



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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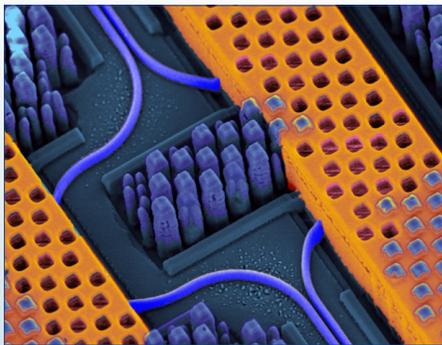
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FEATURE ARTICLES



This image shows a false-colored integrated optical and electrical circuit. The blue wires carry optical signals and the yellow wires carry electrical ones.

[Computing with Light](#)

[MIT Technology Review, 11DEC2012](#)

IBM researchers have developed a chip that integrates electrical and optical devices on the same piece of silicon, enabling computer chips to communi-

cate using pulses of light (instead of electrical signals), resulting in smaller, faster and more power-efficient chips than is possible with conventional technologies. The chip was made using a 90 nanometer manufacturing process, and the optical data can travel through the chip at 25 Gigabits per second.

Tags: Microelectronics, Breakthrough technology, Featured Article

[Speeding up electronics to light frequencies](#)

[Science Daily, 09DEC2012](#)

In two groundbreaking complementary experiments researchers at the Max Planck Institute of Quantum Optics have demonstrated that, under certain conditions, ultrashort light pulses of extremely high intensity can induce electric currents in otherwise insulating dielectric materials. They provided evidence that the fast oscillations of the electric field instantly alter the electrical and optical properties of the material, and that these changes can be reversed on a femtosecond time scale.

[TECHNICAL ARTICLE 1](#), [TECHNICAL ARTICLE 2](#)

Tags: Communications Technology, Communications Technology, S&T Germany, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Materials and Manufacturing Capabilities for Sustaining Defense Systems: Summary of a Workshop](#)

[National Academies, 11DEC2012](#)

The Standing Committee on Defense Materials Manufacturing and Infrastructure (DMMI) conducted a workshop on July 23-24, 2012, to share information and gather perspectives on issues concerning Materials and Manufacturing Capabilities for Sustaining Defense Systems. [REPORT](#)

Tags: Advanced manufacturing, Military technology

ADVANCED MATERIALS

[Electronics: Graphene sheets' growing attractions](#)

[Science Daily, 11DEC2012](#)

Light squeezed between single graphene sheets can propagate more efficiently than along a single sheet. Researchers in Singapore have demonstrated that the interactions of single graphene sheets in certain arrays allow efficient control of light at the nanoscale. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Self-assembled monolayers create p-n junctions in graphene films](#)

[EurekAlert, 10DEC2012](#)

A low temperature, controllable and stable method has been developed to dope graphene films using self-assembled monolayers (SAM) that modify the interface of graphene and its support substrate. Using this concept, a team of researchers at the Georgia Institute of Technology has created graphene p-n junctions—which are essential to fabricating devices—without damaging the material's lattice structure or significantly reducing electron/hole mobility. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

Flexible silicon solar-cell fabrics may soon become possible

Science Daily, 09DEC2012

Rather than merge a flat chip with a round optical fiber, researchers at Penn State found a way to build a new kind of optical fiber—which is thinner than the width of a human hair—with its own integrated electronic component, thereby bypassing the need to integrate fiber-optics with chips. To do this, they used high-pressure chemistry techniques to deposit semiconducting materials directly, layer by layer, into tiny holes in optical fibers.

TECHNICAL ARTICLE

Tags: *Advanced materials, Breakthrough technology*

Research team discovers new way to make near perfect light absorber

PhysOrg.com, 09DEC2012

To make the new material, an international team of researchers placed a very thin piece of gold on top of a piece of flat glass, then dipped it in a polymer solution to create a polymer layer over the gold just a few nanometers thick. Next, they cut a piece of silver into very small cubes, each just 74 nanometers wide and tossed them randomly onto the polymer coated gold. And that was all it took.

