



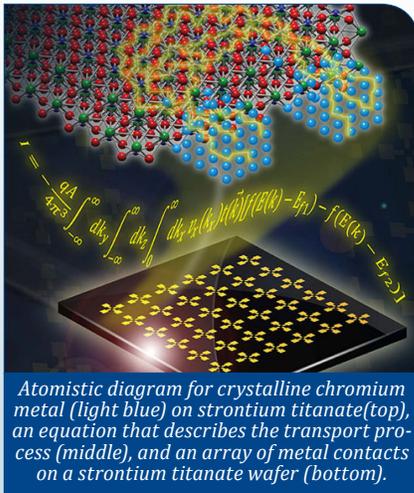
# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced materials \(4\)](#)[Energy \(4\)](#)[Information technology \(2\)](#)[Neuroscience \(2\)](#)[Autonomous systems & robotics \(2\)](#)[Environmental science \(2\)](#)[Materials science \(4\)](#)[Photonics \(2\)](#)[Communications technology \(6\)](#)[Government S&T \(1\)](#)[Microelectronics \(2\)](#)[Quantum science \(7\)](#)

## FEATURE ARTICLES

## S&T NEWS ARTICLES



Atomistic diagram for crystalline chromium metal (light blue) on strontium titanate (top), an equation that describes the transport process (middle), and an array of metal contacts on a strontium titanate wafer (bottom).

### [How to overcome the oxide barrier](#)

Nanowerk, 13MAY2013

Getting electrical signals into and out of oxide semiconductors is hard because a large energy barrier typically develops at the junction with metal contacts. PNNL researchers show how to eliminate this

barrier while keeping the contact area extremely small, at the nanometer level.

Tags: [Microelectronics](#), [Government S&T](#), [Featured Article](#)

### [New magnetic graphene may revolutionize electronics](#)

Science Daily, 11MAY2013

Researchers in Spain have managed to give graphene magnetic properties. The breakthrough opens the door to the development of graphene-based spintronic devices and could transform the electronics industry.

[TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#), [Featured Article](#)

### [Terahertz technology: Seeing more with less](#)

PhysOrg.com, 08MAY2013

Before terahertz technology can take off on a large scale, devices which can operate in this frequency need to be developed. Researchers in Singapore have designed novel circuits and antennas for terahertz radiation and efficiently integrated these components into a transmitter-receiver unit on a single chip.

[TECHNICAL ARTICLE](#)

Tags: [Communications Technology](#), [Terahertz technology](#), [Featured Article](#)

### ADVANCED MATERIALS

#### [Capturing light in an efficient dye trap](#)

RIKEN RESEARCH, 13MAY2013

Researchers in Japan discovered a compound known as an aminobenzopyrano-xanthene (ABPX) dye that is not affected by aggregation of molecules that dissipate absorbed light energy. The researchers found that the key to the ABPX dye's improved performance, despite aggregation, is its extra bulk.

Tags: [Advanced materials](#), [S&T Japan](#)

#### [Debut for thermal invisibility cloak](#)

BBC News, 11MAY2013

The prototype developed by a team of researchers from Germany and France contained a 5cm-wide flat region impervious to heat flowing around it. It works by channelling heat flow around the central region, with carefully designed, alternating rings made of copper and a silicone material called PDMS.

Tags: [Advanced materials](#)

#### [Unusual behavior of graphene under irradiation: More damage—less noise](#)

Nanowerk Spotlight, 11MAY2013

An acceptable level of flicker 1/f noise is one of the key metrics that each new material has to pass before it can be used for practical devices. Researchers at the University of California–Riverside have discovered a unique feature of 1/f noise in graphene, which can help understand its microscopic origin and develop new techniques for noise reduction.

Tags: [Advanced materials](#)

### AUTONOMOUS SYSTEMS & ROBOTICS

#### [NRL Shatters Endurance Record for Small Electric UAV](#)

Science Newsline, 10MAY2013

Researchers at the U.S. Naval Research Laboratory flew their fuel cell powered Ion Tiger unmanned aerial vehicle (UAV) for 48 hours and 1 minute, April 16 to 18, by using

*continued...*

[BACK TO TOP](#)

liquid hydrogen (LH2) fuel in a new, NRL-developed, cryogenic fuel storage tank and delivery system.

