Volume 3, Issue 26 ■ 28JUNE2013

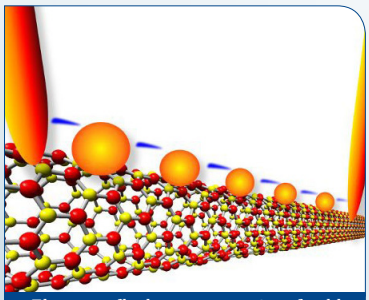
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Beyond silicon: Transistors without semiconductors

Nanowerk, 21JUN2013



Electrons flash across a series of gold quantum dots on boron nitride nanotubes. Michigan Tech scientists made the quantum-tunneling device, which acts like a transistor at room temperature, without using semiconducting materials. (Graphic: Yoke Khin Yap)

Using lasers, researchers at Michigan Technological University placed quantum dots (QDs) of gold as small as three nanometers across on the tops of the BNNTs (boron nitride nanotubes), forming QDs-BNNTs. BNNTs are the perfect substrates for these quantum dots due to their small, controllable, and uniform diameters, as well as their insulating nature. TECHNICAL ARTICLE

Tags: Microelectronics, Advanced materials, Featured Article

Scientists Identify Emotions Based On Brain Activity

Science Daily, 19JUN2013

Researchers at Carnegie Mellon University combined functional magnetic resonance imaging (fMRI) and machine learning to measure brain signals to accurately read emotions in individuals. The findings illustrate how the brain categorizes feelings, giving researchers the first reliable process to analyze emotions. TECHNICAL ARTICLE

Tags: Neuroscience, Featured Article

What Do Memories Look Like?

Science Daily, 19JUN2013

Researchers at USC engineered microscopic probes that light up synapses in a living neuron in real time by attaching fluorescent markers onto synaptic proteins—all without affecting the neuron's ability to function. TECHNICAL ARTICLE

Tags: Neuroscience, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Pin-sized battery printed in 3D packs a powerful punch

Nature News, 24JUN2013

Researchers at Harvard University have developed a new lithium-ion battery which is one of the smallest ever made and the first battery to be created with a three-dimensional printer. Measuring less than a millimetre on each side, it fits comfortably on the head of pin and could potentially power tiny medical devices or miniature robots.

Tags: Advanced manufacturing, Battery

ADVANCED MATERIALS

Extreme insulating-to-conducting nanowires promise novel applications

PhysOrg.com, 24JUN2013

Researchers at Brookhaven National Laboratory have studied nanowires made of vanadium oxide bronze and measured drastic, never-before-seen transitions from insulator to conductor. Their work also hints at what happens at the atomic-level. TECHNICAL ARTICLE

Tags: Advanced materials

Graphene Gets Some Competition

IEEE Spectrum, 24JUN2013

Rounded up here are some of the most promising materials on the 2-D scene. Some offer smaller and less power-hungry transistors that could be used for future logic and memory chips. Others could be ideal for computing with light and for other far-out applications. Some may work in concert with one another or with graphene, while others are direct competitors.

Tags: Advanced materials

Researchers ID Thousands of Organic Materials for Use in Solar Cells

MIT Technology Review, 24JUN2013

Harvard researchers have computationally screened 2.3 million organic molecules for properties relevant to photovoltaic applications and then organized them into a

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searchable, sortable database. The new library, open to the public will help guide the search for new organic photovoltaic materials.

Tags: Advanced materials

Scientists use electron 'ink' to write on graphene 'paper'

PhysOrg.com, 24JUN2013

Researchers from Denmark and China have demonstrated a simple yet effective way to write and draw on the nanoscale by using an electron beam to selectively break the carbon atoms in single-layer graphene. TECHNICAL ARTICLE

Tags: Advanced materials, S&T China

Ferroelectric-graphene-based system could lead to improved information processing

MIT News, 21JUN2013

Researchers at MIT have proposed a new system that combines ferroelectric materials—the kind often used for data storage with graphene. The resulting hybrid technology could eventually lead to computer and data-storage chips that pack more components in a given area and are faster and less power-hungry. TECHNICAL ARTICLE

Tags: Advanced materials

Wearable electronics—Highly conductive textiles and paper with aluminum

Nanowerk, 20JUN2013

Researchers in Korea have developed a simple, affordable approach for making conductive textile and paper fibers with aluminum. The paper or textile fibers are first pre-treated with a titanium-based catalyst and then dipped into a solution of an aluminum hydride composite solution. The catalyst is needed to allow the subsequent conversion of the aluminum compound to metallic aluminum to occur at room temperature. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Tofu Squishing, UAV Tricks, and Robots with Too Many Legs

IEEE Spectrum, 21JUN2013

Raytheon posted a new (old) video of their Phalanx CIWS (close-in weapon system), which is an impressive piece of hardware, able to toss 4,500 armor piercing tungsten rounds at incoming threats every minute.