TECHNICAL ARTICLE

Tags: *Advanced materials*

AUTONOMOUS SYSTEMS & ROBOTICS

Automation systems become flexible when robots make their own decisions

Science Daily, 09DEC2012

Researchers in Sweden have created an automation system where machines and robots make their own decisions and adapt to external circumstances. They continue to work even when something goes wrong. You can reprogram them every day and easily vary equipment and manufactured products.

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

What an unmanned aerial vehicle can do with depth perception

PhysOrg.com, 09DEC2012

A DARPA-funded technology demonstration recently completed a successful testing of vision-driven robotic-arm payload emplacement using tail-sitter UAV, V-Bat. This UAV is capable of both hover and wing-borne flight, making the delivery and precision emplacement of a payload possible.

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

Video Friday: Dances With Robot Arms, ROS Turns Five, LittleDog Says Hello

IEEE Spectrum, 07DEC2012

The reconfigurable robot from MIT can efficiently fold itself into all sorts of shapes. The overall concept is that the robot

is effectively one-dimensional, and with a long enough one-dimensional robot, math says that you can fold it (or have it fold itself) into absolutely any 3D shape that you want.

Tags: *Autonomous systems & robotics*

BIOTECHNOLOGY

Pentagon, NIH Fund Pollen-Based Vaccine Delivery Research

Global Security Newswire, 10DEC2012

At the core of the Texas Tech University work on improved vaccine delivery is pollen. They have determined that the allergens within pollen particles can be chemically removed and replaced with a test vaccine. The particles have a hardened shell that would allow the treatment to survive the trip through the stomach and into the intestines to provide protection against infection.

Tags: *Biotechnology*

BREAKTHROUGH TECHNOLOGY

Magnetic bubbles behave differently than other magnetic defects (w/ video)

PhysOrg.com, 11DEC2012

In a new study, physicists at Johns Hopkins University have demonstrated that magnetic topological defects called skyrmions, which resemble swirling eddies or bubbles, behave differently than do other magnetic defects. The scientists show that skyrmions' unusual behavior arises from the strange occurrence of waves on the bubbles' edges that travel with different speeds in opposite directions.

TECHNICAL ARTICLE

Tags: *Breakthrough technology, Materials science*

Tiny structure gives big boost to solar power

Science Daily, 09DEC2012

Researchers at Princeton University have developed a nanostructured "sandwich" called a subwavelength plasmonic cavity which has an extraordinary ability to dampen reflection and trap light. The new technique allowed the team to create a solar cell that only reflects about 4 percent of light and absorbs as much as 96 percent. It demonstrates 52 percent higher efficiency in converting light to electrical energy than a conventional solar cell.

TECHNICAL ARTICLE

Tags: *Breakthrough technology, Energy, Stealth technology*

Superconductors that work by themselves: Scientists discover new possibilities in cryoelectronics

Science Daily, 06DEC2012

Scientists in Israel have experimentally demonstrated a new type of superconducting element—named the phi-Josephson junction. Implemented in cryogenic devices, this element will make superconducting electronic circuits

“We can judge our progress by the courage of our questions
and the depth of our answers.” CARL SAGAN

work practically “by themselves” and improve functionality.

[TECHNICAL ARTICLE 1](#), [TECHNICAL ARTICLE 2](#)

Tags: Breakthrough technology, Materials science

[Patent Power 2012](#)

[IEEE Spectrum](#), 03DEC2012

Fresh names are making waves in this, our sixth [Patent Power](#) scorecard. After analysis of thousands of patent portfolios for the 2011 calendar year, two newcomers—Intelligent Technologies International and Fluidigm Corp.—have debuted at Nos. 1 and 2 in the Scientific Instruments category.

Tags: Breakthrough technology

COMMUNICATIONS TECHNOLOGY

[Point of light: Light-focusing device may lead to applications in computing, communications, and imaging](#)

[Science Daily](#), 09DEC2012

Researchers at Caltech have created a device that can focus light into a point just a few nanometers across—an achievement they say may lead to next-generation applications in computing, communications, and imaging.