*Tags: Autonomous systems & robotics, Electronic Warfare, Government S&T*

### **Video Friday: Robohand, Entropy-Powered AI, and Bad Breath Bot**

[IEEE Spectrum, 10MAY2013](#)

A researcher with ties to MIT and Harvard has actually created what he says is a powerful artificial intelligence that, in simulations, was able to “walk upright, use tools, cooperate, play games, make useful social introductions, globally deploy a fleet, and even earn money trading stocks, all without being told to do so.

*Tags: Autonomous systems & robotics*

## COMMUNICATIONS TECHNOLOGY

### **Chaos could improve performance of wireless communication systems**

[PhysOrg.com, 13MAY2013](#)

A team of international researchers (UK, Germany, China) has found that although a chaotic signal itself is strongly modified by the wireless physical media through which it propagates, the information transmitted by the signal is not modified despite having traveled through open space.

#### **TECHNICAL ARTICLE**

*Tags: Communications Technology*

### **Improving communication during disasters**

[Alpha Galileo Foundation, 13MAY2013](#)

“BRIDGE”—a major EU project is addressing emergency response collaboration during disasters, and looking into how technology can help to improve response strategies. They are developing a geolocation-based system which assembles all available data and displays them on a map. This makes it available both to, and shared between, personnel out in the field, and to those staffing the emergency centres where response coordinators can control operations from their desks.

*Tags: Communications Technology, S&T EU*

### **Samsung successfully testing long distance millimeter wave transmission with 64 antenna elements with gigabit per second speed for 5G rollout by 2020**

[Next Big Future, 13MAY2013](#)

Samsung has successfully developed the world’s first adaptive array transceiver technology operating in the millimeter-wave Ka bands for cellular communications. The new technology sits at the core of 5G mobile communications system and will provide data transmission up to several hundred times faster than current 4G networks.

*Tags: Communications Technology, Terahertz technology*

### **Quantum tele-amplification with a continuous-variable superposition state**

[Nature Photonics, 12MAY2013](#)

Researchers in Japan demonstrate a basic CSQC (coherent-state quantum computing) protocol, where a cat state is used as an entanglement resource for teleporting a coherent state with an amplitude gain. They also show how this can be extended to a loss-tolerant quantum relay of multi-ary phase-shift keyed coherent states.

*Tags: Communications Technology, Quantum science, S&T Japan*

### **Engineers using quantum nature of light to boost Internet security**

[PhysOrg.com, 08MAY2013](#)

As part of a multi-university DARPA project, UT Arlington will encode information in spatial features or pixels of the photons that are sent through multimode fiber-optic lines to dramatically increase the amount of received data without jeopardizing its security protected by quantum mechanics.

*Tags: Communications Technology, Quantum science*

## ENERGY

### **Solar panels as inexpensive as paint?**

[Science Daily, 13MAY2013](#)

Researchers at the University of Buffalo are using plasmonic-enhanced organic photovoltaic materials because they are made (or processed) in liquid form and can be applied to a greater variety of surfaces. To achieve the market-required 10% efficiency, they are incorporating metal nanoparticles and/or patterned plasmonic nanostructures into organic photovoltaic cells. **TECHNICAL ARTICLE**

*Tags: Energy, Solar energy*

### **Team observes real-time charging of a lithium-air battery**

[Nanowerk, 13MAY2013](#)

Researchers at MIT and Sandia National Laboratories have used transmission electron microscope (TEM) imaging to observe, at a molecular level, what goes on during a reaction called oxygen evolution as lithium-air batteries charge; this reaction is thought to be a bottleneck limiting further improvements to these batteries. The TEM technique could help in finding ways to make such batteries practical in the near future. **TECHNICAL ARTICLE**

*Tags: Energy*

### **New Advance in Biofuel Production**

[Science Newsline, 11MAY2013](#)

Researchers at Lawrence Berkeley Laboratory have developed a new technique for pre-treating cellulosic biomass with ionic liquids—salts that are liquids rather than crystals at room temperature. This new technique

“Engineers operate at the interface between science and society.”

GORDON STANLEY BROWN

requires none of the expensive enzymes used in previous ionic liquid pretreatments, and makes it easier to recover fuel sugars and recycle the ionic liquid.

*Tags: Energy, Government S&T*

### **'Power plants': How to harvest electricity directly from plants**

[Science Daily, 11MAY2013](#)

During photosynthesis, plants use sunlight to split water atoms into hydrogen and oxygen, which produces electrons. Researchers at the University of Georgia have developed a way to interrupt photosynthesis so that we can capture the electrons before the plant uses them to make these sugars.

