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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

Microresonators: Transmitting 40 Communication Channels with One Laser

IEEE Spectrum, 14AUG2015

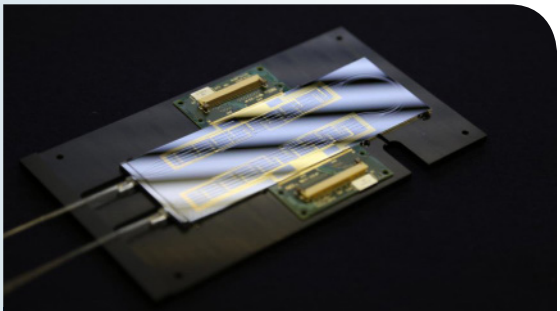
A tiny microresonator is the key component of a new technology developed by researchers at Purdue University. It is a 100-micrometer-wide optical waveguide loop or microring made from silicon nitride. Because it is as thin as a sheet of paper, it can easily be integrated on silicon chips. A single laser can simultaneously transmit data over a number of individually controlled channels, at different frequencies. TECHNICAL ARTICLE

Tags: Communications Technology, Featured Article

New optical chip lights up the race for quantum computer

Science Daily, 13AUG2015

An international team of researchers (UK, Japan) has developed an optical chip that can process photons in an infinite number of ways. The fully reprogrammable chip brings together a multitude of existing quantum experiments and can realise a plethora of future protocols that have not even been conceived yet, marking a new era of research for quantum scientists and engineers at the cutting edge of quantum technologies. The team demonstrated the chip's unique capabilities by re-programming it to rapidly perform a number of different experiments, each of which would previously have taken many months to build. TECHNICAL ARTICLE



This is the silicon based quantum optics lab-on-a-chip. Credit: University of Bristol

Tags: Quantum science, Breakthrough technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

A new material for transparent electronics

Nanowerk, 17AUG2015

An international team of researchers (USA - Pacific Northwest National Laboratory, Binghamton University, Oak Ridge National Laboratory, UK) demonstrated that crystalline $La_{1-x}Sr_xCrO_3$ (LSCO) films deposited on $SrTiO_3$(001) show figures of merit. They are highly competitive with best p-type transparent conducting oxides reported to date, and yet are more stable and structurally compatible with the workhorse materials of oxide electronics. TECHNICAL ARTICLE 1, 2, 3

Tags: Advanced materials, Materials science

Breakthrough brings futuristic electronics a step nearer

Nanowerk, 17AUG2015

By mixing solutions of the right substances, researchers in Denmark automatically built structures that in principle could have been solar cells or transistors. Even random substances were able to organise well and layer, so that we now have complete control over where the molecules are, and in which direction they are oriented. The next step is to incorporate functionality within the layers. TECHNICAL ARTICLE

Tags: Advanced materials

Superconductivity record sparks wave of follow-up physics

Nature News, 17AUG2015

Researchers in Germany found that when they subject samples of hydrogen sulfide to extremely high pressures—around 1.5 million atmospheres (150 gigapascals)—and cool them below 203 K, the samples display the classic hallmarks of superconductivity: zero electrical resistance and a phenomenon known as the Meissner effect. A superconductor that works at room-temperature would make everyday electricity generation and transmission vastly more efficient, as well as give a massive boost to current uses of superconductivity

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such as the enormous magnets used in medical imaging machines. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Germany

Engineers 'sandwich' atomic layers to make new materials for energy storage

Science Daily, 14AUG2015

An international team of researchers (USA - Drexel University, Oak Ridge National Laboratory, Sweden) has developed a technique to sandwich 2-D sheets of elements that otherwise couldn't be combined in a stable way. They proved its effectiveness by creating two entirely new, layered two-dimensional materials using molybdenum, titanium and carbon. The discovery is significant because it represents a new way of combining elemental materials to form the building blocks of energy storage technology--such as batteries, capacitors and supercapacitors, as well as superstrong composites. TECHNICAL ARTICLE

Tags: Advanced materials

How to Make Graphene Using Supersonic Buckyballs

MIT Technology Review, 13AUG2015

Researchers in Italy accelerate the buckyballs by releasing them into a helium or hydrogen gas, which they allow to expand at supersonic speeds, carrying the carbon balls with it. That gives the buckyballs energies of around 40 keV without changing their internal dynamics. The buckyballs are aimed at a copper sheet to smash into it resulting in a fairly even coating of graphene-like material in a single layer. Although just a proof of principle at this stage, the technique looks interesting, and could also be applied to a wide range of other materials such as metals, semiconductors, and insulators. And that could pave the way for a new generation of electronic devices. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Italy

