



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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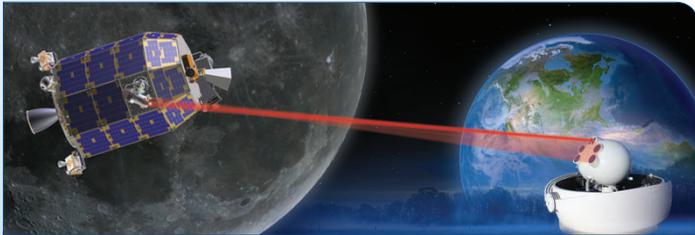
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## FEATURE ARTICLES

### [Historic Demonstration Proves Laser Communication Possible](#)

NASA News, 28OCT2013



*Compared to the days of dial-up, today's web-sites load at lightning speed. Just like you need web-pages to load quickly and securely, NASA scientists and engineers want the same quick connectivity with their data-gathering spacecraft. To meet these demands NASA is moving away from their form of dial-up (radio frequency-based communication), to their own version of high-speed Internet; using laser communications.*

In the early morning hours of Oct. 18, NASA's Lunar Laser Communication Demonstration (LLCD) made history, transmitting data from lunar orbit to Earth at a rate of 622 Megabits-per-second (Mbps). That download rate is more than six times faster than previous state-of-the-art radio systems flown to the moon. The LLCD system was designed, built and being operated by the MIT/LL team in Lexington, Mass. [MORE ABOUT LLCD](#)

*Tags: Communications Technology, Government S&T, Featured Article*

### [New Material for Quantum Computing Discovered out of the Blue](#)

Science Daily, 27OCT2013

Researchers from the London Centre for Nanotechnology at UCL and the University of British Columbia have shown that the electrons in the pigment, copper phthalocyanine (CuPc), which is similar to the light harvesting section of the chlorophyll molecule CuPc can remain in 'superposition' for surprisingly long times. This simple dye molecule has potential as a medium for quantum technologies.

*Tags: Quantum science, Materials science, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [Using genetic algorithms to discover new nanostructured materials](#)

Nanowerk, 28OCT2013

Researchers at Columbia University and Brookhaven Laboratory have developed an inverse design framework using genetic algorithms. The study could help speed up the materials discovery process. It also shows the potential of machine learning and 'big data' approaches. [TECHNICAL ARTICLE](#)

*Tags: Advanced manufacturing, Government S&T*

### ADVANCED MATERIALS

#### [Making complex nanoparticles easily reproducible](#)

Nanowerk, 28OCT2013

Researchers at Case Western Reserve University are working to streamline manufacturing and assembly for two-sided nanoparticles. Two sided particles applications range from medicine, photonics, to data storage.

*Tags: Advanced materials*

#### [Persuading Light to Mix It Up With Matter](#)

Science Daily, 24OCT2013

Researchers at MIT have succeeded in producing and measuring a coupling of photons and electrons on the surface of a topological insulator. The researchers suggest that this finding could lead to the creation of materials whose electronic properties could be "tuned" in real time simply by shining precise laser beams at them. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

#### [Researchers Advance Scheme to Design Seamless Integrated Circuits Etched On Graphene](#)

Science Daily, 22OCT2013

Researchers at UC Santa Barbara have introduced and modeled an integrated circuit design scheme in which transistors and interconnects are monolithically patterned seamlessly on a sheet of graphene. The demonstration

*continued...*

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offers possibilities for ultra energy-efficient, flexible, and transparent electronics. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Flexible electronics*

## AUTONOMOUS SYSTEMS & ROBOTICS

**[Video Friday: Robokind on Kickstarter, Atlas Breaks an Ankle, and FirstLook Gets Armed](#)**  
[IEEE Spectrum, 25OCT2013](#)

Last week, DARPA hosted a public presentation day for all the Track A and Track B/C teams that'll be competing in the DRC this December. Not all of those presentations have been put online (yet), but here's one from Team DRC-Hubo.

