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## FEATURE ARTICLES

### World's First Photonic Integrated Circuit For Manipulating Atoms

MIT Technology Review, 19DEC2013

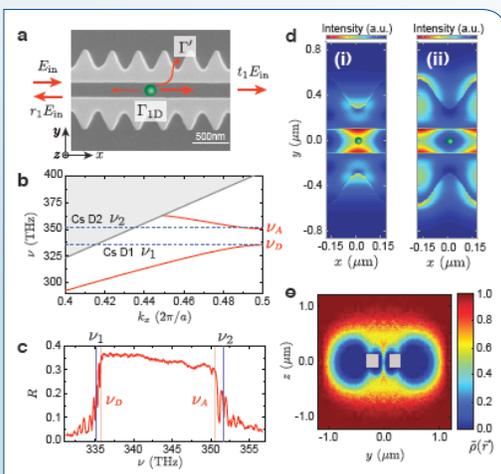


Image courtesy of MIT Technology Review

Researchers at California Institute of Technology report the development of the first integrated optical circuit with a photonic crystal capable of both local-

izing and interfacing atoms with guided photons in the device. This should allow physicists to explore entirely new ways in which matter and light interact.

[TECHNICAL ARTICLE](#)

Tags: [Microelectronics](#), [Featured Article](#)

### World's First Text Message Using Vodka: Messages Sent Via Molecules Can Aid Communication Underground, Underwater or Inside the Body

Science Daily, 18DEC2013

An international team of researchers (UK, Canada) has developed the capability to transform any generic message into binary signals, which in turn is 'programmed' into evaporated alcohol molecules to demonstrate the potential of molecular communications. [TECHNICAL ARTICLE](#)

Tags: [Communications Technology](#), [S&T Canada](#), [S&T UK](#), [Featured Article](#)

## S&T NEWS ARTICLES

### ADVANCED MATERIALS

#### New Report: Nano-solutions for the 21st century

Foresight Institute, 20DEC2013

The core technological emphasis of the report, [Nano-solutions for the 21st century](#) is atomically precise manufacturing. Even those most familiar with the topic will find the breadth of this report compelling and informative.

Tags: [Advanced materials](#)

#### Dual Catalysts Help Synthesize Alpha-Olefins Into New Organic Compounds

Science Daily, 19DEC2013

By combining a pair of catalytic reactions in sequence, researchers at Boston College converted inexpensive and plentiful chemicals into new boron-containing organic compounds prized by researchers. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

#### Graphene Sees the Light: Sheets of Carbon Just One Atom Thick Could Be Used in Photovoltaic Cells

Science Daily, 19DEC2013

Researchers in Singapore believe that graphene could be used as a transparent electrode in photovoltaic cells, replacing a layer of indium tin oxide (ITO) that is brittle and becoming increasingly expensive. They have compared these two materials and found that graphene outperforms ITO when used with solar cells that absorb a broad spectrum of light. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

#### Graphene-Based Field-Effect Transistor With Semiconducting Nature Opens Up Practical Use in Electronics

Science Daily, 19DEC2013

Researchers in South Korea announced a method for the mass production of boron/nitrogen co-doped graphene nanoplatelets, which led to the fabrication of a

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graphene-based field-effect transistor (FET) with semiconducting nature. This opens up opportunities for practical use in electronic devices.

*Tags: Advanced materials, Microelectronics*

### **Exposing the Roots of the Lithium Battery Problem**

[Science Daily, 17DEC2013](#)

Researchers at the Berkeley National Laboratory observed the seeds of dendrites forming in lithium anodes and growing out into a polymer electrolyte during cycling. It was not until the advanced stages of development that the bulk of dendrite material was in the electrolyte. They suspect that non-conductive contaminants in the lithium anode trigger dendrite nucleation. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Government S&T, Materials science*

### **Targeted Synthesis of Natural Products With Light**

[Science Daily, 17DEC2013](#)

Photoreactions are driven by light energy and are vital to the synthesis of many natural substances. But in most cases only one of the possible products has the right spatial structure to make it effective. Researchers in Germany have developed a methodology for one of these photoreactions that allows them to produce only the specific molecular variant desired. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, S&T Germany*

### **Graphene nanoribbons an ice-melting coat for radar**

[EurekAlert, 16DEC2013](#)

Pristine graphene transmits electricity ballistically and would not produce enough heat to melt ice or keep it from forming, but graphene nanoribbons (GNRs) unzipped from multiwalled carbon nanotubes in a chemical process invented by Rice University researchers does the job nicely. When evenly dispersed on a solid object, the ribbons overlap and electrons pass from one to the next with just enough resistance to produce heat as a byproduct. The effect can be tuned based on the thickness of the coating. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science*

