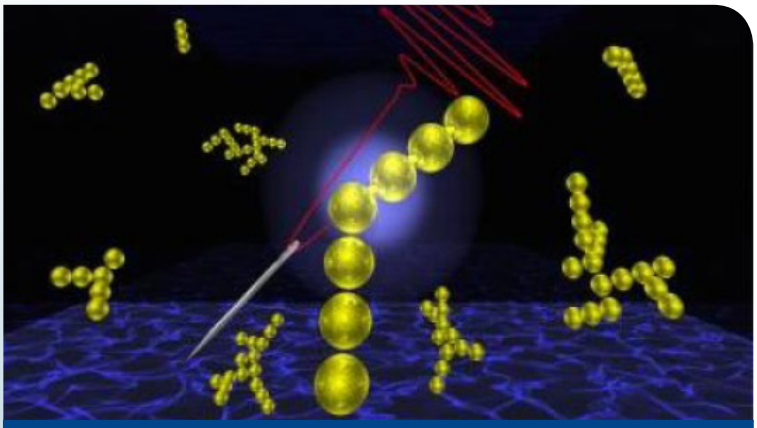
Volume 4, Issue 31 ■ 1AUG2014

# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS


Advanced manufacturing (1)
Advanced materials (4)
Autonomous systems & robotics (1)
Biotechnology (1)
Communications Technology (1)
Energy (3)
Government S&T (1)
Information Technology (3)
Materials science (4)
Neuroscience (1)
Photonics (1)
Quantum science (6)
S&T policy (1)
Science without borders (2)
Sensors (2)


## FEATURE ARTICLES



*This image depicts an efficient route to manufacturing nanomaterials with light through plasmon-induced laser-threading of gold nanoparticle strings.*

*Credit: Ventsislav Valev*

### Building 'invisible' materials with light

Science Daily, 28JUL2014

The technique developed by researchers in the UK involves using unfocused laser light as billions of needles, stitching gold nanoparticles together into long strings directly in water. These strings can then be stacked into layers one on top of the other, similar to Lego bricks. The method makes it possible to produce materials in much higher quantities than can be made through current techniques. TECHNICAL ARTICLE

*Tags: Breakthrough technology, S&T UK, Featured Article*

### Collecting just the right data: Algorithm helps identify which data to target

Science Daily, 25JUL2014

Researchers at MIT have developed a new technique that can identify the subset of data items that will yield the most reliable predictions when data is either difficult to collect or too time-consuming to process. Geologists trying to assess the extent of underground petroleum deposits, or meteorologists trying to forecast the weather, can make do with just a few, targeted measurements.

*Tags: Big data, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### Technique simplifies the creation of high-tech crystals

PhysOrg.com, 22JUL2014

Researchers at Princeton and Columbia universities have proposed a new method that could allow scientists to customize and grow photonic crystals. Highly purified crystals that split light with uncanny precision are key parts of high-powered lenses, specialized optics and, potentially, computers that manipulate light instead of electricity. TECHNICAL ARTICLE

*Tags: Advanced manufacturing, Advanced materials*

### ADVANCED MATERIALS

#### Dream come true for chemists? Creating organic zeolites

Science Daily, 24JUL2014

Using a mixed solvent with low solubility, researchers at the University of Delaware devised a way to slow down the polymer's intrinsic reactivity allowing it to be reversible. The new material can be used in catalysis, separations for chemicals production and hydrocarbon conversion for energy applications. TECHNICAL ARTICLE

*Tags: Advanced materials*

#### Lithium-doped graphene approaches the limits of transparency and conductivity

Nanowerk, 24JUL2014

Researchers at the University of Maryland and Australia doped few-layer graphene by inserting lithium in between the graphene layers. As a result of this electrochemical intercalation, the Fermi level is upshifted by the doping effect resulting in a more transparent and conductive material. TECHNICAL ARTICLE

*Tags: Advanced materials*

*continued...*

BACK TO TOP

### New approach to form non-equilibrium structures

Science Daily, 24JUL2014

Researchers at Northwestern University report that varying pH levels flipped the electric charges of the particles, causing them to oscillate and create the energy needed to assemble into non-equilibrium structures. They can create novel structures that are impossible to find in equilibrium conditions. Scientists could potentially determine how they want particles to interact and then tailor oscillations to lead to that outcome. TECHNICAL ARTICLE

