



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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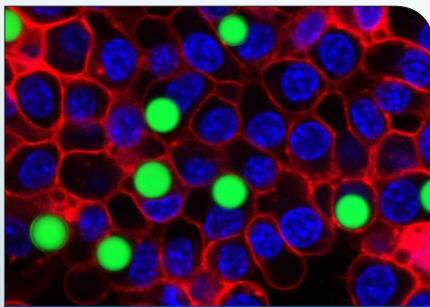
[Quantum science \(5\)](#)

FEATURE ARTICLES

S&T NEWS ARTICLES

[Transforming living cells into tiny lasers](#)

[PhysOrg.com, 28JUL2015](#)



Green lasers glowing within cells. Credit: Matjaž Humar and Seok Hyun Yun, CC BY-ND

An international team of researchers (USA - Harvard University, Slovenia) made lasers out of solid polystyrene beads which contain a fluorescent dye. The surface of the bead confines light, creating an optical cavity. The beads

are fed to live cells in culture, which eat the lasers within a few hours. After that, the lasers can be operated by illuminating them with external light without any harm to the cells. The lasers act as sensors when the light emitted by the cells is captured and analyzed.

[TECHNICAL ARTICLE](#)

Tags: Biotechnology, Sensors, Featured Article

[The future with nanoionics](#)

[Nanowerk, 26JUL2015](#)

Nanoionics is a new area of research in which ionic currents are conducted on the scale of nanometers; it may one day lead to innovative technologies. Researchers in Israel have developed a method for building ion-conducting channels with planned shapes and dimensions on the surface of a solid material. This method answers two technical challenges: The motion of ions through solids is rather sluggish at room temperature, and no previous method has been available for confining such motion to well-defined, predetermined paths. [TECHNICAL ARTICLE](#)

Tags: Forecasting, Emerging technology, Featured Article

ADVANCED MATERIALS

[Researchers predict material with record-setting melting point](#)

[EurekaAlert, 27JUL2015](#)

Researchers at Brown University showed that a material made with just the right amounts of hafnium, nitrogen, and carbon would have a melting point of more than 4,400 kelvins (7,460 degrees Fahrenheit). The work could ultimately point toward new high-performance materials for a variety of uses, from plating for gas turbines to heat shields on high-speed aircraft.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

[Wafer-thin material heralds future of wearable technology](#)

[Nanowerk, 27JUL2015](#)

Researchers in Australia have developed a three-dimensional structure using a flat-pack self-assembly of three components: graphene, a conductive polymer and carbon nanotubes. It is highly conductive, lightweight, and can be folded like a roll or stack like a paper in electronic devices to store a huge amount of charge. It can store charge in a second and deliver the charge at superfast speed. It will be more lightweight than traditional batteries used in present day's electronics.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, Energy, S&T Australia

[CNT fibres go stretchy](#)

[Nanotechweb, 23JUL2015](#)

The electrical conductivity of conducting fibres normally decreases when they are highly stretched, but researchers at UT Dallas have created superelastic fibres based on carbon nanotubes that do not suffer from this problem. Conductivity of the new fibres actually increases by 121-fold when they are stretched to over 11 times their original length, and such extreme stretch results in only a 5% change in their resistance. The fibres might be used in a host of flexible electronics

continued...

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applications, smart textiles, artificial muscles, and interconnects to name a few. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Plasmonics study suggests how to maximize production of 'hot electrons'](#)

Nanowerk, 23JUL2015

Researchers at Rice University describe a new method that solar-panel designers could use to incorporate light-capturing nanomaterials into future designs. By applying an innovative theoretical analysis, they created a methodology that solar engineers can use to determine the electricity-producing potential for any arrangement of metallic nanoparticles. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

[Nanocomposite window materials can control light and energy](#)

Nanowerk, 22JUL2015

A team of researchers in the US (UT Austin, Lawrence Berkeley National Laboratory) has developed a nanostructured architecture for electrochromic materials that allows for a cool mode to block near-infrared light while allowing the visible light to shine through. This could help reduce energy costs for cooling buildings and homes during summer. [TECHNICAL ARTICLE 1, 2](#)

Tags: Advanced materials

[New molecular butterflies help advance energy research](#)