## **AUTONOMOUS SYSTEMS & ROBOTICS**

### **DARPA Robotics Challenge Trials Get Off to a Positive Start**

[DARPA News, 21DEC2013](#)

The two-day competition has drawn teams from around the world with a common goal: speeding development of robots that could aid in response efforts after future natural and man-made disasters. [The Robotic Challenge](#)

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

## **BREAKTHROUGH TECHNOLOGY**

### **New Magnetic Behaviour in Nanoparticles Could Lead to Even Smaller Digital Memories**

[Science Daily, 19DEC2013](#)

An international team of researchers (Spain, Italy, Russia, Sweden, Greece, USA) have created antiferromagnetic coupling between layers in particles measuring 10 to 20 nanometres. The discovery provides an unprecedented control of the magnetic behaviour of nanoparticles solely by controlling the temperature and the magnetic fields surrounding it. [TECHNICAL ARTICLE](#)

*Tags: Breakthrough technology, Materials science*

### **Science's Top 10 Breakthroughs of 2013**

[Science Daily, 17DEC2013](#)

Every year, the editors of Science huddle together and pick an outstanding scientific achievement as the Breakthrough of the Year. This year's winner is CANCER IMMUNOTHERAPY: harnessing the immune system to battle tumors.

*Tags: Breakthrough technology, Science without borders*

## **ENERGY**

### **Producing Electricity On the Moon at Night**

[Science Daily, 20DEC2013](#)

An international team of researchers (Spain, USA, France) has proposed a system of mirrors, processed lunar soil and a heat engine to provide energy to vehicles and crew during the lunar night. This would preclude the need for batteries and nuclear power sources such as those used by the Chinese rover that recently landed on the moon.

[TECHNICAL ARTICLE](#)

*Tags: Energy*

## **ENVIRONMENTAL SCIENCE**

### **Van Allen Probes Shed Light On Decades-Old Mystery**

[Science Daily, 20DEC2013](#)

A team of researchers from government and academia observed high-energy electrons during a geomagnetic storm of Oct. 9, 2012, which they analyzed together with a data-driven global wave model. Their analysis reveals that linear, stochastic scattering by intense, natural very low-frequency radio waves—known as chorus waves—in Earth's upper atmosphere can account for the observed relativistic electron build-up. [TECHNICAL ARTICLE](#)

*Tags: Environmental science, Space technology*

“One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike and yet it is the most precious thing we have.” ALBERT EINSTEIN

## FORECASTING

### [Scientists Anticipated Size and Location of 2012 Costa Rica Earthquake](#)

Science Daily, 22DEC2013

An international team of researchers (Costa Rica, USA, Singapore) published a study a few months before the earthquake, describing the particular locked patch with the clearest potential for the next large earthquake in the region. The team projected the total amount of energy that could have developed across that region and forecast that there is presently enough energy for an earthquake on the order of magnitude 7.8. [TECHNICAL ARTICLE](#)

Tags: Forecasting, Environment

## INFORMATION TECHNOLOGY

### [New Data Compression Method Reduces Big-Data Bottleneck; Outperforms, Enhances JPEG](#)

Science Daily, 19DEC2013

Drawing inspiration from physics and the arts, researchers at UCLA developed a data compression method that outperforms existing techniques, such as JPEG for images, and that could eventually be adopted for medical, scientific and video streaming applications. [TECHNICAL ARTICLE](#)

Tags: Information Technology

## MATERIALS SCIENCE

### [Graphene can host exotic new quantum electronic states at its edges](#)

MIT News, 22DEC2013

MIT researchers found that under an extremely powerful magnetic field and at extremely low temperature graphene can effectively filter electrons according to the direction of their spin, something that cannot be done by any conventional electronic system. This could render graphene suitable for exotic uses such as quantum computing. [TECHNICAL ARTICLE](#)

Tags: Materials science, Advanced materials

Tags: Materials science, Advanced materials

### [Catching the Big Wave: 'Universal Ripple' Could Hold the Secret to High-Temperature Superconductivity](#)

Science Daily, 19DEC2013

Work by researchers in Canada reveals the universal existence of so-called 'charge-density-waves'—static ripples formed by the self-organization of electrons in the material's normal state. These ripples carry the seeds out of which superconductivity emerges. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Canada

### [Electron 'Antenna' Tunes in to Physics Beyond Higgs](#)

Science Daily, 19DEC2013

In making the most precise measurements ever of the shape of electrons, a team of Harvard and Yale scientists has raised severe doubts about several popular theories of what lies beyond the Higgs boson. They are trying to glimpse in the lab any difference from what is predicted by the Standard Model, like what is being attempted at the LHC. [TECHNICAL ARTICLE](#)