Microscopic rake doubles efficiency of low-cost solar cells

Science Daily, 12AUG2015

An international team of researchers (USA - Stanford University, SLAC National Accelerator Laboratory, Lawrence Berkeley National Laboratory, China, Germany, South Korea) have developed a new technique in which, as the polymers are painted onto a conducting surface, they are forced through a slightly angled rake containing several rows of stiff microscopic pillars. The large polymer molecules untangle and mix with each other as they bounce off and flow past the pillars, ultimately drying into tiny nanometer-sized crystals of uniform size with enhanced electrical properties. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Erica the Android, Autonomous Drifting, and Birds Don't Like Drones

IEEE Spectrum, 14AUG2015

ExoAtlet is the first Russian-designed rehabilitation exoskeleton. Eventually, patients using the exoskeleton will be able to sit, stand, walk, and even handle stairs completely independently. A year of clinical trials is underway.

Tags: Autonomous systems & robotics

BIG DATA

European consortium develops new approaches for dealing with Big Data

Alpha Galileo, 14AUG2015

The BigStorage project, funded by the European Union, will develop new approaches to deal with Big Data concepts over the next three years, from theoretical basic research to the development of complex infrastructures and software packages. It also plays an important role in the training of researchers and developers in the international context.

Tags: Big data, S&T EU

CYBER SECURITY

Ambient sound may help protect your online accounts

PhysOrg.com, 18AUG2015

Researchers in Germany have developed a two-factor authentication mechanism called Sound-Proof that is transparent to the user; it can be used with current phones and with major browsers without any plugin. The second authentication factor is the proximity of the user's phone to the computer being used to log in. When the user logs in, the two devices record the ambient noise via their microphones. The phone compares the two recordings, determines if the computer is located in the same environment, and ultimately decides whether the login attempt is legitimate or fraudulent. TECHNICAL ARTICLE

Tags: Cyber security, S&T Germany

Eleven security flaws found in popular internet browsers

Science Daily, 13AUG2015

Researchers at Georgia Institute of Technology explored vulnerabilities in C++ programs (such as Chrome and Firefox) that result from "bad casting" or "type confusion." Bad casting enables an attacker to corrupt the memory in a browser so that it follows a malicious logic instead of proper instructions. The researchers developed a new, proprietary detection tool called CAVER to catch them. The 11 vulnerabilities identified by Georgia Tech have been confirmed and fixed by vendors.

Tags: Cyber security

continued...

"You've got to think about the big things while you're doing small things, so that the small things go in the right direction." —ALVIN TOFFLER

FORECASTING

35 Innovators Under 35 2015

MIT Technology Review, 18AUG2015

These are not merely personality profiles. They also illustrate the most important emerging technologies of the moment.

Tags: Forecasting, Emerging technology, Science without borders

Seven over 70

MIT Technology Review, 18AUG2015

Every year *Technology Review* celebrates 35 innovators under the age of 35. They choose to write about the young simply because they want to introduce you to the most promising new technologists, researchers, and entrepreneurs. But older people are, of course, just as capable of new thinking as the young. Here are seven innovators over the age of 70, still working.

Tags: Forecasting, Emerging technology

IMAGING TECHNOLOGY

Mini X-ray source with laser light

Science Daily, 14AUG2015

Until now, light-generated radiation could only be produced in expensive ring accelerators measuring several kilometers in diameter. By contrast, researchers in Germany developed a laser-driven system in combination with phase-contrast X-ray tomography that only requires a university laboratory to view soft tissues. The new imaging method could make future medical applications more cost-effective and space-efficient than is possible with today's technologies.

Tags: Imaging technology, Medical Sciences

INFORMATION TECHNOLOGY

How to preserve fleeting digital information with DNA for future generations

PhysOrg.com, 17AUG2015

Researchers in Switzerland encoded DNA with 83 kilobytes of text from the Swiss Federal Charter from 1291 and the Method of Archimedes from the 10th century. They encapsulated the DNA in silica spheres and warmed it to nearly 160 degrees Fahrenheit for one week, which is the equivalent of keeping it for 2,000 years at about 50 degrees. When they decoded it, it was error-free.

