the new device is capable of putting the viewer right into the picture to become an active participant in the entertainment experience. The system is connected through a video or DVD player, and contains a camera, which captures the image of the user against a blue-screen background. By filtering out the background, the viewer's image can then be superimposed onto whatever scene is playing on the TV. In addition to enhancing entertainment, the interactive system will also be used in training and education environments to develop more realistic simulations.

For information: SBS Interactive, 4211 Yonge Street, Suite 235, Toronto, Ontario M2P 2A9, Canada; phone: 416-223-9293; Web site: [www.sidebyside.tv/intro.html](http://www.sidebyside.tv/intro.html); fax: 416-223-4046

**ELECTRONIC PAPER**

The future of display technology is thin and flexible, and Scottish researchers are paving the way with a revolutionary thin-film material that is not only robust but is also inexpensive to produce. The electronic paper is made up of tiny spheres that act as pixels, and are encased in a plastic sheet. One half of the sphere is white and the other is black. Varying the electrical charge applied to each sphere changes its orientation to the viewing surface. In this way, words and images can be arranged to look much like ink printed on paper. The paper reflects ambient light, so images do not wash out even in bright sunlight. There is no limit to the size of the display so they can be used for anything from price tags to television sets to billboards. They could even be used to create 360-degree screens for virtual reality and advanced simulation environments.

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**DNA CHIP SENDS ITS OWN RESULTS**

DNA chips have the potential to revolutionize medicine by determining a person's predisposition to diseases and response to specific drugs. The information the chips provide can be used to tailor medical treatment for each individual. However, the current methods for analyzing these chips are expensive and cumbersome. Now, scientists at Hitachi have developed a chip that uses RFID technology to simplify the process. The new chip incorporates its own passive transmitter that is activated by an external power unit.

To detect a specific DNA sequence, the corresponding chip is placed into a solution containing the sample DNA. If the gene is present, an enzyme on the chip emits light, which is detected by a built-in optical sensor. The transmitter then sends a signal to the receiver indicating the presence of that gene. The researchers believe that up to 100 gene variations could be measured at one time in the same sample. The data can be transmitted from within a sealed container so there is less chance of cross-contamination or risk of infecting workers. And since the chips use conventional off-the-shelf RFID technology, the cost to implement is fairly low. One day, these devices may be used in clinics and doctors' offices to determine which drugs will be most beneficial for a given patient.

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## **BREATHALYZER TEST FOR CANCER**

Early detection is key to successfully treating many forms of cancer, and now it may be as simple as taking a breath test. A new device called the Lungscan, developed by a physician at New York Medical College, has a sensitivity rating that is one billion times that of a standard breathalyzer. The device is capable of detecting around 200 different chemicals that may be present in a person's breath, some of which are markers for cancer. The National Institutes of Health is currently conducting a large, multi-center study to confirm the results of earlier studies, which indicated that 85 percent of lung cancers and 88 percent of breast cancers were detected using the Lungscan device. If all goes well, Lungscan could provide a safe, inexpensive means of screening large numbers of people and catching certain types of cancer before they enter advanced stages. The company is also working on breath screening tests for pulmonary tuberculosis and ischemic heart disease.

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## **PORTABLE MRI SYSTEM**

Magnetic resonance imaging (MRI) and nuclear magnetic resonance (NMR) have proven to be extremely valuable for identifying the chemical and physical makeup of living organisms as well as inert objects. The drawback to such tests, however, is that the magnets required to generate adequate fields are so large that portability is out of the question. In addition, they must be positioned around the subject in all directions in order to maintain a uniform magnetic field. As a result the applications for such testing have been limited to what can be done in a lab or a clinical setting. But recently, scientists in Germany reported that they have developed a "single-sided" sensor, about the size of a phone book, which can project a uniform, pea-sized field just above its trough-shaped magnet. Current portable MR probes are only capable of crude measurements. This development represents the first single-sided MR device that is capable of generating a field strong enough to accurately identify chemical signatures. As the technology is further developed, uses may include archeological exploration and assessment of oil reserves as well as medical diagnostics.

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## **NEW ROLE FOR LEDs**

When most people think of LEDs they usually envision a control panel filled with blinking lights that are red or green, sometimes yellow, and possibly blue. This wide array of colors makes them ideal for

displays and status indicators, but not very useful for general lighting applications – until now. New advancements in phosphors – the materials that give LEDs a characteristic color – have now made it possible to manufacture white-light LEDs, opening up a whole new market for LED technology. Applications will include backlighting for liquid crystal displays and keypads, camera flashes, and signs, as well as automotive and architectural lighting.

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## **HIGH QUALITY, LOW COST HOUSING**

Researchers at Argonne National Laboratory have teamed up with a construction firm to find an answer to the need for quality, low-cost housing throughout the world. What they developed is a new ceramic, called Grancrete, that can be sprayed onto a simple Styrofoam frame to create a strong, durable structure at a cost of only \$10 per square foot (as compared to \$150 per square foot for typical U.S. construction). Made primarily from magnesium oxide and potassium phosphate, Grancrete is actually stronger than concrete and dries in one day, as compared to up to three weeks for concrete. It's fire resistant, holds up in hot climates as well as cold, and has excellent insulating properties. The new material will help provide housing to many of the world's poorest in developing nations. With only two days of training, a team of five people can erect a simple home in a single day.

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## **COMPUTERS WITHOUT TRANSISTORS**

Semiconductor circuits are the lifeblood of computers, and rapid advancements in semiconductor technology continue to produce faster and faster processors every year – so much so that, eventually, we will reach a point where the size and speed of circuits will be constrained by the physical limitations of the silicon itself. That's why engineers at Hewlett-Packard are already working on a replacement. The new technology, called a "crossbar," consists of an array of wires that criss-cross each other, separated by a single layer of molecules. Research has shown that they can store data, filter noisy data, or be linked with other components to perform any logic function. In theory, such devices will enable faster, more efficient performance than even the most advanced silicon counterparts.

For information: Phil Kuekes, Hewlett-Packard, Quantum Science Research, Palo Alto, CA; Web site: [www.hpl.hp.com/research/qsr](http://www.hpl.hp.com/research/qsr)

## **MORE EFFICIENT WELDING**

Researchers at Battelle recently received high praise from the Society of Automotive Engineers for developing a method of predicting fatigue life in welded components. Referred to as the Verity™ mesh-insensitive structural stress method, it could potentially save billions of dollars in expensive testing and over-engineering that has been done in the past because of uncertainty over current fatigue prediction practices. Ford Motor Company has already started using the new technique, which is expected to reduce costs by millions of dollars per year. Other industries that stand to benefit from this development include bridge building, pipeline construction, aerospace, shipbuilding, and offshore oil rigs.

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