Providing information on technological advances, applications, and business news to nanotechnology professionals across the globe

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In This Issue

- **NASA Nanotechnology to Improve Microelectronics**

NASA Ames Research Center, located in California's Silicon Valley, and Nanoconduction, Inc., Sunnyvale, Calif., are launching a new partnership to advance scientific and commercial utilization of NASA's innovative nanotechnology research by developing better cooling systems for microelectronics.

Nanotechnology is the ability to control or manipulate matter on the atomic scale, making it possible to create structures, devices and systems that have novel properties and functions because of their small size, approximately 1/10,000th the diameter of a human hair. Carbon nanotubes are extremely efficient at the transfer of heat, and are especially useful because of their small size, light weight, and mechanical strength.

"Reliable thermal protection for spacecraft and advanced instrument electronics is essential if NASA is to enable the nation's Vision for Space Exploration," said NASA Ames Center Director G. Scott Hubbard. "Our goal is to provide nanotechnology-based products to NASA as quickly as possible, in order to benefit missions in the near- term, as well as the longer term. Nanoscience has the potential to help NASA rapidly develop state-of- the-art systems in terms of performance, size, and weight," Hubbard

Nanotechnology Colloquium Series

concluded.

To Read This Article on the NASA Site, Click Here

- **The Hydrogen Economy**

This article was authored by George W. Crabtree, Mildred S. Dresselhaus, and Michelle V. Buchanan and published in Physics Today.

George Crabtree is a physicist in the materials science division at Argonne National Laboratory in Illinois. Mildred Dresselhaus is a professor in the department of physics and the department of electrical engineering and computer science at the Massachusetts Institute of Technology in Cambridge. Michelle Buchanan is a chemist in the chemical sciences division at Oak Ridge National Laboratory in Tennessee.

If the fuel cell is to become the modern steam engine, basic research must provide breakthroughs in understanding, materials, and design to make a hydrogen-based energy system a vibrant and competitive force.

Since the industrial revolution began in the 18th century, fossil fuels in the form of coal, oil, and natural gas have powered the technology and transportation networks that drive society. But continuing to power the world from fossil fuels threatens our energy supply and puts enormous strains on the environment. The world's demand for energy is projected to double by 2050 in response to population growth and the industrialization of developing countries.1 The supply of fossil fuels is limited, with restrictive shortages of oil and gas projected to occur within our lifetimes. Global oil and gas reserves are concentrated in a few regions of the world, while demand is growing everywhere; as a result, a secure supply is increasingly difficult to assure. Moreover, the use of fossil fuels puts our own health at risk through the chemical and particulate pollution it creates. Carbon dioxide and other greenhouse gas emissions that are associated with global warming threaten the stability of Earth's climate.

To Read This Article, Click Here

- **Nanotechnology set to get funding boost, declares Lu**

2004-12-17 / Central News Agency

Taiwan authorities are planning to spend NT$21.5 billion (US$663.27 million) over six years on a national project to develop the nanotechnology and relevant industries, Vice President

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Annette Lu said yesterday.

Addressing the 2004 Taiwan Chemical Technology Forum at the Taipei International Convention Center, Lu said the goal of the project is to create an output value of NT$300 billion in the nanotechnology industry by 2008, with more than 800 companies in the business, while by 2012, the output will expand to NT$1 trillion, with over 1,500 companies in the sector.

The project is expected to help local industries to upgrade or transform and to further sharpen Taiwan's national competitiveness, she noted.

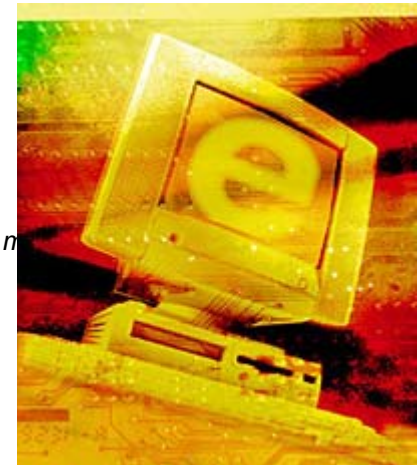
In her speech, the vice president pointed out that Taiwan is now in good shape in terms of technological development compared with other countries in the world, quoting the 2004 global competitiveness report of the Switzerland-based World Economic Forum.