[TECHNICAL ARTICLE](#)

Tags: Communications Technology, Optical communication

[Quantum cryptography goes mainstream](#)

[PhysOrg.com](#), 05DEC2012

Researchers in the UK have succeeded in extracting the very weak signals used for quantum cryptography from ordinary telecom fibres transmitting data traffic. This means that existing telecom networks can now be secured with this ultimate form of encryption. [TECHNICAL ARTICLE](#)

Tags: Communications Technology, Cryptology

CYBER SECURITY

[Hackers Hold Australian Medical Records Ransom](#)

[Information Week](#), 11DEC2012

They literally got in, hijacked the server and then ran their encryption software. There’s also been an increase this year in ransom-style attacks targeting consumers. Last week, the Internet Crime Complaint Center (IC3), which is a joint effort between the FBI and the National White Collar Crime Center, reissued a warning about the “Raveton malware” V, which automatically locks an infected PC and issues a fake notice from the FBI demanding users pay a fine to regain access.

Tags: Cyber security

ENERGY

[Japan researchers invent solar-cell fabric](#)

[PhysOrg.com](#), 11DEC2012

The new fabric is made of wafer-thin solar cells woven together that could see people powering up their mobile phones and other electronics with their sweater or trousers. Researchers said their solar-cell fabric would eventually let wearers harvest energy on the go.

Tags: Energy, S&T Japan

[Recharge Your Electric Car Through Its Tires](#)

[MIT Technology Review](#), 11DEC2012

Researchers in Japan have demonstrated that power can be transferred from electrodes buried in a road to the steel belts inside tires. That power was used to propel a scale model of an electric vehicle. The researchers say the energy transfer is as efficient as charging and discharging a lithium ion battery. [TECHNICAL ARTICLE](#)

Tags: Energy

FORECASTING

[Lethal Asymmetrical Technology Will be More Widespread by 2030: Report](#)

[Global Security Newswire](#), 11DEC2012

Within two decades, lowered barriers for access to biological warfare agents, precision-strike weapons and other lethal technologies will give nonstate actors new abilities to carry out massive destabilizing attacks, according to the conclusions of a new report from the National Intelligence Council. [REPORT](#)

Tags: Forecasting

[New System for Aircraft Forecasts Potential Storm Hazards Over Oceans](#)

[Newswise](#), 11DEC2012

NCAR has developed a prototype system to help flights avoid major storms as they travel over remote ocean regions. The 8-hour forecasts of potentially dangerous atmospheric conditions are designed for pilots, air traffic controllers, and others involved in flights over remote ocean regions where limited weather information is available.

Tags: Forecasting, Climatology

INFORMATION TECHNOLOGY

[Can your smartphone see through walls? Engineers make tiny, low-cost, terahertz imager chip](#)

[Science Daily](#), 10DEC2012

Researchers at Caltech have created tiny silicon microchips that could help people see through walls, luggage, sealed

continued...

boxes and containers, and other objects. The new chips generate terahertz waves that have the ability to penetrate materials with none of the harmful affects of X-rays.

TECHNICAL ARTICLE

Tags: Information Technology

MATERIALS SCIENCE

Doctoral student unravels 'tin whisker' mystery

[Science Daily, 04DEC2012](#)

A doctoral student at the University of South Carolina used a process called digital image correlation to track the deformation of the surfaces and was able to prove that the growth of whiskers is caused by high-strain gradient built up inside the device. The importance of that work goes well beyond extending the operating life of consumer electronics. Satellites, missile systems, nuclear power stations and heart pacemakers have fallen victim to tin whiskers over the past several decades.

Tags: Materials science

FEATURED RESOURCE

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MICROELECTRONICS

New '4-D' transistor is preview of future computers

[Science Daily, 09DEC2012](#)

Researchers from Purdue and Harvard universities created a transistor, which is made from a material that could replace silicon within a decade. Each transistor contains three tiny nanowires made not of silicon, like conventional transistors, but made from indium-gallium-arsenide. The three nanowires are progressively smaller, yielding a tapered cross section. New findings show how to improve the device performance by linking the transistors vertically in parallel.