Science Daily, 22JUL2015

Researchers at Florida State University have developed new functional materials with well-defined structures and tailored properties. The molecular butterflies can be controlled to emit blue, red or white colors. Those colors translate into different levels of energy. Their research may lead to the development of better materials and more efficient sensors, light bulbs and solar panels.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

[Robots' maps of their environments can make existing object-recognition algorithms more accurate](#)

PhysOrg.com, 24JUL2015

The system, devised by researchers at MIT, uses the simultaneous localization and mapping (SLAM) to guide the segmentation of images captured by its camera before feeding them to the object-recognition algorithm. It thus wastes less time on spurious hypotheses. More important, the SLAM data let the system correlate the segmentation of images captured from different perspectives. Analyzing image segments that likely depict the

same objects from different angles improves the system's performance. [TECHNICAL ARTICLE](#)

Tags: Autonomous systems & robotics

[Video Friday: Atlas Kicked, Tea-Brewing Robot, and Rodney Brooks's Giant Brains](#)

IEEE Spectrum, 24JUL2015

NASA's Tensegrity robot can roll downhill, which is not super amazing. What is more amazing is that it can also roll uphill.

Tags: Autonomous systems & robotics

BREAKTHROUGH TECHNOLOGY

[Superfast fluorescence sets new speed record](#)

Nanowerk, 27JUL2015

In a new study, researchers at Duke University pushed semiconductor quantum dots to emit light at more than 90 billion gigahertz. This plasmonic device could one day be used in optical computing chips or for optical communication between traditional electronic microchips. The eventual goal is to integrate this technology into a device that can be excited either optically or electrically. Aside from its potential technological impacts, the research demonstrates that well-known materials need not be limited by their intrinsic properties. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Microelectronics

COMMUNICATIONS TECHNOLOGY

[Data transmission devices: Smaller, faster, cheaper](#)

Science Daily, 27JUL2015

In order to make the device smaller than the wavelength, an international team of researchers (Switzerland, Germany, USA) first turned light into surface-plasmon-polaritons. At the end of the strip they are converted back to light once again. The advantage of this detour is that plasmon-polaritons can be confined in a much smaller space than the light they originated from. The new modulator is considerably cheaper and faster than common models, and it uses far less energy. [TECHNICAL ARTICLE](#)

Tags: Communications Technology

[China launches two satellites as it builds GPS rival](#)

PhysOrg.com, 24JUL2015

The satellites are the 18th and 19th launched by China as it develops its domestic navigation system Beidou, or Compass. They take the total number launched this year to three. Beidou is currently centred on the Asia Pacific region but is slated to cover the whole world by 2020. The new satellites will be deployed in testing a new type of navigation signalling and inter-satellite links as well as providing navigation services.

Tags: Communications technology, S&T China, Space technology

continued...

“I can no longer laugh at ignorance or stupidity. Those are our chief enemies, and it is dangerous to make fun of them.” CHARLES RICHTER

CYBER SECURITY

[IARPA wants an early warning system for cyber attacks](#)

[Defense Systems](#), 24JUL2015

IARPA said Cyberattack Automated Unconventional Sensor Environment (CAUSE) will be a three-and-a-half-year program in three phases, the first lasting 18 months, followed by two 12-month phases. Phase 1 will focus on identifying predictive threat signals, creating new sensors and generating cyber attack warnings. Phase 2 will work on enhancements to and integration of the various internal and external sensors. And in Phase 3, IARPA will look for the ability to integrate the systems within the organization, along with further improvements in sensors and data fusion. Work is expected to start in February 2016. [BAA](#)

Tags: Cyber security, Government S&T

ENERGY

[Reshaping the solar spectrum to turn light to electricity](#)

[Nanowerk](#), 28JUL2015

Researchers at UC Riverside have developed a hybrid material that first captures two infrared photons that would normally pass right through a solar cell without being converted to electricity, then adds their energies together to make one higher energy photon. This upconverted photon is readily absorbed by photovoltaic cells, generating electricity from light that normally would be wasted. [TECHNICAL ARTICLE](#)

Tags: Energy, Solar energy

[Scientists harvest energy from beam's self-induced, self-sustaining vibrations in airflow](#)