Tags: Materials science, Particle physics

### [New Salt Compounds Challenge the Foundation of Chemistry](#)

Science Daily, 19DEC2013

Researchers at Stony Brook University document their predictions about, and experiments in, compressing sodium chloride—rock salt—to form new compounds. These compounds validate the methodology for predicting the properties of objects—a methodology now used worldwide for computational material discovery—and hold the promise of novel materials and applications. [TECHNICAL ARTICLE](#)

Tags: Materials science

Tags: Materials science

### [Opposing Phenomena Possible Key to High-Efficiency Electricity Delivery](#)

Science Daily, 19DEC2013

Princeton University researchers' findings provide a substantial clue for unraveling the inner workings of high-temperature superconductors (HTS) based on compounds containing copper oxides. It's been shown that the material can be used to deliver electrical power like ordinary transmission lines, but with no loss of energy. Unlike typical superconductors it can reach this level of efficiency at a comparatively toasty -135 degrees Celsius.

Tags: Materials science

## NEUROSCIENCE

### [NIH Details Plan for BRAIN Initiative](#)

Science Magazine, 17DEC2013

The agency is calling for grant applications in six "high-priority" research areas drawn from a September report by its 15-member scientific advisory committee for the project. The agency is committing to spend roughly \$40 million per year for 3 years on these areas.

Tags: Neuroscience, Government S&T, R&D Funding, S&T Policy

## PHOTONICS

**Optical Rogue Waves: The Storm in a Test Tube**[Science Daily, 20DEC2013](#)

Researchers in Germany demonstrate the appearance of rogue waves in a new optical system. In this system they are clearly ruled by atmospheric turbulence in a gas cell, effectively enabling the observation of a storm in a test tube. [TECHNICAL ARTICLE](#)

*Tags: Photonics, S&T Germany*

## FEATURED RESOURCE

**Nature web feeds**

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

## S&amp;T POLICY

**Data Are Lost to Science at ‘Astonishing Rate’**[Science Daily, 19DEC2013](#)

Two years after publication, data are essentially always available to other researchers who might wish to confirm the findings, the researchers found. By 20 years post-publication, 80% of that data obtained through publicly funded research is inaccessible due to mundane issues, primarily old email addresses and obsolete storage devices. The researchers call on journals to require that authors share their data on a public archive before a paper can be published.

*Tags: S&T policy, Science without borders*

**Inside China’s Version of Silicon Valley**[Wall Street Journal, 04DEC2013](#)

On the outside, China’s answer to Silicon Valley doesn’t look the part. But in these nondescript offices China is nurturing a growing class of tech entrepreneurs and venture capitalists, whose promising startups are challenging the long-held idea that China’s Internet companies merely copy the products of the West. Beijing’s Zhongguancun district relies instead on a new kind of mimicry—of Silicon Valley’s culture itself.

*Tags: S&T policy, S&T China*

## SCIENCE WITHOUT BORDERS

**Top 2013 Aussie science stories**[Science Alert \(Australia\), 22DEC2013](#)

It’s been an exciting year for Australian research, with new species being discovered, extinct ones almost brought back to life and quantum computers getting closer than ever.

*Tags: Science without borders*

**The Secret Half-Lives of Scientific Papers**[Science Magazine, 19DEC2013](#)

Scholarly articles continue to be read years after publication. The median half-life across all publishers was

between 2 and 4 years. Papers in the health sciences were on the lower end, at 2 to 3 years, and the longest lived fields were humanities, physics, and mathematics with article downloads peaking between 4 to 5 years after publication.

*Tags: Science without borders*

**The world of physics in 2014**[PhysOrg.com, 19DEC2013](#)

So 2013 will go down as the year that the Nobel Prize for Physics went to Peter Higgs and François Englert for their theory of how some particles acquire mass. But what of next year? What will be the key events in physics and who will have taken the accolades in 12 months’ time?

*Tags: Science without borders*

**Multimedia highlights of 2013**[Physics World, 16DEC2013](#)

Here is a selection of Physics World’s audio and visual highlights from the past year, which has certainly been another colourful 12 months for physics.

*Tags: Science without borders*

**Top 10 Science Stories of 2013**[Australian Science Media Centre, 09DEC2013](#)

From leaving the solar system to resurrecting a frog, our top 10 science stories from 2013 highlight some of the best that science in Australia and around the world has to offer.

*Tags: Science without borders*

## SENSORS

**First Battery-Powered Invisibility Cloak Designed**[Science Daily, 18DEC2013](#)

Researchers at the University of Texas, Austin, proposed a design for an active cloak that draws energy from a battery, allowing objects to become undetectable to radio sensors over a greater range of frequencies. The proposed active cloak will have a number of applications beyond camouflaging, such as improving cellular and radio communications, and biomedical sensing. [TECHNICAL ARTICLE](#)

*Tags: Sensors ■*

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