



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[ANNOUNCEMENT: Army Science and Technology Ideation Exercise Launching 20 June 2016](#)

[Army Scitech, 15JUN2016](#)



From 20-25 June, 2016, Army Scitech will be running their latest futures game, sponsored by the Deputy Assistant Secretary of the Army (Research & Technology). Through this game, you can join fellow thought leaders in exploring how advances in science

and technology might transform the world and the U.S. Army in the decades to come. At the end of the game, we'll rack and stack all of the ideas and concepts to identify the most thought-provoking, challenging, and inspiring submissions. From this foundation, our team of analysts, concept artists, and authors will do added analysis that will be used to inform Army and Defense Department leaders, guide wargames examining future capabilities, and shape over \$2 billion a year in S&T investments. [Learn more and register](#) for the June game at any time.

Tags: Government S&T, Military technology, S&T Policy, Featured article

[Surf's up: Magnetic waves on the edge](#)

[Nanowerk, 13JUN2016](#)

An international team of researchers (USA - MIT, NIST, Northwestern University, University of Missouri, Harvard University, Stanford University, UK) has shown that a metal-organic framework compound, copper[1,3-benzenedicarboxylate] with a unique arrangement of copper atoms in a crystal conducts spin waves along their edges, without conduction through the bulk material. The material, called the topological magnon insulator, could lead to new applications in such fields as spintronics.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, Featured article

[Quantum teleportation across a metropolitan fibre network](#)

[arXiv, 27MAY2016](#)

An international team of researchers (Canada, USA - NIST, CalTech) reports quantum teleportation from a telecommunication-wavelength photon, interacting with another telecommunication photon after both have travelled over several kilometres in a bee-line, onto a photon at 795~nm wavelength. This improves the distance over which teleportation takes place from 818~m to 6.2~km. The demonstration establishes an important requirement for quantum repeater-based communications and constitutes a milestone on the path to a global quantum Internet.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, Communications technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Innovative solar absorber can harness more sunlight, enhancing its sunlight-to-heat efficiency](#)

[PhysOrg.com, 10JUN2016](#)

An international team of researchers (Saudi Arabia, USA - MIT) has developed a new fabrication technique that involves patterning a solar absorber with tiny holes with diameters less than 400 nanometers cut into the absorber at regular intervals. Close to 90% of the all the wavelengths of light that reach Earth's surface are absorbed by the nano-hole patterned absorber. This idea can be applied to most conventional solar absorbers. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Solar energy

continued...

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Finding superconducting needles in the metal haystack[PhysOrg.com](#), 06JUN2016

A team of researchers in Japan undertook a four-year exploration of more than 1,000 materials to look for new superconductors. Among the team's many successes in the project was the introduction of a new substance (a hydride ion) that induces iron-based superconductivity; the discovery of new cobalt- and titanium-based superconductors; and the design of electrical wires and tapes made from some of the superconducting materials, demonstrating their real-world applicability.

Tags: Advanced materials, S&T Japan

New low-defect method to nitrogen dope graphene resulting in tunable bandstructure[Science Daily](#), 06JUN2016

Researchers at the Naval Research Laboratory have demonstrated hyperthermal ion implantation (HyTII) as an effective means of substitutionally doping graphene with nitrogen atoms. The research shows that the HyTII method delivers a high degree of control including doping concentration and depth control of implantation by doping a single monolayer of graphene in a bilayer graphene stack. The resulting films have high-quality electronic transport properties that can be described solely by changes in bandstructure rather than the defect-dominated behavior of graphene films doped or functionalized using other methods.

Tags: Advanced materials, Government S&T

AUTONOMOUS SYSTEMS & ROBOTICS**Video Friday: Robotic Submersible, Hair-Cutting Drone, and What Is a Robot?**[IEEE Spectrum](#), 10JUN2016

Microsoft Research moderated a panel discussion on "Progress in AI: Myths, Realities, and Aspirations" featuring panelists from Stanford University, Brown University, Massachusetts Institute of Technology, Allen Institute for Artificial Intelligence and Microsoft Research.

Tags: Autonomous systems & robotics

COMMUNICATIONS TECHNOLOGY**Researchers demonstrate a 100x increase in the amount of information that can be 'packed into light'**[PhysOrg.com](#), 10JUN2016

Due to technical hurdles, only one pattern of light is used in optical communications. An international team of researchers (South Africa, Tunisia) demonstrate over 100 patterns of light used in an optical communication link, potentially increasing the bandwidth of communication systems by 100 times. [TECHNICAL ARTICLE](#)

Tags: Communications technology, Quantum science

World's-first compact transceiver for terahertz wireless communication using 300-GHz band[EurekAlert](#), 09JUN2016

Researchers in Japan have developed the world's-first compact terahertz wireless transceiver using the 300-GHz band and experimentally demonstrated that it can transmit data at a transmission rate of 40 gigabits per second through multiplex transmission using orthogonal polarization. Since the transceiver can assure a broad frequency band, it is expected to be applied for high-speed wireless communication.