Tags: Information Technology, S&T Switzerland

Programming and prejudice: Computer scientists discover how to find bias in algorithms

PhysOrg.com, 14AUG2015

A team of researchers in the US (University of Utah, University of Arizona, Haverford College, PA) has discovered a technique to determine if an algorithm used for hiring decisions discriminate unintentionally and violate the legal standards for fair access to employment, housing and other opportunities. The team also has determined a method to fix these potentially troubled algorithms.

Tags: Information technology

MATERIALS SCIENCE

Unusual magnetic behavior observed at a material interface

PhysOrg.com, 18AUG2015

A team of researchers in the US (MIT, Brookhaven National Laboratory, NIST, Northeastern University, Boston College) bonded a layer of topological insulator material to a ferro-magnetic layer. Topological insulator enhanced the proximity effect and locked the new magnetic order near the interface. They showed that the induced magnetism extends to the interior of the insulator material. The technique could be a building block of quantum computers. TECHNICAL ARTICLE

Tags: Materials science, Quantum science

Eliminating water-borne bacteria with pages from The Drinkable Book could save lives

PhysOrg.com, 16AUG2015

A company in the USA has developed a unique product that is essentially a book comprised of pages embedded with silver nanoparticles. Printed on each page is information on water safety both in English and the language spoken by those living where the filter is to be used. Each page can be removed from the book and slid into a special holding device in which water is poured through and filtered. A page can clean up to 26 gallons (100 liters) of drinking water; a book can filter one person's water needs for four years.

Tags: Materials science, Biotechnology

Materials Science: Advancing the Next Revolution of "Stuff"

DARPA News, 14AUG2015

DARPA is pursuing other approaches to creating new materials with unique properties through its Materials with Controlled Microstructural Architecture (MCMA) program. This program seeks to control the architecture of material microstructures to improve structural efficiency and realize properties that traditionally aren't achieved

continued...

together in a single substance, such as the strength of steel and the weight of plastic. The work could also help incorporate other important properties, such as high rates of heat diffusion for thermal management applications and tailorability of thermal expansion to enable joining of normally incompatible materials. BAA

Tags: Materials science, DARPA, Government S&T

The pressure is on: New technology to squeeze materials with a million times the pressure of Earth's atmosphere

Science Daily, 13AUG2015

Researchers at Oak Ridge National Laboratory have developed a technology known as diamond anvil cell to squeeze materials with a million times the pressure of Earth's atmosphere while studying them with neutrons. When they bombard these materials with neutrons, the materials provide an unprecedented picture of the changing nature of matter under extreme pressure. The new technology, coupled with the ability of Sandia's neutron source to exploit neutrons in a variety of ways, will open up exciting new areas of knowledge.

Tags: Materials science, Government S&T

Featured Resource

Academia.edu

Academics use Academia.edu to share their research, monitor deep analytics around the impact of their research, and track the research of academics they follow.

Unusual discovery in thin film magnetism

Science Daily, 13AUG2015

An international team of researchers (the Netherlands, Singapore, USA - University of Nebraska, Stanford University, Ireland) has discovered that the magnetism in stackings of $LaMnO_3$ unit cells is switched on abruptly when the number of $LaMnO_3$ building blocks changes from 5 to 6. According to the researchers, the abrupt switch from antiferromagnetism to ferromagnetism is based on an avalanche of electronic charge inside the $LaMnO_3$ thin film from the top surface of the film to the bottom. The discovery makes it possible to define magnetic structures on a nanoscale and alter the magnetic properties of the structure. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

Black Phosphorus Takes a Step Toward CMOS

IEEE Spectrum, 17AUG2015

Researchers in South Korea discovered that they can manipulate black phosphorus to behave as an n-type, semiconductor, a p-type, or as if it were ambipolar simply by changing its thickness and its bandgap or by using a different metal to contact it with. The thinner they can make the material, the better its switching performance. TECHNICAL ARTICLE

Tags: Microelectronics, Advanced materials

PHOTONICS

Breakthrough optics pave way for new class of intriguing technologies

EurekAlert, 18AUG2015

Performance of many optical functions is limited by beam splitters that deviate from the ideal 50:50 split. Rather than engineering a perfect, single component, researchers at Stanford University propose that it is possible to create a mesh, or array, of interferometers that, when properly programmed, could compensate for its less-than-perfect parts and deliver overall perfect performance. TECHNICAL ARTICLE

