



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced manufacturing \(1\)](#)

[Advanced materials \(4\)](#)

[Autonomous systems & robotics \(2\)](#)

[Big data \(1\)](#)

[Communications technology \(1\)](#)

[Energy \(1\)](#)

[Forecasting \(1\)](#)

[Imaging technology \(1\)](#)

[Information technology \(3\)](#)

[Materials science \(4\)](#)

[Photonics \(2\)](#)

[Quantum science \(1\)](#)

[S&T policy \(4\)](#)

[Science without borders \(1\)](#)

[Sensors \(4\)](#)

[STEM \(1\)](#)

FEATURE ARTICLES

[Solid light could compute previously unsolvable problems](#)

[Science Daily, 09SEP2014](#)

Researchers at Princeton University are not shining light through crystal—they are transforming light into crystal. As part of an effort to develop exotic materials such as room-temperature superconductors, the researchers have locked together photons so that they become fixed in place. **TECHNICAL ARTICLE**

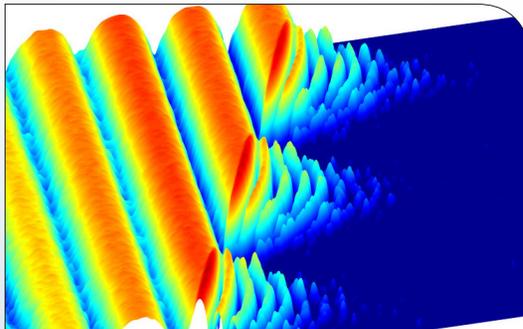
Tags: Photonics, Breakthrough technology, Featured Article

[Seeing below the surface: Ultra-thin, high-speed detector captures unprecedented range of light waves](#)

[Science Daily, 07SEP2014](#)

An international team of researchers (USA, Australia) has developed a detector that can see below the surface of bodies, walls, and other objects, with applications in emerging terahertz fields such as mobile communications, medical imaging, chemical sensing, night vision, and security. By utilizing the special properties of graphene, the team has been able to increase the speed and maintain the sensitivity of room temperature wave detection in the terahertz range. **TECHNICAL ARTICLE**

Tags: Sensors, Featured Article



Researchers at Princeton University have begun crystallizing light as part of an effort to answer fundamental questions about the physics of matter. Credit: Image courtesy of Princeton University, Engineering School

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Magnetic attraction](#)

[Harvard Gazette, 02SEP2014](#)

Harvard scientists have developed a system for using magnetic levitation technology to manipulate nonmagnetic materials, potentially enabling manufacturing with materials that are too fragile for traditional methods.

Tags: Advanced manufacturing

ADVANCED MATERIALS

[Phosphorus a promising semiconductor: Physicists find 2-D form pays no heed to defects](#)

[Science Daily, 09SEP2014](#)

Researchers at Rice University report that even when point defects or grain boundaries exist, the material's semiconducting properties are stable. Like perfect graphene—but unlike imperfect graphene—it performs as expected. They show it may be possible to tune the electronic properties of 2-D phosphorus by doping it with foreign atoms. **TECHNICAL ARTICLE**

Tags: Advanced materials, Materials science

[Nano-pea pod model widens electronics applications](#)

[Science Daily, 04SEP2014](#)

Periodic chain-like nanostructures are widely used in nanoelectronics. Some applications require localized electrons which are in a discrete energy spectrum. A new study by researchers in Russia identifies ways of disturbing the periodicity of a model nanostructure to obtain the desired discrete spectrum with localised electrons. **TECHNICAL ARTICLE**

Tags: Advanced materials, S&T Russia

[Breakthrough for carbon nanotube solar cells: Twice as efficient as current models](#)

[Science Daily, 03SEP2014](#)

Researchers at Northwestern University made a mixture of polychiral semiconducting nanotubes. This

continued...

[BACK TO TOP](#)

maximized the amount of photocurrent produced by absorbing a broader range of solar-spectrum wavelengths. The cells significantly absorbed near-infrared wavelengths, a range that has been inaccessible to many leading thin-film technologies. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Energy

[Turning oxide semiconductors into metal-like conductors](#)

[Nanotechweb, 02SEP2014](#)

Researchers at the University of Colorado demonstrate the synthesis of thin film or porous membranes made of hollow transparent conducting oxide (TCO) nanotubes. The tubes combine the attractive optoelectronic properties of oxide semiconductors with metal-like conduction. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

[Video Friday: Ollie Rolling, RoboRaven Flying, TurtleBot Curling](#)

[IEEE Spectrum, 05SEP2014](#)

In collaboration with Lockheed Martin, a team of research students and staff from Warsaw University of Technology successfully demonstrated the first phase of flight test and integration of unmanned aircraft platforms with an autonomous mission control system.