*Tags: Autonomous systems & robotics*

## COMMUNICATIONS TECHNOLOGY

**[The Clever Circuit That Doubles Bandwidth](#)**  
[MIT Technology Review, 28OCT2013](#)

Kumu Networks, a startup spun out of Stanford, says it has solved an age-old problem in radio communications with a new circuit and algorithm that allow data to be sent and received on the same radio frequency—thus doubling wireless capacity, at least in theory. The underlying technology, known as full-duplex radio, tackles a problem known as “self-interference.” [TECHNICAL ARTICLE](#)

*Tags: Communications Technology*

## ENERGY

**[Scientists' New Approach Improves Efficiency of Solar Cells](#)**

[Science Daily, 25OCT2013](#)

The new approach developed by an international team (UK, Belgium, China) achieves highly efficient broad-band light trapping in thin films in order to maximise absorption and electricity generation. [TECHNICAL ARTICLE](#)

*Tags: Energy, S&T UK, Solar energy*

**[Inexpensive Material Boosts Battery Capacity](#)**

[Science Daily, 24OCT2013](#)

Researchers in Singapore have developed next generation lithium-ion batteries, made with iron oxide nanoparticles, that could extend the driving distance of electronic cars.

[TECHNICAL ARTICLE](#)

*Tags: Energy, Battery*

## FORECASTING

**[Scientists identify a mathematical 'crystal ball' that may predict calamities](#)**

[PhysOrg.com, 28OCT2013](#)

A study by a team of researchers from the UK and Australia could have far-reaching implications. If the principle is generalised in other real-world complex systems, such as climate change or disease control, it could open up the possibility of catastrophes being averted before they happen. [TECHNICAL ARTICLE](#)

*Tags: Forecasting*

## IMAGING TECHNOLOGY

**[Startup Gets Computers to Read Faces, Seeks Purpose Beyond Ads](#)**

[MIT Technology Review, 28OCT2013](#)

A technology for reading emotions on faces can help companies sell candy. Now its creators hope it also can take on bigger problems. While people notoriously have a hard time articulating how they feel, now it is clear that machines can not only read some of their feelings but also go a step farther and predict the statistical likelihood of later behavior.

*Tags: Imaging technology, Sensors*

**[South Korean Research Center Unveils Radar-Absorbing 'Stealth Paint'](#)**

[Defense Update, 27OCT2013](#)

The radar-absorbing material developed by researchers in South Korea can be sprayed on the surface of the protected platform, providing a lighter, durable and cheaper application, compared to contemporary tile or metal sheet-type electromagnetic wave absorbers. The new material is expected to be applied in naval weapons systems, following successful certification in 11 categories by the Korea Testing & Research Institute.

*Tags: Imaging technology, Military technology*

**[100 Percent of an Image Restored Using a Version Containing Between One and 10 Percent of the Information](#)**

[Science Daily, 24OCT2013](#)

Researchers in Spain have developed algorithms to reduce and optimize images; using a reduced image (with between 1% and 10% of the information from the original image), they allow 100% of the pixels in the initial image to be restored. The main idea underpinning the algorithms developed is to divide the image into small zones that are processed individually.

*Tags: Imaging technology*

## INFORMATION TECHNOLOGY

**[Rewritable, transferable, and flexible sticker-type organic memory](#)**

[Nanowerk, 25OCT2013](#)

Researchers in Taiwan have demonstrated a rewritable, transferable, and flexible sticker-type organic memory on arbitrary nonconventional substrates through a simple, low-temperature and cost-effective one-step methodology.

[TECHNICAL ARTICLE](#)

*Tags: Information Technology, Flexible electronics*

“For a successful technology, reality must take precedence over public relations, for nature cannot be fooled.” RICHARD FEYNMAN

## MATERIALS SCIENCE

### **Breakthrough in Study of Aluminum Should Yield New Technological Advances**

Science Daily, 28OCT2013

Researchers at Oregon State University and the University of Oregon announced a platform to study and fully understand the aqueous chemistry of aluminum, one of the world's most important metals. The findings should open the door to significant advances in electronics and many other fields, ranging from manufacturing to construction, agriculture and drinking water treatment. [TECHNICAL ARTICLE](#)

Tags: Materials science

### **Tin for faster chips**

Nanowerk, 28OCT2013

An international team of researchers (USA, Switzerland, Germany) have succeeded in creating topological insulators made from tin, a simple and readily available material.