**TECHNICAL ARTICLE**

*Tags: Energy, Solar energy*

## ENVIRONMENTAL SCIENCE

### **Greenhouse gas level highest in two million years, NOAA reports**

[PhysOrg.com, 10MAY2013](#)

Worldwide levels of the greenhouse gas that plays the biggest role in global warming have reached their highest level in almost 2 million years—an amount never before encountered by humans.

*Tags: Environmental science*

### **Dust in the clouds: Cirrus clouds form around mineral dust and metallic particles**

[Science Daily, 09MAY2013](#)

A team of interdisciplinary researchers at MIT identified a “menagerie of metal compounds,” including lead, zinc and copper, that may point to a further human effect on cloud formation. Contrary to what many lab experiments have found, the team observed very little evidence of biological particles, such as bacteria or fungi, or black carbon emitted from automobiles and smokestacks. **TECHNICAL ARTICLE**

*Tags: Environmental science, Climatology*

## GOVERNMENT S&T

### **Making the Soldier Decisive on Future Battlefields**

[National Academies, 11MAY2013](#)

A new National Research Council report provides the Army with 15 recommendations on how to focus its efforts to enable dismounted soldiers operating individually or in small units to outmatch an adversary.

*Tags: Government S&T*

## INFORMATION TECHNOLOGY

### **Data storage: Synchronized at the 'write time'**

[Science Daily, 13MAY2013](#)

An analysis by researchers in Singapore indicates that the total additional information needed for synchronization and error correction for a motor with a medium rotation variation is 11.75%. Numerical simulations show how to avoid imperfections in the next generation of high-density data storage. **TECHNICAL ARTICLE 1, 2**

*Tags: Information Technology*

### **In first head-to-head speed test with conventional computing, quantum computer wins**

[PhysOrg.com, 08MAY2013](#)

Researchers at Amherst College who recently devised and conducted experiments to test the speed of a quantum computing system against conventional computing methods will soon be presenting a paper with their verdict: quantum computing is, “in some cases, really, really fast.”

*Tags: Information Technology*

## MATERIALS SCIENCE

### **Physicists light 'magnetic fire' to reveal energy's path**

[Nanowerk, 13MAY2013](#)

New York University physicists have uncovered how energy is released and dispersed in magnetic materials in a process akin to the spread of forest fires, a finding that has the potential to deepen our understanding of self-sustained chemical reactions. **TECHNICAL ARTICLE**

*Tags: Materials science*

### **Perfectly doped quantum dots yield 'colors to dye for'**

[Science Daily, 11MAY2013](#)

Researchers at the University of Illinois, Chicago, have developed a way to introduce precisely four copper ions into each and every quantum dot. Doping opens up possibilities for fine-tuning the optical properties of the quantum dots and opens up the opportunity to study a wide array of doped quantum dot systems. **TECHNICAL ARTICLE**

*Tags: Materials science, Quantum dots*

**Scientists demonstrate pear shaped atomic nuclei**

Science Daily, 11MAY2013

Scientists at the University of Liverpool have shown that some atomic nuclei can assume the shape of a pear which contributes to our understanding of nuclear structure and the underlying fundamental interactions. [TECHNICAL ARTICLE](#)

*Tags: Materials science, Particle physics*

**The secret lives of bubbles: Mathematicians describe evolution, dissolution of clusters of bubbles (w/ video)**

PhysOrg.com, 09MAY2013

Researchers at the University of California, Berkeley, have mathematically described the successive stages in the complex evolution and disappearance of foamy bubbles, a feat that could help in modeling industrial processes in which liquids mix or in the formation of solid foams such as those used to cushion bicycle helmets.

*Tags: Materials science*

**FEATURED RESOURCE****PLoS Synthetic Biology Collection**

Articles in the Synthetic Biology Collection are presented in order of publication date. Collection will be updated to include new publications, thereby tracking the evolution of this dynamic research area. [RSS](#)

**MICROELECTRONICS****Direct Desktop Printed-Circuits-on-Paper Flexible Electronics**

Nature Scientific Reports, 09MAY2013

Researchers in China have demonstrated that through modifying adhesion of the ink, overcoming its high surface tension by dispensing machine and designing a brush like porous pinhead for printing alloy and identifying matched substrate materials among different papers, the slightly oxidized alloy ink to be flexibly printed on coated paper.