*Tags: Advanced materials, Materials science*

### The birth of topological spintronics: New material combo could lead to more efficient computers

Science Daily, 23JUL2014

Researches from Penn State University and Cornell University study "spin torque" in devices that combine a standard magnetic material with a "topological insulator." The team's results show that such a scheme can be 10 times more efficient for controlling magnetic memory or logic than any other combination of materials measured to date. TECHNICAL ARTICLE

*Tags: Advanced materials*

## AUTONOMOUS SYSTEMS & ROBOTICS

### Video Friday: Jibo Update, N Robot Arms, and RoboCup

IEEE Spectrum, 25JUL2014

During Rim of the Pacific 2014 the U.S. Marines also got to test an autonomous ground vehicle, the Ground Unmanned Support Surrogate (GUSS)

*Tags: Autonomous systems & robotics*

## BIOTECHNOLOGY

### Wyss Institute's technology translation engine launches 'Organs-on-Chips' company

EurekAlert, 28JUL2014

Harvard University announced that its human 'Organs-on-Chips' technology will be commercialized by a newly formed private company to accelerate development of pharmaceutical, chemical, cosmetic, and personalized medicine products. This is a big step towards transforming medicine by developing breakthrough technologies and facilitating their translation from the benchtop to the marketplace.

*Tags: Biotechnology, Disruptive technology, Emerging technology*

## COMMUNICATIONS TECHNOLOGY

### Developing the next evolution in underwater communication

PhysOrg.com, 23JUL2014

The primary method of high-speed underwater communications uses acoustics which is plagued by noise. Researchers in Canada are looking at bringing in a new generation of computational algorithms, modifying and adapting them to this particular problem.

*Tags: Communications Technology, S&T Canada*

## ENERGY

### A new material, combined with a cheap tracking system, could unleash the promise of concentrated solar power.

MIT Technology Review, 30JUL2014

Researchers at a company in the US have developed an adaptive material which changes its reflectivity in response to heat from concentrated sunlight in a way that makes it possible to capture light coming in at different angles throughout the day. Combined with a cheap tracking system, it could unleash the promise of concentrated solar power.

*Tags: Energy, Solar energy*

### Researchers achieve 'holy grail' of battery design: A stable lithium anode

PhysOrg.com, 27JUL2014

Two challenges with lithium are that lithium ions expand as they gather on the anode during charging and a lithium anode is highly chemically reactive with the electrolyte. The nanosphere layer created by researchers at Stanford University resembles a honeycomb: it creates a flexible, uniform and non-reactive film that protects the unstable lithium from the drawbacks. TECHNICAL ARTICLE

*Tags: Energy, Battery*

### Nano-supercapacitors for electric cars

Science Daily, 24JUL2014

One of the main tasks of the EU sponsored ElectroGraph project is to develop new types of supercapacitors with significantly improved energy storage capacities. The electrodes they developed surpassed commercially available electrodes by 75 percent in terms of storage capacity.

*Tags: Energy, Advanced materials, S&T Germany*

## GOVERNMENT S&T

### Beyond GPS: 5 Next-Generation Technologies for Positioning, Navigation & Timing (PNT)

DARPA News, 24JUL2014

Several DARPA programs are exploring innovative technologies and approaches that could eventually provide reliable, highly accurate PNT capabilities when GPS capabilities are degraded or unavailable. Penny-sized inertial sensors, pulsed lasers and tracked lightning strikes are among novel approaches.

*Tags: Government S&T, Sensors*

*continued...*

"In all science, error precedes the truth, and it is better it should go first than last."

HUGH WALPOLE

## INFORMATION TECHNOLOGY

### Presentations collectively prepared

Fraunhofer Research News, 30JUL2014

On the Internet platform "SlideWiki," users can prepare, optimize and translate presentations collectively, just like Wikipedia, the platform on which it is modeled. Currently presentations from the field of information technology predominate. However, the portal is open to users from all scientific disciplines.