Tags: Communications technology, S&T Japan

Researchers find the right balance to speed wireless downloads through use of duplexing[Science Daily](#), 08JUN2016

An international team of researchers (USA - New York University, Ireland) has come up with a means of boosting wireless efficiency without increasing interference by mixing full and half duplex radios in base stations. This tunable solution could also allow wireless providers to adjust the mix of cells based on the needs of a region. They generated mathematical models of base stations with varying configurations of half and full duplex, then ran simulations to predict the trade-offs in efficiency and coverage areas. [TECHNICAL ARTICLE](#)

Tags: Communications technology

ENERGY**Perovskite solar cells surpass 20 percent efficiency**[Science Daily](#), 09JUN2016

Researchers in Switzerland found that, by briefly reducing the pressure while fabricating perovskite crystals, they were able to achieve the highest performance ever measured for larger-size perovskite solar cells, reaching over 20% efficiency and matching the performance of conventional thin-film solar cells of similar sizes. [TECHNICAL ARTICLE](#)

Tags: Energy, Advanced materials, S&T Switzerland, Solar energy

A Big Leap for an Artificial Leaf[MIT Technology Review](#), 07JUN2016

An international team of researchers (USA - Harvard University, Singapore) has devised a system that completes the process of making liquid fuel from sunlight, carbon dioxide, and water. And they've done it at an efficiency of 10 percent, using pure carbon dioxide—in other words, one-tenth of the energy in sunlight is captured and turned into fuel. It could be a milestone in the shift away from fossil fuels. [TECHNICAL ARTICLE](#)

Tags: Energy

“Technology feeds on itself. Technology makes more technology possible.”

ALVIN TOFFLER

ENVIRONMENTAL SCIENCE

[A protective shield against the heavy metal uranium](#)

Science Daily, 06JUN2016

Microorganisms can better withstand the heavy metal uranium when glutathione, a molecule composed of three amino acids, is present. An international team of researchers (Germany, Russia) discovered that glutathione is an effective decontamination agent. The studies provide important insights into bioremediation of mining waste piles and other contaminated areas with the help of bacteria or plants. [TECHNICAL ARTICLE](#)

Tags: Environmental science, Biotechnology

IMAGING TECHNOLOGY

[Machine-Vision Algorithm Learns to Transform Hand-Drawn Sketches Into Photorealistic Images](#)

MIT Technology Review, 14JUN2016

Researchers in the Netherlands used deep neural networks for inverting face sketches to synthesize photorealistic face images. They trained models achieving state-of-the-art results on both computer-generated sketches and hand-drawn sketches by leveraging recent advances in deep learning such as batch normalization, deep residual learning, perceptual losses and stochastic optimization in combination with their dataset containing computer-generated face sketches and corresponding face images. The technique has applications in forensic and fine arts. [TECHNICAL ARTICLE](#)

Tags: Imaging technology, Artificial intelligence

[New technique doubles resolution of near-field terahertz imaging](#)

PhysOrg.com, 06JUN2016

Problems with using Terahertz rays more widely is that it costs a lot and it cannot be used in applications smaller than its wavelength. Researchers in the UK found a way to effectively double the resolution. Using their technique, they were able to detect cracks in a circuit board affixed to the opposite side of a wafer, at approximately double the resolution of existing terahertz imaging techniques. They believe their technique could prove useful in the microelectronics industry, and medicine. [TECHNICAL ARTICLE](#)

Tags: Imaging technology, S&T UK, Terahertz technology

MATERIALS SCIENCE

[New way to control oxygen for electronic properties](#)

Science Daily, 10JUN2016

Researchers at Argonne National Laboratory found they could use a small electric current to introduce vacancies that dramatically change the conductivity of thin oxide films. The discovery improves our understanding of how these materials work and could be useful for new electronics, catalysts or more. [TECHNICAL ARTICLE](#)

Tags: Materials science, Government S&T

[Graphite makes good metallic contact for graphene](#)

Nanotechweb, 09JUN2016

Researchers at Columbia University found that the contact resistivity of the graphite-graphene interface can be as low as $6.6 \Omega\mu\text{m}^2$ and it varies with the relative twist angle between the crystal lattices of graphite and graphene. Mechanically integrating graphite contacts to the graphene surface avoids any contamination problems that can arise during conventional nanofabrication techniques. [TECHNICAL ARTICLE](#)

Tags: Materials science, Advanced materials

[Graphene enables optoelectronics on regular paper](#)

Nanowerk, 08JUN2016

Based on their previous work, researchers in Turkey integrated a large area multilayer graphene on a piece of printing paper to fabricate optoelectronic devices using electro-modulation of graphene layer via reversible intercalation process. The device consists of two multilayer graphene layers transfer-printed on both sides of the paper. Graphene simultaneously operates as the electrically reconfigurable optical medium and electrically conductive electrodes. The paper substrate yields a flexible and foldable mechanical support for the graphene layers and it holds the electrolyte in the network of hydrophilic cellulose fibers. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Switzerland winds up superconductivity](#)

Science Daily, 08JUN2016

Using copper-oxide-based ceramic, YBCO, researchers in Switzerland have successfully developed superconducting coil. They combined an existing magnet producing 21 Tesla and the insert coil to create the magnetic field of 25 Tesla.