Tags: Autonomous systems & robotics

[Wanted: Insights to Guide Creation of Robotic Satellite-Servicing Capabilities in Geostationary Earth Orbit](#)

[DARPA News, 03SEP2014](#)

DARPA is considering a flight demonstration to introduce DARPA-developed space robotics capabilities in GEO within the next five years. They have issued an RFI seeking technical, security and business insights to support the agency's pursuit of these goals.

Tags: Autonomous systems & robotics, DARPA, Government S&T

BIG DATA

[Big Data: Creating the Power to Move Heaven and Earth](#)

[MIT Technology Review, 02SEP2014](#)

By 2020, about 1.7 megabytes of new information will be created every second for every human being on the planet, according to the annual [IDC Digital Universe](#) study. The vast majority of data never gets used, only 0.5 percent of all data is ever analyzed.

Tags: Big data

COMMUNICATIONS TECHNOLOGY

[Success in test of ultra-high-speed optical transmission up to distances of 10,000km](#)

[PhysOrg.com, 05SEP2014](#)

Researchers in Japan have achieved a successful transmission test of the world's top-level, 400Gbps/channel-class digital coherent optical transmissions technology. The test, with 400Gbps-class signals multiplexed up to 62 channels, verified fiber-optic transmissions of 12.4-24.8Tbps wavelength division multiplexed signals having different capacities for each modulation method at distances ranging from several thousand kilometers up to 10,000km.

Tags: Communications Technology, Optical communication, S&T Japan

ENERGY

[First-ever look inside a working lithium-ion battery \(w/video\)](#)

[Nanowerk, 08SEP2014](#)

Using a neutron beam, chemists and engineers at Ohio State University were able to track the flow of lithium atoms into and out of an electrode in real time as a battery charged and discharged. The study suggests that neutron depth profiling (NDP) could one day help explain why rechargeable batteries lose capacity over time, or sometimes even catch fire. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

FORECASTING

[US Army looks at Megacity Urban warfare the 2030s](#)

[Next Big Future, 02SEP2014](#)

A megacity disaster scenario was set in the "deep future," 2030 to 2040. Constructive simulation, using computers, was used to create a fictitious environment, weapons, and red, blue and green players.

Tags: Forecasting, Military technology

IMAGING TECHNOLOGY

[The Revolutionary Technique That Quietly Changed Machine Vision Forever](#)

[MIT Technology Review, 09SEP2014](#)

According to researchers at Stanford University the use of deep convolutional neural networks to classify 1.2 million high resolution images in the dataset into 1000 different classes in a competition was a turning point for machine vision. The best machine vision algorithms still struggle with objects that are small, thin or distorted with filters. But it is not going to be long before machines significantly outperform humans in image recognition tasks.

[TECHNICAL ARTICLE](#)

Tags: Imaging technology, Artificial intelligence

continued...

“Basic research, to which we owe everything, is relatively very cheap when compared with other outlays of modern society.” ALBERT SZENT-GYÖRGYI

INFORMATION TECHNOLOGY

High-performance computing crossing the barriers between clouds achieved

PhysOrg.com, 08SEP2014

Researchers in Japan have developed a technology with which once an environment to perform high-performance computing has been established, a virtual cluster-type computer can easily be built on a different cloud and made available for immediate use.

Tags: Information Technology

Artificial Intelligence: How Algorithms Make Systems Smart

Wired, 05SEP2014

Algorithms can make systems smarter, but without adding a little common sense into the equation they can still produce some pretty bizarre results.

Tags: Information Technology

Intel's new processor eliminates fans and passwords

Wired (UK), 05SEP2014

Intel has demonstrated a new type of mobile processor—the Core M—which the chip maker believes will usher in a new generation of tablets and 2-in-1 laptops that require no fan to keep it cool. The processors will come with speeds starting at 2.0GHz and max out at 2.6GHz for the fastest model.

Tags: Information Technology

MATERIALS SCIENCE

Ordinary materials, fantastic opportunities

PhysOrg.com, 08SEP2014

Researchers at MIT model the physics of structural materials to better understand how they degrade, and ultimately break down. They aim to use the models to design new materials that are resistant to radiation damage, fracturing, and corrosion. The result could be jet engines that run more efficiently, bridges and buildings that withstand earthquakes, and nuclear power plants that produce less waste.

Tags: Materials science

Stealthy and sticky: The chemical battle inside instantaneous graphene energy storage devices

Nanowerk, 08SEP2014

Researchers at Pacific Northwest National Laboratory found that two groups of atoms were slipping onto the surface and causing ions to stick, keeping charged particles from doing their job of storing and releasing electricity.