[TECHNICAL ARTICLE](#)

Tags: Materials science

### **Learning How to Convert Heat Directly Into Power: A Thermoelectric Materials Emulator**

Science Daily, 24OCT2013

Researchers in Switzerland have created a “thermoelectric material emulator” to better understand the thermoelectric materials. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Switzerland

### **Polymer Scientists Jam Nanoparticles, Trapping Liquids in Useful Shapes**

Science Daily, 24OCT2013

U Mass researchers discovered how to kinetically trap and control one liquid within another, locking and separating them in a stable system over long periods, with the ability to tailor and manipulate the shapes and flow characteristics of each. The discovery holds promise for a wide range of different applications including in drug delivery, biosensing, fluidics, photovoltaics. [TECHNICAL ARTICLE](#)

Tags: Materials science

### **Minuscule bumps improve an anti-reflective coating**

Nanowerk, 23OCT2013

Researchers in Singapore have developed a coating that matches the optical properties of the best conventional anti-reflective coatings (ARCs), while being more robust and easier to produce. ARCs are used in a variety of applications to reduce glare and increase the proportion of light transmitted through the glass or plastic beneath—potentially

boosting the output of a solar module, for example.

[TECHNICAL ARTICLE](#)

Tags: Materials science

## MICROELECTRONICS

### **Super-Thin Membranes Clear the Way for Chip-Sized Pumps**

Science Daily, 28OCT2013

University of Rochester scientists have created a super-thin silicon membrane that could be used to cool electronic devices. As electronic devices get smaller, components are packed more tightly, making it easier for the devices to overheat. With miniature power supplies, it may be possible to use Electroosmotic pumps (EOPs) to help cool laptops and other portable electronic devices. [TECHNICAL ARTICLE](#)

[TECHNICAL ARTICLE](#)

Tags: Microelectronics, Advanced materials

### **The Status of Moore's Law: It's Complicated**

IEEE Spectrum, 28OCT2013

When will the scaling stop? Today's patterning technology, which relies on 193-nm laser light, is becoming an ever more costly challenge, and its natural successor, shorter-wavelength extreme ultraviolet lithography, has been long delayed.

Tags: Microelectronics

### **'Getting the Edge' On Photon Transport in Silicon**

Science Daily, 23OCT2013

A research team from NIST and the University of Maryland has demonstrated their recent theory about how particles of light flow within a novel device they built. The team's solution could help computer designers use light instead of electricity to carry information in computer circuits, potentially leading to vast improvements in efficiency.

[TECHNICAL ARTICLE](#)

Tags: Microelectronics, Government S&T

## NEUROSCIENCE

### **The Man Who Would Teach Machines to Think** The Atlantic, 01NOV2013

“Cognition is recognition,” Douglas Hofstadter likes to say. He describes “seeing as” as the essential cognitive act: you see some lines as “an A,” you see a hunk of wood as “a table.” That's what it means to understand. But how does understanding work? For three decades, Hofstadter and his students have been trying to find out, trying to build “computer models of the fundamental mechanisms of thought.”

Tags: Neuroscience, Artificial intelligence

*continued...*

**Does brain training make you smarter?**[The Conversation](#), 28OCT2013

No one really disputes that extensive training on a specific task will improve performance on that task. But the acid test for brain training is whether it can be reliably demonstrated that training on some tasks transfers more widely to a range of other tasks and thought processes. [MORE STUDIES](#).

*Tags: Neuroscience***Study With Totally Blind People Shows How Light Helps Activate the Brain**[Science Daily](#), 28OCT2013

In a study, researchers from the US and Canada have shown that light enhances brain activity during a cognitive task even in some people who are totally blind, according to a new study. The findings contribute to scientists' understanding of everyone's brains, as they also revealed how quickly light impacts on cognition. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience***Smart Neurons: Single Neuronal Dendrites Can Perform Computations**[Science Daily](#), 27OCT2013

Researchers at the University of North Carolina at Chapel Hill and the UK have shown that dendrites do more than relay information from one neuron to the next. They actively process information, multiplying the brain's computing power. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience***FEATURED RESOURCE****PhysOrg**

Covers physical sciences, math, biology, medicine, earth science, computer sciences, and technologies.