Tags: Autonomous systems & robotics

ENERGY

Better droplet condensation could boost power efficiency

MIT News, 21JUN2013

Researchers at MIT have developed an innovative approach to improving heat transfer in power plants and cooling systems. The new system could provide a 100 percent improvement in the efficiency of heat transfer over conventional systems. TECHNICAL ARTICLE

Tags: Energy

Particle accelerator that can fit on a tabletop opens new chapter for science research

EurekAlert, 21JUN2013

Researchers at the University of Texas in Austin have accelerated about half a billion electrons to 2 gigaelectronvolts over a distance of about 1 inch. It's a downsizing of a factor of approximately 10,000. Until now that degree of energy and focus has required a conventional accelerator that stretches more than the length of two football fields.

Tags: Energy, Nuclear energy

Uncovering Quantum Secret in Photosynthesis

Science Daily, 20JUN2013

Researchers in the EU have been able to show for the first time at ambient conditions that the quantum mechanisms of energy transfer make phyotosynthesis more robust in the face of environmental influences. This discovery could lead to new research lines aiming at the developments of a new generation of solar cells that mimic these quantum coherences for efficient energy transfer. TECHNICAL ARTICLE

Tags: Energy, S&T EU

DNA Constructs Antenna for Solar Energy

Science Daily, 19JUN2013

By combining self-assembling DNA molecules with simple dye molecules, researchers in Sweden have created a system that resembles nature's own antenna system. TECHNICAL ARTICLE

Tags: Energy, Solar energy

ENVIRONMENTAL SCIENCE

Getting the carbon out of emissions

MIT News, 25JUN2013

Researchers at MIT have come up with a scrubbing system to remove CO2 that requires no steam connection, can operate at lower temperatures, and would essentially be a "plug-and-play" solution that could be added relatively easily to any existing power plant. It could be useful for submarines or spacecraft, where carbon dioxide can accumulate to levels that could endanger human health. TECHNICAL ARTICLE

Tags: Environmental science, Energy

Man-made particles affect hurricane frequency, study finds

PhysOrg.com, 23JUN2013

In a study, researchers in the UK found that higher levels of air pollution reduced the frequency of North Atlantic hurricanes and other tropical storms for most of the 20th century. The study focused on particles from North America and Europe that were generated mainly from burning fossil fuels. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

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"Engineers use knowledge to design, produce, and operate artifacts. … Scientists, use knowledge primarily to generate more knowledge." WALTER VINCENTI

INFORMATION TECHNOLOGY

How to convert a PDF file into a Word file

Digital Trends, 21JUN2013

In this quick tutorial, we'll show you the easiest way to convert PDF files into the .DOCX format—with or without using Adobe Acrobat. We've also included a free method for converting large batches of PDFs simultaneously.

Tags: Information Technology

MATERIALS SCIENCE

Scientists solve riddle of strangely behaving magnetic material

PhysOrg.com, 21JUN2013

While most materials tend to lose magnetism at higher temperatures, pure LaCoO3 is a non-magnetic semiconductor at low temperatures, but as the temperature is raised, it becomes magnetic. Researchers at Ames Laboratory found that a small rhombohedral distortion of the LaCoO3 lattice structure, which had largely been ignored, was key. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

Changing the Transistor Channel—Ending silicon's central role in transistors could maintain the march of Moore's Law

IEEE Spectrum, 24JUN2013

To keep Moore's Law going chipmakers are taking aim at the current-carrying channels at the very heart of the device, replacing the silicon there with germanium and compound semiconductors known as III-Vs. If all goes well, these materials could usher in a new generation of speedier, less power-hungry transistors, allowing for denser, faster, cooler-running chips.

Tags: Microelectronics

Atomically-flat transistors show promise for next generation green electronics

Nanowerk, 21JUN2013

Researchers at UC Santa Barbara, in collaboration with University of Notre Dame, have recently demonstrated the highest reported drive current on a transistor made of a monolayer of tungsten diselenide (WSe_2), a 2-dimensional atomic crystal categorized as a transition metal dichalcogenide (TMD). The discovery is also the first demonstration of an "n-type" WSe_2 field-effect-transistor (FET), showing the tremendous potential of this material for future low-power and high-performance integrated circuits. TECHNICAL ARTICLE

Tags: Microelectronics

Organic Electronics: A Faster Way to Move Electrons

Science Daily, 19JUN2013

Researchers in Singapore have developed a polymer for solution-based OFET processing that has inherently high carrier mobility and extraordinary air stability. The polymer has specifically designed hydrogen bond interactions that create ordered networks for transporting electrons and holes. TECHNICAL ARTICLE

Tags: Microelectronics, Advanced materials

Sound Waves Precisely Position Nanowires

Science Daily, 19JUN2013

Using sound waves researchers at Penn State can place nanowires in repeatable patterns for potential use in a variety of sensors, optoelectronics and nanoscale circuits. They can tune the pattern to the configuration they want and then transfer the nanowires using a polymer stamp. This would save a lot of time compared to lithography or other static fabrication methods. TECHNICAL ARTICLE