Tags: Microelectronics

S&T POLICY

Breakthrough medical research relies heavily on NIH funding

[Science Daily, 10DEC2012](#)

A new survey, representing responses from 1,040 abstract presenters at a recent conference from the US and abroad, demonstrates how critical NIH funding has been to the success of science and medicine.

Tags: S&T policy, Government S&T

R&D Scoreboard: Despite crisis, top EU firms continue to invest in innovation

[Alpha Galileo Foundation, 06DEC2012](#)

In the face of the continuing economic and financial crisis, major EU-based firms continue to rely on R&D for their competitive edge. They increased R&D investment by 8.9% in 2011, up from 6.1% in 2010. The increase nearly matches US firms (9%) and beats the global average (7.6%).

Tags: S&T policy, R&D Funding, S&T EU

SCIENCE WITHOUT BORDERS

Perimeter congratulates Davide Gaiotto and Stephen Hawking on receiving awards from the Fundamental Physics Prize Foundation

[Perimeter Institute, 10DEC2012](#)

Davide Gaiotto, a Perimeter faculty member, and Stephen Hawking, a Perimeter Distinguished Visiting Research Chair, have both been awarded prizes from the Fundamental Physics Prize Foundation. Gaiotto has won a \$100,000 New Horizons in Physics Prize for emerging work as a young researcher, and Stephen Hawking was awarded a \$3 million Fundamental Physics Prize for his work on black holes.

Tags: Science without borders

Subterranean Sound Waves from Projectile Impact—Focus

[American Physical Society Spotlight, 09DEC2012](#)

When a falling rock hurtles into a bed of sand, the grains quickly dissipate its energy and momentum. To learn exactly how the grains absorb the blow, a research team used a high-speed camera to capture the response of grains that light up when squeezed. They report that the impact creates pulses of acoustic waves that travel down into the granular material along networks of connected grains. The results may provide a better understanding of crater formation, as well as granular dynamics in general.

TECHNICAL ARTICLE

Tags: Science without borders

SENSORS

Ultrasound can now monitor the health of your car engine

[Science Daily, 10DEC2012](#)

A team of researchers at the University of Sheffield is measuring the lubricant film by transmitting ultrasonic pulses through the cylinder wall from sensors attached to the outside. The reflections from these pulses can then be recorded and measured. The technology could lead to more efficient engines—and huge fuel savings for motorists.

Tags: Sensors, S&T UK

continued...

[Detecting tunnels using seismic waves not as simple as it sounds](#)

[PhysOrg.com](#), 09DEC2012

Researchers at Sandia Laboratory speculate the difficulty might be what's called a halo effect around a tunnel, in which fracturing and other geological anomalies create diffuse boundaries and hide the tunnel. The earlier, broader research produced several successes in tunnel detection, but was not focused specifically on what happens in the area where tunnel and earth meet, which might help explain why tunnels can be detected in some cases but not others.

Tags: Sensors

[GPS Has Uses in Detecting Underground Atomic Detonations](#)

[Global Security Newswire](#), 06DEC2012

Powerful radio telescopes and GPS technology can be employed to uncover secret subterranean atomic detonations through the analysis of upper-atmospheric disturbances created by the explosion. The Ohio State researchers worked out a mathematical formula to identify other atomic detonations and examined years of GPS signal collections to find out if they could identify more nuclear blasts. They were successful.

Tags: Sensors, Military technology

STEM

[Global student achievement in math, science and reading literacy: Results of 2011 TIMSS and PIRLS assessments](#)

[Science Daily](#), 11DEC2012

Students from East Asian countries, in addition to a select group of European countries, outperformed students around the world in mathematics, science and reading at both the fourth and eighth grades, according to the latest assessments. [REPORT](#)

Tags: STEM

[Characteristics of U.S. Science and Engineering Doctorates Detailed in New Report](#)

[NSF News](#), 07DEC2012

The National Center for Science and Engineering Statistics (NCSES) released a report titled Doctorate Recipients from U.S. Universities: 2010 that unveils important trends in U.S. doctoral education. [REPORT](#)

Tags: STEM ■

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