TECHNICAL ARTICLE

Tags: Materials science, Government S&T

Rethinking the basic science of graphene synthesis

Science Daily, 07SEP2014

An international team of researchers (USA, Japan) describes intercalation in which guest molecules or ions are inserted between the carbon layers of graphite to pull the single sheets apart. The results of this new understanding of intercalation in boron nitride and graphene could apply to many other layered materials of interest. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

Titania-based material holds promise as new insulator for superconductors

Science Daily, 04SEP2014

Researchers at North Carolina State University show that a type of modified titania holds promise as an electrical insulator for superconducting magnets allowing heat to dissipate while preserving the electrical paths along which current flows. Superconducting magnets are being investigated for use in next-generation power generating technologies and medical devices. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

PHOTONICS

Army's New Laser Cannon Blasts Drones Out of the Sky, Even in Fog

Wired, 05SEP2014

Boeing is building a laser cannon for the U.S. Army which has proved to be as capable at sea as on land. The High Energy Laser Mobile Demonstrator (HEL MD)—basically a high-energy laser mounted on top of a big truck—was successfully used to blast some UAV drones and 60mm mortars out of the Florida sky earlier this year.

Tags: Photonics, Military technology

QUANTUM SCIENCE

Google Launches Effort to Build Its Own Quantum Computer

MIT Technology Review, 03SEP2014

Google will try to make their own versions of the kind of chip inside a D-Wave machine. Google has not given up on D-Wave. The two companies will continue to work together. Google's D-Wave computer will be upgraded with a new 1,000 qubit processor when it becomes available.

Tags: Quantum science, Information technology

continued...

S&T POLICY

UT Arlington genomic data-mining framework to aid manufacturers discover desired materials

EurekaAlert, 08SEP2014

The project is part of the national Materials Genome Initiative which aims to discover, manufacture and deploy advanced materials faster, cheaper and more efficiently than current technology allows.

Tags: S&T policy

FEATURED RESOURCE

Perry-Castañeda Library Map Collection (UT Austin)

Includes a collection of online CIA and historical maps, worldwide coverage, and an extensive directory of links to other sites.

Hagel: US is losing its tech edge, needs new R&D strategy

Defense Systems, 05SEP2014

Increasingly worried that its technological edge is being eroded, the Defense Department is expected to launch a long-range strategy for technology research and development.

Tags: S&T policy

Put focus back on basic research, say science unions

Nature News, 03SEP2014

An unrelenting political push towards economic returns and short-term targets for research is endangering scientists' academic freedom in many countries around the world, the leading French researchers' union has warned. A survey of higher education and research unions in 11 countries including the US was led by France.

Tags: S&T policy

China's high speed rail dominance is built upon Tunneling expertise and dominance in tunnel boring machines

Next Big Future, 02SEP2014

At any given time, there are around 700 TBMs (Tunnel Boring Machines) running throughout China. If the Chinese Government approves the proposed Bohai Strait tunnel, then China will hold the record for the longest undersea tunnel at 122km – 2.5 times longer than the Channel Tunnel.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

Keeping upright: How much gravity is enough?

Science Daily, 03SEP2014

An international team of researchers (Canada, Germany) found that the threshold level of gravity needed to just influence a person's orientation judgment was about 15 per cent of the level found on Earth—very close to that on the moon. Martian gravity, at 38 per cent of that on Earth, should be sufficient for astronauts to orient themselves and maintain balance on any future manned missions to Mars.

TECHNICAL ARTICLE

Tags: Science without borders

SENSORS

Light detector to revolutionize night vision technology

Science Daily, 08SEP2014

An international team of researchers (USA, Australia) has developed a detector based on graphene that could revolutionize chemical sensing and night vision technology. The detector is capable of detecting light over an unusually broad range of wavelengths, including terahertz where sensitive light detection is most difficult.

TECHNICAL ARTICLE

Tags: Sensors

Multimodal graphene biosensor integrates optical, electrical, and mechanical signals

Nanowerk, 08SEP2014

Researchers at the University of Pennsylvania fabricated a graphene-based multimodal biosensing device, capable of transducing protein binding events into optical, electrical, and mechanical signals. It combines all the advantages of the respective single-mode sensors and achieves a 100 times improvement in the sensing dynamic range.

TECHNICAL ARTICLE

Tags: Sensors

Changing temperature powers sensors in hard-to-reach places

Science Daily, 03SEP2014

Researchers at Washington University have designed a device that harvests energy in any location where temperature changes naturally occur, powering sensors that can check for water leaks or structural deficiencies in hard-to-reach places and alerting users by sending out a wireless signal.

Tags: Sensors

STEM

Why Finland, Korea and Czech Republic get the most bang for their educational buck

The Conversation, 05SEP2014

Each year, governments spend trillions of dollars on their education systems. A new report published by London-based education consultancy GEMS Education Solutions, has highlighted which countries are using these most effectively to produce the best educational outcomes for their young people.

Tags: STEM ■

ABOUT THIS PUBLICATION

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To **SUBSCRIBE** or **UNSUBSCRIBE**, visit <https://tin-ly.sainc.com/ASDRE>. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com. This publication is authored and distributed by:

Office of Technical Intelligence (OTI)

Ms. Hema Viswanath, OTI Corporate Librarian