[PhysOrg.com](#), 27JUL2015

Researchers at Virginia Tech have demonstrated the ability to harvest energy directly from the vibrations of a flexible, piezoelectric beam placed in a wind tunnel. The new design eliminates the need for the secondary vibrating structure because the beam is designed so that it produces self-induced and self-sustaining vibrations. As a result, it can be made very small, which increases its efficiency and makes it more practical for applications, such as self-powered sensors. [TECHNICAL ARTICLE](#)

Tags: Energy, Wind energy

[Testing shows using microwaves to propel a craft into space might work](#)

[PhysOrg.com](#), 23JUL2015

A company in the US proposes to use microwaves beamed from the ground to heat hydrogen carried by the spaceplane to push the craft into space. They report that the thruster they built achieved a specific impulse of 500 seconds when using helium, and believe that when they switch to hydrogen that number will jump to 600 seconds—enough, they claim, to push a small craft into space.

Tags: Energy, Satellite technology, Space technology

FORECASTING

[Army S&T Futures Brainstorming Exercise Announcement July 27th to July 31st 2015](#)

[U.S. Army](#), 24JUL2015

Army is rolling out a new online platform designed to facilitate discussions about potential future technologies and concepts, their strengths and weaknesses, and how they could be applied to operational needs within future scenarios in the 2040 timeframe. The layered complexity gives us a chance to generate new and exciting ideas about what the future may look like. This exercise invites you to mix and match emerging S&T trends to share with us your ideas of what the future of technology may hold. [REGISTER FOR AN ACCOUNT](#)

Tags: Forecasting, Emerging technology, Government S&T, Military technology

MICROELECTRONICS

[Penn researchers discover new chiral property of silicon, with photonic applications](#)

[PhysOrg.com](#), 23JUL2015

Researchers at the University of Pennsylvania have demonstrated a silicon-based photonic device that is sensitive to the spin of the photons in a laser shined on one of its electrodes. Light that is polarized clockwise causes current to flow in one direction, while counter-clockwise polarized light makes it flow in the other direction. This property is a function of the geometric relationship between the pattern of atoms on the surface of silicon nanowires and how electrodes placed on those wires intersect them. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Materials science

[Researchers make scalable arrays of ‘building blocks’ for ultrathin electronics](#)

Science Daily, 22JUL2015

Researchers at the Department of Energy’s Oak Ridge National Laboratory have combined a novel synthesis process with commercial electron-beam lithography techniques to produce arrays of semiconductor junctions in arbitrary patterns within a single, nanometer-thick semiconductor crystal. The process transforms patterned regions of one existing, single-layer crystal into another. The two semiconductor crystals formed sharp junctions, the desired building blocks of electronics. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Government S&T

FEATURED RESOURCE

[IOPscience](#)

IOPscience is an online service for journal content published by the Institute of Physics Publishing. It has been designed to make it easy for researchers to discover relevant content and manage their research information.

PHOTONICS

[Asymmetric optical-invisibility camouflage](#)

Nanowerk, 28JUL2015

Researchers in Japan have formulated a theory of asymmetric (or nonreciprocal) camouflage that can achieve unidirectional transparency in which “they cannot see us, but we can see them.” This theory is unrelated to transformation optics but instead based on the concept of ‘Lorentz/Coulomb-like forces for photons.’ [TECHNICAL ARTICLE](#)

Tags: Photonics, S&T Japan

[The First White Laser](#)

IEEE Spectrum, 27JUL2015

The heart of the new device, developed by researchers at the Arizona State University, is a sheet made of a semiconducting alloy of zinc, cadmium, sulfur, and selenium that is only nanometers thick. Individually targeting each segment of the nano-sheet with varying power light pulses allows the laser to produce 70 percent more perceptible colors than the most commonly used light sources. [TECHNICAL ARTICLE](#)

Tags: Photonics

[Photonic waveguides suppress “crosstalk among neighbors”](#)

PhysOrg.com, 23JUL2015

A team of researchers in the US (Rutgers University, Brookhaven National Laboratory, Stanford University, University of Central Florida) designed and fabricated advanced waveguide superlattices comprising an array of waveguides spaced at a pitch of $0.78 \mu\text{m}$ ($\lambda/2$). The detected crosstalk was no larger than -20 dB, a level that confirmed the feasibility of these superlattices in photonic device applications. [TECHNICAL ARTICLE](#)