*Tags: Information Technology*

### Liquid bits could brim with data in future computers

New Scientist, 23JUL2014

Clusters of spheres can arrange themselves around a central sphere in a limited number of ways. To test the idea, researchers at the University of Michigan created a cluster of five spheres in a liquid and watched them naturally switch between two states, like the 0s and 1s of traditional computing bits. TECHNICAL ARTICLE

*Tags: Information Technology*

### A new multi-bit 'spin' for magnetic random access memory storage

Science Daily, 22JUL2014

An international team of researchers (USA, France) reports a new multi-bit MRAM storage paradigm with the potential to rival flash memory. At the heart of the team's work is a proprietary Magnetic Logic Unit technology, which enables the researchers to remotely control a sensor to probe various magnetic configurations. By identifying key features of the electrical responses obtained it is possible to infer the stored information. TECHNICAL ARTICLE

*Tags: Information Technology*

## MATERIALS SCIENCE

### Measuring the smallest magnets: Physicists measure magnetic interactions between single electrons

Science Daily, 28JUL2014

Researchers in Israel built an electric trap in which two electrons are bound to two strontium ions that are cooled close to absolute zero and separated by 2 micrometers. As the electron pairs were not affected by external magnetic noise, the interactions between them could be measured with great precision. The technique may prove useful in the development of atomic clocks, the study of quantum systems in a noisy environment and particle physics. TECHNICAL ARTICLE

*Tags: Materials science*

### New meaning to refrigerator magnets: Magnets may act as wireless cooling agents

Science Daily, 28JUL2014

In addition to the magnetic moments, magnons also conduct heat. From their equations, researchers at MIT found that when exposed to a magnetic field gradient, magnons may be driven to move from one end of a magnet to another, carrying heat with them and producing a cooling effect. TECHNICAL ARTICLE

*Tags: Materials science*

### Finding the 'heart' of an obstacle to superconductivity

PhysOrg.com, 23JUL2014

A team of researchers at Cornell University and Brookhaven National Laboratory has discovered that previously observed density waves that seem to suppress superconductivity are linked to an electronic "broken symmetry," offering an important clue to why superconductivity doesn't happen at higher temperatures.

*Tags: Materials science, Government S&T*

### Self-cooling solar cells boost power, last longer

Nanotechweb, 22JUL2014

By adding a specially patterned layer of silica glass to the surface of ordinary solar cells, researchers at Stanford University found a way to let solar cells cool themselves by shepherding away unwanted thermal radiation. TECHNICAL ARTICLE

*Tags: Materials science, Solar energy*

## NEUROSCIENCE

### Try, try again? Study says no

MIT News, 21JUL2014

Researchers at MIT report that when learning certain elements of language, adults' more highly developed cognitive skills actually get in the way. The harder adults tried to learn an artificial language, the worse they were at deciphering the language's morphology—the structure and deployment of linguistic units such as root words, suffixes, and prefixes. TECHNICAL ARTICLE

*Tags: Neuroscience*

## PHOTONICS

### The future of ultrashort laser pulses

PhysOrg.com, 24JUL2014

Next-generation approaches to the production of ultrashort flashes of laser light—the so-called third generation of femtosecond laser pulses—are stimulating further

*continued...*

advances in the investigation of ultrafast processes in the realm of the microcosmos. Researchers in Germany describe the underlying technology and the prospects that it will open up. TECHNICAL ARTICLE

*Tags: Photonics, S&T Germany*

## QUANTUM SCIENCE

### Paradoxical pigeons are the latest quantum conundrum

Physics World, 25JUL2014

An international team of researchers (USA, Israel, Italy, UK) has proposed a scenario dubbed the "quantum-pigeonhole effect". The paradox begins with the observation that when you put three pigeons in two pigeonholes, there will always be at least two pigeons in the same hole. But according to the team's quantum analysis, it is possible for none of the pigeons to share a hole. TECHNICAL ARTICLE

*Tags: Quantum science*

## Featured Resource

### Fraunhofer Research News

**Fraunhofer is Europe's largest application-oriented research organization. Our research efforts are geared entirely to people's needs: health, security, communication, energy and the environment. RSS**

### Unleashing the power of quantum dot triplets

Science Daily, 24JUL2014

Researchers in Poland report that by changing the coupling of the quantum dot with the electrodes, they can help induce quantum phase transition between entangled and disentangled electron states. Theoretical investigations outlined in the paper and based on numerical renormalisation group analysis suggest that the detection of such change is best achieved by measuring the electrical conductance. TECHNICAL ARTICLE