The forum put Taiwan in first place in Asia and second in the world in terms of national competitiveness in technological manufacture and research.

Despite the achievement, Lu said, Taiwan must still try to seek advanced development to maintain its competitiveness. She raised the island's chemical technology industry as an example, saying that the sector's output has amounted to NT$2.2 trillion, a figure that makes the sector one of the country's most important basic industries.

The industry is closely connected to a broad spectrum of manufacturing sectors, including petrochemicals, plastics, rubber, high-tech textiles, chemical textiles, high-tech electronics and semiconductors, Lu said, noting that the sectors' demand for key chemical raw materials is expected to reach NT$600 billion by 2006.

- **Smart Dust Advances in Russia**



"FutureTech"

Written by Bill Robinson & Natasha Starkell for Gateway2Russia by Bill Robinson bill@relentlessmarketing.com

Smart Dust is going to be something really special. But not just yet. Like a toddler learning to walk by

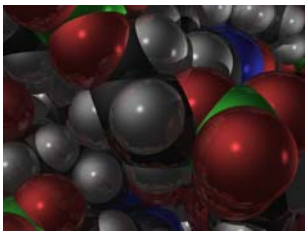
"furniture cruising," staggering wobbly from stationary object to object, Smart Dust is looking for its sea legs.

The birth of Smart Dust potential was based on RFID (Radio Frequency Identification) and the journey toward full-on Distributed-Sensing Smart Dust-which is the goal for final evolution of this technology--will be a long and arduous one.

First thorny issues such as cost (perhaps the most important early consideration); industry and platform standardization (which are in the throes of coming together right now); infrastructure (the crucial chip, semiconductor and hardware development), connectivity (How will these motes communicate with each other and what's the best base station in the future? Bluetooth? Wi-Fi? WiMax? Or some other, as yet undiscovered communications technology?); software (getting the necessary programs and applications right); and responding to the needs of the marketplace are all very critical areas. RFID is beginning to steady itself in terms of development but it will require a link of some kind in order to mature and move into the Smart Dust world. This link, I believe, will be Wireless Sensor Networks (WSN). As the new networking structures proliferate (think the Internet, as the latest and greatest "network" of them all), and the customers such as corporations, governments and others use these wireless sensing networks more and more, the inevitable result will be a progression to Smart Dust.

To Read This Article on the Gateway to Russia Site, Click Here

- **DNA For Information Processing and Data Storage**



The DNA molecule--nature's premier data storage material--may hold the key for the information technology industry as it faces demands for more compact data processing and storage circuitry. A team led by Richard Kiehl, a professor of electrical engineering at the University of Minnesota [profile], has used DNA's ability to assemble itself into predetermined patterns to construct a synthetic DNA scaffolding with regular, closely spaced docking sites that can direct the assembly of circuits for processing or storing data.

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The scaffolding has the potential to self-assemble components 1,000 times as densely as the best information processing circuitry and 100 times the best data storage circuitry now in the pipeline. Members of the team first published their innovation in 2003, and they

have now refined the technique to allow more efficient and more versatile assembly of components. The new work, which was a collaborative effort with chemistry professors Karin Musier-Forsyth and T. Andrew Taton at Minnesota and Nadrian C. Seeman at New York University, is reported in the December issue of Nano Letters, a publication of the American Chemical Society.

"There's a need for programmability and precision on the scale of a nanometer--a billionth of a meter--in the manufacture of high-density nanoelectronic circuitry," said Kiehl. "With DNA scaffolding, we have the potential for arranging components with a precision of one-third of a nanometer.

"In a standard silicon-based chip, information processing is limited by the distance between units that process and store information. With DNA scaffolding, we can lay out devices closely, so the interconnects are very short and the performance very high."