Tags: Photonics

[Infrared amplifier reaches the nanoscale](#)

Nanotechweb, 22JUL2015

An international team of researchers (UCLA, China) has unveiled the first nanoscale amplifier for light at the technologically important telecommunications wavelength of $1.55 \mu\text{m}$. The new device, which is 20 times more powerful than previous such amplifiers that measured microns across, is small enough to fit on an integrated circuit. It could help make for the next generation of faster, more efficient, nanophotonics components. [TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

[Interacting ion qutrits](#)

Nanowerk, 28JUL2015

In quantum mechanics, symmetry is used to classify the nature of quantum states. For some entangled states, the symmetry of these connections can offer a kind of protection against disruptions. An international team of researchers (USA - University of Maryland, Israel) has used trapped atomic ions to construct a system that could potentially support a type of symmetry-protected quantum state. For this research they used a three-state system, called a qutrit, and demonstrated a proof-of-principle experiment for manipulating and controlling multiple qutrits. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Currently Quantum computers might be where Rockets were at the time of Robert Goddard](#)

Next Big Future, 27JUL2015

If quantum computing is at the Goddard level, that would be a good thing for quantum computing. This means that the major fundamental breakthrough that would put them over the top was in hand and merely a lot of investment, engineering and scaling was needed.

Tags: Quantum science

Quantum networks: Back and forth are not equal distances**PhysOrg.com, 27JUL2015**

An international team of researchers (Denmark, South Korea) developed a new photonic channel where they can control the photons so that they are only sent in one direction. It also turns out that a photon that enters from one end of the channel behaves differently than a photon that enters from the other end. Only when the photon moves in one direction does it interact with the quantum dot and this slows the photon a little bit. We now have a number of new opportunities to control and design the interaction between a photon and a quantum dot, which is important for the development of quantum computers. [TECHNICAL ARTICLE](#)

*Tags: Quantum science***Superconducting qubit and magnetic sphere hybrid****Nanowerk, 27JUL2015**

Researchers in Japan have coupled a magnon in a magnet to a photon in a microwave cavity at an ultralow temperature near absolute zero (-273.14 degrees centigrade). They observed coherent interaction between the two by placing a millimeter-sized ferromagnetic sphere made of yttrium iron garnet in a centimeter-scale microwave cavity. This result is expected to contribute to the development of quantum interfaces and quantum repeaters. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, S&T Japan***Qubit chemistry****Nanowerk, 22JUL2015**

A team of researchers in the US (University of Maryland, NIST) has developed an approach for entangling electron spin qubits localized on spatially separated impurity atoms or quantum dots via a multielectron, two-level quantum dot. This provides both a high degree of tunability and a means for realizing high-fidelity two-qubit gates between spatially separated spins, yielding an experimentally accessible method of coupling donor electron spins in silicon via a hybrid impurity-dot system. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Government S&T***SCIENCE WITHOUT BORDERS****Can Moore's Law make a comeback?****Nanotechweb, 27JUL2015**

With the limit of miniaturization of two-dimensional semiconductor circuits approaching, independent analyses have now announced "Moore's law is dead", almost 50 years since its inception. Researchers at the University of Colorado offer hope for extending and reviving Moore's Law by stacking transistors in the third dimension. [TECHNICAL ARTICLE](#)

*Tags: Science without borders***SENSORS****Smaller and smarter antennas for military use****PhysOrg.com, 24JUL2015**

Researchers at UW-Madison are working to develop a 1-meter antenna that can send high-power signals at frequencies as low as 3 megahertz. They are looking at a combination of vacuum electronics, which can handle high-power transmissions, and the concept of non-Foster impedance matching to design the short antenna.

*Tags: Sensors***Nanopaper as an optical sensing platform****PhysOrg.com, 23JUL2015**

An international team of researchers (Spain, Iran, Czech Republic) has developed new sensing platforms based on bacterial cellulose nanopaper. They describe how the material can be tuned to exhibit plasmonic or photoluminescent properties that can be exploited for sensing applications. This class of platforms may prove valuable for displaying analytical information in diverse fields such as diagnostics, environmental monitoring and food safety.

[TECHNICAL ARTICLE](#)*Tags: Sensors, Advanced materials ■***ABOUT THIS PUBLICATION**

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