Tags: Microelectronics

Transistor Made from Just One Molecular Monolayer Made to Work On Computer Chip

Science Daily, 19JUN2013

The molecular integrated circuit was created by rersearchers in Denmark. The breakthrough was made possible through an innovative use of the two dimensional carbon material graphene. TECHNICAL ARTICLE

Tags: Microelectronics

NEUROSCIENCE

Whole Human Brain Mapped in 3D (w/video)

Scientific American, 23JUN2013

An international group of neuroscientists has sliced, imaged and analyzed the brain of a 65-year-old woman to create the most detailed map yet of a human brain in its entirety. The atlas, called 'BigBrain', shows the organization of neurons with microscopic precision, which could help to clarify or even redefine the structure of brain regions obtained from decades-old anatomical studies.

Tags: Neuroscience

Online games offer trove of brain data

Nature News, 21JUN2013

By trawling through data from 35 million users of online 'brain-training' tools, researchers at Lumos Labs in Caligornia, have conducted a survey of what they say is the world's largest data set of human cognitive performance.

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Their preliminary results show that drinking moderately correlates with better cognitive performance and that sleeping too little or too much has a negative association.
Tags: Neuroscience, Big Data

PHOTONICS

Light wheel—New type of light wave extends the possibilities in nanotechnology

Nanowerk, 24JUN2013

Researchers at the Max Planck Institute in Germany are now able to use a laser to cause tiny particles to rotate around an axis perpendicular to the light beam—a particle thus rotates like the wheel of a bicycle in its direction of motion. The researchers achieved this by creating a photonic wheel: light with purely transverse angular momentum. TECHNICAL ARTICLE
Tags: Photonics, Breakthrough technology, S&T Germany

New Method for Achieving Nonlinear Optical Effects: Method Could Be a Step Toward Quantum Computing

Science Daily, 20JUN2013

Researchers at Northwestern University have proposed a new method for realizing nonlinear optical effects that is more practical than previous methods. The results represent a step forward toward quantum computing and could also have interdisciplinary applications in areas like gravity wave detection and biological microscopy. TECHNICAL ARTICLE
Tags: Photonics

Featured Resource

Nature.com web feeds

Provide headlines, summaries and links for all the new content published on their respective sites.

QUANTUM SCIENCE

Quantum Computing Continues to Move Closer to Reality - New Quantum Memory Design

SciTech Daily, 21JUN2013

Researchers from Dartmouth College and the University of Sydney are helping move quantum computing closer to reality, demonstrating a technique for storing quantum states with high fidelity for exceptionally long times. TECHNICAL ARTICLE
Tags: Quantum science, Communications Technology

Milestone for Quantum Networks: First Entanglement Between Light and an Optical Atomic Coherence

Science Daily, 19JUN2013

Using clouds of ultra-cold atoms and a pair of lasers operating at optical wavelengths, researchers at Georgia Institute of Technology have reached a quantum network milestone: entangling light with an optical atomic coherence composed of interacting atoms in two different states. The development could help pave the way for functional, multi-node quantum networks. TECHNICAL ARTICLE
Tags: Quantum science, Communications Technology

S&T POLICY

Technology for the next generation

PhysOrg.com, 24JUN2013

The European Commission has identified luminescent materials as a key technology in the future. In order to further develop this area, a network of 13 research institutes and companies will be training talented young people to form the next generation of leading experts in this field.
Tags: S&T policy, S&T EU

SCIENCE WITHOUT BORDERS

Plants Do Sums to Get Through the Night

Science Daily, 24JUN2013

Researchers in the UK show that to prevent starvation at night, plants perform accurate arithmetic division. The calculation allows them to use up their starch reserves at a constant rate so that they run out almost precisely at dawn. TECHNICAL ARTICLE
Tags: Science without borders, S&T UK

Current Global Food Production Trajectory Won't Meet 2050 Needs

Science Daily, 19JUN2013

Crop yields worldwide are not increasing quickly enough to support estimated global needs in 2050, according to a study by researchers at the University of Minnesota. TECHNICAL ARTICLE
Tags: Science without borders

SENSORS

A Microphone That Listens With Light: Microphones Have Hyper-Acute Hearing and a Sense of Direction

Science Daily, 18JUN2013

A sensor developed by scientists in Norway will help to make microphones hypersensitive. With this technology a microphone will be able to "see" where the sound comes from, pick up the voice of the person speaking, and filter out other sources of noise in the room.
Tags: Sensors

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STEM

Research Universities and the Future of America: Ten Breakthrough Actions Vital to Our Nation's Prosperity and Security

National Academies, 24JUN2013

The report responds to a request from Congress for "the top ten actions that Congress, the federal government, state governments, research universities, and others could take to assure the ability of the American research university to maintain the excellence in research and doctoral education needed to help the United States compete, prosper, and achieve national goals for health, energy, the environment, and security in the global community of the 21st Century. REPORT

Tags: STEM, S&T Policy ■

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