Tags: Photonics

A nanoscale color filter

Nanowerk, 13AUG2015

Researchers in South Korea fabricated a device that consists of a ZnO nanowire sandwiched between two silver films. At the filter wavelength, the metal effectively acts as an imperfect cloak to the nanowire, and makes the nanowire appear more transparent than its surrounding. It is possible to choose the color with excellent spectral selectivity by simply changing the diameter of the nanowire. This work also ushers in possibilities of realizing filters at even smaller sizes. TECHNICAL ARTICLE

Tags: Photonics

New diamond laser 20 times more powerful

PhysOrg.com, 13AUG2015

The new laser, developed by an international team of researchers (Australia, Germany), provides up to 380 Watts of output power. The wavelength of the new diamond laser, at 1240nm, has high transmission through the atmosphere. High-power diamond lasers are well-suited to applications that require beaming power over long distances, such as optical communications in space, laser ranging, and the tracking and removal of space debris. TECHNICAL ARTICLE

Tags: Photonics

QUANTUM SCIENCE

Quantum computing advance locates neutral atoms

Science Daily, 12AUG2015

For quantum computing, singling out one data location without influencing any of the surrounding locations is difficult. Now researchers at Pennsylvania State University have a method for using neutral atoms for quantum computing. They investigated ways to individually locate and address an atom to store and retrieve information. TECHNICAL ARTICLE

Tags: Quantum science

continued...

Experimental demonstration of a quantum router

arXiv, 07AUG2015

An international team of researchers (China, USA - University of Michigan) demonstrated quantum nature of the router by showing entanglement generated between the initially unentangled control and signal photons, and confirmed that the qubit state of the signal photon was well preserved by the router through quantum process tomography. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

China DF-5B liquid-fuel ICBM 'can hit any target on Earth'

Next Big Future, 16AUG2015

The DF-41 has a longer operational range of 12,000–15,000 kilometers and can carry three or more warheads, though the missile is still in the testing phase. The JL-2, which has an estimated operation of up to 8,000 km, can only be fired from a submarine at sea. US and Japanese media report that China may have recently tested two ICMBs, the DF-41 and the DF-5A.

Tags: S&T policy, Military technology, S&T China

China could build floating airstrips three times longer than US aircraft carrier by using oil platform technology and modular construction can go bigger

Next Big Future, 14AUG2015

A construction company in China is proposing to build a floating sea base for multipurpose usage, such as tourism, shipping, power generation and offshore fossil fuel extraction. The floating sea base would be based in the South China Sea, for logistical support activities. The Chinese platforms could be 400,000 to 1.5 million tons of displacement and could be 900 meters long.

Tags: S&T policy, S&T China

Presidential advisors recommend 8 new focus areas for IT research and development

Fierce Government IT, 13AUG2015

The Federal Networking and Information Technology Research and Development Program, or NITRD report focuses on eight R&D areas for the federal government: cybersecurity, IT and health, big data and data-intensive computing, IT and the physical works, privacy protection, cyber-human systems, high capability computing and foundational computing research.

Tags: S&T policy, Information technology

SCIENCE WITHOUT BORDERS

Electronic Noise Is Drowning Out the Internet of Things

IEEE Spectrum, 18AUG2015

There hasn't been a systematic study of radio-frequency noise in the United States since the mid-1970s. The RF noise problem is increasing. Although most devices pollute less than their predecessors, we have far more of those devices. To begin to solve the problem, we need to amass statistics on a broad scale. We have to determine where and when RF noise usually appears and at what frequencies, in each case tracing it to its source. With the exponential increase in the number of noise-generating devices and of wireless systems, RF pollution will become a very expensive problem—unless we act now.

Tags: Science without borders

SENSORS

The world's first electrically powered optical nanoantenna

Nanowerk, 17AUG2015

An international team of researchers (Germany, the Netherlands) describes for the first time how light is generated using an electrically powered nanoantenna measuring just 250 nanometres made of gold. The antenna emits electromagnetic waves in the form of visible light. The colour of the light is determined by the length of the antenna arms. Properties of the antenna can be controlled by adjusting its geometry. TECHNICAL ARTICLE

Tags: Sensors

Sandia wants to help security analysts see better

Federal Computer Week, 13AUG2015

Sandia National Laboratory is working with a private company to develop a way to capture, within tens of milliseconds, the content beneath the point on a screen where a viewer is looking. The technology could benefit intelligence analysts working to identify security threats in war zones, airports or elsewhere.

Tags: Sensors, Government S&T

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