*Tags: Quantum science*

### Exotic state of matter propels quantum computing theory

PhysOrg.com, 23JUL2014

Researchers at Cornell University demonstrate more efficient non-Abelian quasi-particles, Fibonacci anyons, through the use of a superconducting vortex, at the interface of a 2/3 fractional quantum Hall-superconductor structure. They demonstrate how this system undergoes a phase transition to the Fibonacci state that is the most coveted platform for building fault-tolerant quantum computers. TECHNICAL ARTICLE

*Tags: Quantum science*

### Scientists find way to maintain quantum entanglement in amplified signals

PhysOrg.com, 23JUL2014

An international team of researchers (Russia, Slovakia, Czech Republic) has found a way to preserve quantum entanglement of particles passing through an amplifier and, conversely, when transmitting a signal over long distances. They say that a certain class of signals can be transmitted so that the risk of ruining quantum entanglement becomes much lower. In this case, neither the attenuation nor the amplification of a signal ruins the entanglement. TECHNICAL ARTICLE

*Tags: Quantum science*

### Quantum leap in lasers brightens future for quantum computing

Science Daily, 22JUL2014

Researchers at Dartmouth College have devised a breakthrough laser that uses a single artificial atom to generate and emit particles of light. The artificial atom is made of nanoscale pieces of superconductor. It is a part of an electrical circuit on a chip. It means we have a much clearer path toward interesting applications in quantum computing. TECHNICAL ARTICLE

*Tags: Quantum science*

### Sending Messages with a Quantum Seal

American Physical Society Spotlight, 21JUL2014

Previous QDS schemes required using quantum memories, which are currently not robust enough. Researchers in the UK proposed a scheme that directly measures—rather than stores—quantum states in order to obtain partial information about them. They report that they have successfully implemented a variant of this memory-free QDS protocol in an optical system. TECHNICAL ARTICLE

*Tags: Quantum science, S&T UK*

## S&T POLICY

### Technologies that shape the future: Academy awards seven new Research Fellowships

Alphagalileo, 24JUL2014

Each of the seven Royal Academy of Engineering Research Fellowships research projects addresses unresolved or critical issues in a specific engineering field and has the potential to lead to significant breakthroughs, benefiting both the research community and industry.

*Tags: S&T policy, Emerging technology, S&T EU*

*continued...*

## SCIENCE WITHOUT BORDERS

### Spotlight falls on top 1% in science

Nature, 24JUL2014

An analysis, led by researchers at Stanford University, found that less than 1% of all researchers managed to publish every year from 1996 to 2011, but that those elite few were authors on more than 41% of all papers in the same period. Many noted the similarity between this and claims that the top 1% of US earners hold an inordinate share of the country's wealth. TECHNICAL ARTICLE

*Tags: Science without borders*

### Can machines think? Misidentification of humans as machines in Turing tests

Science Daily, 23JUL2014

Researchers in the UK published a series of 'Turing tests'. These entailed a series of five minute conversations between human and machine or human and human. Judges were tasked with identifying whether who they were talking to was human or a computer. The resultant transcripts presented in this paper reveal fascinating insights into human interactions and our understanding of artificial intelligence. TECHNICAL ARTICLE

*Tags: Science without borders, Artificial intelligence*

## SENSORS

### An Indoor Positioning System Based On Echolocation

MIT Technology Review, 25JUL2014

The new system is essentially a form of echolocation. Emit a sound and then listen for the return which will be distorted in a way that depends on the size and shape of the room and everything within the room. Researchers at MIT take data using the built-in microphone and speakers on an ordinary laptop and process the signal in a way that ignores the noise. TECHNICAL ARTICLE

*Tags: Sensors*

### Nano-sized chip picks up scent of explosives molecules better than dog's nose

Science Daily, 23JUL2014

Researchers in Israel have developed a sensor using a single tiny chip that consists of hundreds of supersensitive sensors. It can detect ultra low traces of extremely volatile explosives in air samples, and clearly fingerprint and differentiate them from other non-hazardous materials. In real time, it detects small molecular species in air down to concentrations of parts-per-quadrillion. TECHNICAL ARTICLE

*Tags: Sensors, Explosives*

## About This Publication



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