**PHOTONICS****New generation laser will herald technological breakthrough**[PhysOrg.com](#), 28OCT2013

Researchers in the UK have demonstrated bosonic lasers which emit terahertz radiation. The bosonic terahertz laser will work in tandem with a conventional LED, which is a completely new approach. This will enable the miniaturisation of new optochips which, in turn, will help develop a whole new class of novel devices and applications.

[TECHNICAL ARTICLE](#)*Tags: Photonics***Nanoscale Engineering Boosts Performance of Quantum Dot Light Emitting Diodes**[Science Daily](#), 25OCT2013

The new research developed by the Los Alamos National Laboratory aims to improve QD-LEDs by using a new generation of engineered quantum dots tailored specifically to have reduced wasteful charge-carrier interactions that compete with the production of light. [TECHNICAL ARTICLE](#)

*Tags: Photonics, Government S&T, Quantum science***Long-sought pattern of ancient light detected**[PhysOrg.com](#), 22OCT2013

The ancient light traveled billions of years to reach us, and along the way, its path was distorted by the pull of matter, leading to a twisted light pattern. This twisted pattern of light, called B-modes, has at last been detected. The discovery, which will lead to better maps of matter across our universe, was made using the National Science Foundation's South Pole Telescope, with help from the Herschel space observatory.

*Tags: Photonics***QUANTUM SCIENCE****Physicists aim to make transition to quantum world visible**[Nanowerk](#), 25OCT2013

Researchers in Canada and Germany have developed a mathematical model for a type of microscopic test lab which will enable the simultaneous study of a hundred photons and their quantum entanglement—a far greater number than was previously possible. The researchers hope to gain new insights that will be of relevance to the development of quantum computers. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, S&T Canada, S&T Germany***When Scaling the Quantum Slopes, Veer for the Straight Path**[Science Daily](#), 24OCT2013

Princeton University researchers found that a representation of quantum mechanics that allows the dynamics of atoms and molecules to be manipulated can be unexpectedly simple, which could help scientists realize the next generation of technology by harnessing atoms and molecules to create small but incredibly powerful devices.

[TECHNICAL ARTICLE](#)*Tags: Quantum science***SCIENCE WITHOUT BORDERS****Ghostly Shape of 'Coldest Place in the Universe' Revealed**[Science Daily](#), 24OCT2013

At a cosmologically crisp one degree Kelvin (minus 458 degrees Fahrenheit), the Boomerang Nebula is the coldest known object in the Universe—colder, in fact, than the faint

afterglow of the Big Bang, which is the natural background temperature of space. [TECHNICAL ARTICLE](#)

*Tags: Science without borders, Astronomy*

## SENSORS

### [Traces of DNA exposed by nanorod assemblies and twisted light](#)

[Nanowerk](#), 28OCT2013

Researchers at the University of Michigan and China have shown that structures that put a spin on light reveal tiny amounts of DNA with 50 times better sensitivity than the best current methods. Highly sensitive detection of DNA can help with diagnosing patients, solving crimes and identifying the origins of biological contaminants such as a pathogen in a water supply. [TECHNICAL ARTICLE](#)

*Tags: Sensors, Materials science*

### [Using sound waves for bomb detection](#)

[PhysOrg.com](#), 23OCT2013

The new system built by a multi-university collaboration (Vanderbilt, Purdue, Colorado School of Mines) consists of a phased acoustic array that focuses an intense sonic beam at a suspected improvised explosive device. At the same time a laser vibrometer is aimed at the object's casing and records how the casing is vibrating in response. The nature of the vibrations can reveal a great deal about what is inside the container.

*Tags: Sensors, Explosives*

## STEM

### [Corporate Recruiters Insist There Really Is a STEM Worker Shortage](#)

[IEEE Spectrum](#), 22OCT2013

Bayer Corp., the U.S. arm of the German chemical and pharmaceutical giant Bayer AG, is due to release a report this week showing that half of the recruiters from large U.S. companies surveyed couldn't find enough job candidates with four-year STEM degrees in a timely manner; some said that had led to more recruitment of foreigners.

*Tags: STEM* ■

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