*Tags: Microelectronics, S&T China*

**NEUROSCIENCE****How Multitasking Can Improve Judgments**

Alpha Galileo Foundation, 13MAY2013

Researchers from the University of Basel, Switzerland, found that higher cognitive load can actually improve performance when the task can be best completed using a less demanding, similarity-based strategy that informs judgments by retrieving past instances from memory.

[TECHNICAL ARTICLE](#)

*Tags: Neuroscience, S&T Switzerland*

**Sense of touch reproduced through prosthetic hand**

Science Daily, 09MAY2013

Researchers at the University of Chicago are working with a robotic hand equipped with sensors that send electrical signals to electrodes implanted in the brain to recreate the same response to touch as a real hand. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience, Biotechnology*

**PHOTONICS****Negative refraction makes photonic crystal as super-concave-mirror**

IOP Science, 11MAY2013

The finite-difference time-domain scheme is used to investigate the field patterns of a TM-polarized point source placed in the vicinity of the PC slab. With proper surface termination of photonic crystal (PC) slab, we find one image occurs in the same side as the point source by negative refraction and reflection at the two sides of the PC slab which makes the PC slab act as super-concave-mirror. The work was reported by researchers in China.

*Tags: Photonics, S&T China*

**Researchers develop metamaterials able to control spread of light**

PhysOrg.com, 11MAY2013

A team of researchers in Israel has developed a new class of metamaterials that allow for control of the spread of light in communications devices. They set the stage for devices that are able to manipulate light at the nanoscale. Such devices are also expected to result in simpler interface connections with other electronic components. [TECHNICAL ARTICLE](#)

*Tags: Photonics, Communications Technology*

## QUANTUM SCIENCE

**Photonic quantum computers: a brighter future than ever**

Nanowerk, 13MAY2013

Scientists at the University of Vienna succeeded in prototyping a new and highly resource efficient model of a quantum computer – the boson sampling computer.

TECHNICAL ARTICLE

Tags: Quantum science

**Graphene joins the race to redefine the ampere**

Nanowerk, 12MAY2013

Researchers in the UK have developed the world's first graphene single-electron pump (SEP) which provides the speed of electron flow needed to create a new standard for electrical current based on electron charge. TECHNICAL

ARTICLE

Tags: Quantum science, S&amp;T UK

**Highly fragile, volatile body observed with new quantum-mechanical measurement technique**

Science Daily, 12MAY2013

Researchers in Spain were able to observe the spinning of the electrons in the atoms, and more importantly, the atom cloud was not disturbed in the process. This is the first time quantum non-demolition measurement has been demonstrated with any material object. The same method could be extended to permit the observation of individual atoms.

TECHNICAL ARTICLE

Tags: Quantum science

**Spintronics discovery: Scientists find new 'magic' in magnetic material**

Science Daily, 11MAY2013

University of Delaware scientists have confirmed the presence of a magnetic field generated by electrons which scientists had theorized existed, but that had never been proven until now. The finding expands the potential for harnessing the "spin"—adding a fundamental new building block to the pioneering field of spintronics. TECHNICAL

ARTICLE

Tags: Quantum science

**The changing phase of quantum materials**

RIKEN RESEARCH (Japan), 10MAY2013

A theoretical model that predicts how the properties of topological insulators vary under external influence could aid the search for an ideal material for quantum computers. Researcher in Japan have devised a general theory for how an insulator changes into a topological insulator, which should aid in the practical search for such materials.

Tags: Quantum science, Advanced materials, S&amp;T Japan

**Researchers develop a portable way to produce ultracold atoms for quantum technologies**

Nanowerk, 09MAY2013

British researchers have developed a portable way to produce ultracold atoms for quantum technology and quantum information processing. They pattern the surface of a semiconductor chip to form a diffraction grating, splitting a laser into many beams that cool the atoms.

TECHNICAL ARTICLE

Tags: Quantum science, S&amp;T UK

**Quantum Optics With Microwaves: Hong-Ou-Mandel Effect Demonstrated**

Science Daily, 08MAY2013

Researchers in Switzerland have demonstrated one of the quintessential effects of quantum optics—known as the Hong-Ou-Mandel effect—with microwaves, whose frequency is 100,000 times lower than that of visible light. The experiment takes quantum optics into a new frequency regime and could eventually lead to new technological applications. TECHNICAL ARTICLE

Tags: Quantum science, S&amp;T Switzerland ■

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