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- **Pricey Big Screen TVs Headline Trade Show (Reuters)**

By Franklin Paul and Ben Berkowitz

LAS VEGAS - Televisions big enough to cover living-room walls were the showstoppers at the main U.S. technology convention of 2005 on Wednesday as technology companies said avid fans would pay more for an advanced screen than a luxury car.

Major consumer brands Sony Corp (news - web sites). (6758.T), Panasonic (6752.T) of Japan, Thomson RCA (TMS.PA) of France and LG (066570.KS) of Korea, among others, unveiled scores of glitzy new televisions, music players and related accessories, joined by makers of everything from computers to satellite radios seeking a piece of the huge U.S. market.

The Consumer Electronics Association forecast on Tuesday that boom times lie ahead, estimating 2004 revenue grew 11 percent to an estimated $113.5 billion in 2004 and will grow 11 percent in 2005, to $125.7 billion, the first time in 10 years of consecutive, year-on-year double-digit growth.

"It's a good time to be in the North American TV industry," said Al Arras, president of TTE Corp., a consumer electronics joint venture between Thomson RCA and TCL

of China.

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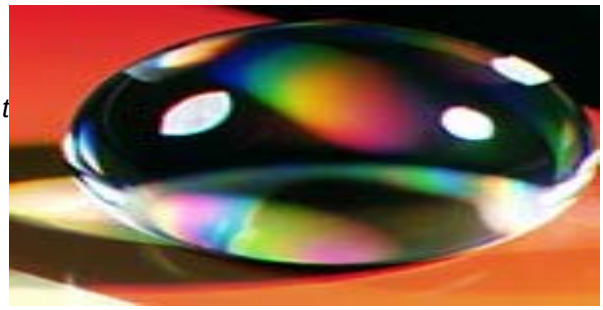
- **mPhase's Next Phase: Nanobatteries**



by Matt Kelly, Small Times Correspondent

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In more ways than one, it's a delicate balancing act that mPhase Technologies Inc. wants to execute.

First is the company's technology: making a nanobattery by placing droplets of water on filaments of silicon. A jolt of electricity then bursts the droplet, it soaks the silicon, and pent-up energy is released.

Then there is the company itself. Eight years old, mPhase was founded to sell telecommunications components. Leveraging that business to leap into the uncertain world of nanotechnology is quite a jump.

"Frankly, it's really a branch into a new field," admitted Steve Simon, mPhase's vice president of engineering.

To Read Entire Article on the Small Times Site, Click Here

- **Aligned Nanotubes Accommodate Bone**

From Technology Review.com

Natural tissues grow from the ground up molecule by molecule, and in many cases the alignment of each molecule matters. Researchers from Purdue University have found that artificial joints can be improved by mimicking the alignment of collagen fibers and natural ceramic crystals in real bones.

Bones are made from proteins and ceramic crystals whose dimensions are on the nanometer scale; the components of bone are also fiber-like. With this in mind, the researchers are using nanoscale materials that are fiber-like.

Today's nanotechnology techniques make it possible to

orient carbon nanotubes and filaments in implant material. Carbon nanotubes are rolled-up sheets of carbon atoms that can be narrower than a nanometer, which is one millionth of a millimeter, or the span of 10 hydrogen atoms.

The researchers' petri-dish experiments show that orienting artificial joint material nanotubes in the same direction made bone cells attach better to the material. It also stimulated the growth of more new bone tissue, which is important for anchoring implanted artificial joints. Finding better artificial joint material is motivated in part by the 15-year lifespan of today's artificial joints.

Aligning the molecules in materials may also make them stronger, according to the researchers.

The researchers used two methods to align nanotubes: aligning a mix of nanotubes and plastic using electric current, and pouring nanotubes into narrow channels on a silicon oxide surface.

The researchers had previously shown that bone- forming cells grow more readily on carbon nanotubes materials than the titanium used in implants.

The material could be used in practical implants in 10 to 15 years, according to the researchers. They presented the research at the Biomedical Engineering Society annual meeting held in Philadelphia October 13 to 16, 2004.

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