The use of YBCO will also simplify the operation of NMR spectrometers by using less complicated cooling systems. In the near future, this record magnet will be used for basic and fundamental research.

Tags: Materials science, S&T Switzerland

FEATURED RESOURCE

[Nature Podcast](#)

Every show features highlighted content from the week's edition of *Nature* including interviews with the people behind the science, and in-depth commentary and analysis from journalists covering science around the world. [RSS](#)

MICROELECTRONICS

[On-Chip Supercapacitors Dump Carbon in Favor of Silicon](#)

[IEEE Spectrum](#), 10JUN2016

Researchers in Finland have fabricated tiny supercapacitors by topcoating porous silicon with a nanometer-thick layer of titanium nitride. The device has high stability, power and surface area. They have power densities of up to 214 W/cm³ and energy densities of 1.3 mWh/cm³. They have gone through upwards of 50,000 cycles (even letting the electrodes dry in the middle of the cycling) without physical or electrical deterioration. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Materials science, S&T Finland

[Broadband wavelength demultiplexer realized on a nanoscale photonic chip](#)

[PhysOrg.com](#), 08JUN2016

Researchers in China designed and fabricated asymmetric multi-component nano-cavities which guaranteed that the plasmonic wavelength demultiplexer operated in a broadband from 780 nm to 980 nm. It has strong confinement and modulation on the surface plasmon polariton, an ultracompact size of only 2.3 μm. In addition, the intensity ratio of 13.7 dB. It is easy to fabricate using a focused ion beam etching system. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T China

PHOTONICS

[New kind of material able to convert near-infrared beam into visible light](#)

[PhysOrg.com](#), 13JUN2016

Researchers in Germany have created a material from a mixture of sulfur and tin atoms (sourced as a powder) which had been fashioned into diamond

shape and finished with a coating of organic ligands to provide structure. When an infrared laser was directed at the material, the invisible light was directed through the material in such a way as to alter its wavelength, without changing its direction. The result was a beam of visible light, such as might be seen emanating from a flashlight. The material might prove useful in applications that require use of a microscope, and light projection. [TECHNICAL ARTICLE](#)

Tags: Photonics, S&T Germany

[Mixing solids and liquids enhances optical properties of both](#)

[MIT News](#), 09JUN2016

A team of researchers in the US (Harvard, MIT) is exploring a new mechanism for modifying an optical device's diffusivity by immersing glass particles in a fluid. In experiments, the solid-liquid mixture demonstrated much more dramatic changes in diffusivity than existing theory would have predicted, so the researchers also developed a new computer model to describe it. The diffuser could be used to calibrate a wide range of imaging systems, holographic video screens, tunable optical devices with applications in imaging, sensing, and photography. [TECHNICAL ARTICLE](#)

Tags: Photonics

[Flat lens could create new opportunities in electronics, telecommunications and microscopy](#)

[PhysOrg.com](#), 08JUN2016

An international team of researchers (the Netherlands, USA - Stanford University) fabricated a lens made of alternating layers of extremely thin layers of silver and titanium dioxide. It has larger field of view and a very short working distance that allows it to be placed very close to an object of interest. It could be used in lab-on-a-chip devices and optical recording techniques. [TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

[Super quantum simulator 'entangles' hundreds of ions](#)

[Science Daily](#), 09JUN2016

The system developed by a team of researchers in the US (NIST, GTRI) can generate quantum entanglement in about 10 times as many ions as any previous simulators based on ions, a scale-up that is crucial for practical applications. The behavior of the entangled ions rotating in a flat crystal just 1 millimeter in diameter can also be tailored or controlled to a greater degree than before. They also developed the capability to make entangled ion crystals of varying sizes - ranging from 20 qubits up to hundreds. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Government S&T

[Google moves closer to a universal quantum computer](#)

Nature News, 08JUN2016

An international team of researchers (USA - Google, Spain) built a prototype that combines the two main approaches to quantum computing. One approach constructs the computer's digital circuits using qubits in particular arrangements geared to solve a specific problem. The other approach is adiabatic quantum computing. This new approach should enable a computer with quantum error correction; hence, it becomes a general-purpose algorithm that is, in principle, scalable to an arbitrarily large quantum computer. The prototype can solve a wide range of problems in fields such as chemistry and physics, and has the potential to be scaled up to larger systems.

TECHNICAL ARTICLE, Podcast

Tags: Quantum science

S&T POLICY

[Europe develops self-removal technology for spacecraft](#)

PhysOrg.com, 13JUN2016

The problem of space debris is emerging as orbital space is getting increasingly crowded. Universities and firms from the U.K., Germany, Denmark and Italy are working on an EU sponsored program called Technology for Self-Removal of Spacecraft (TeSeR). The team will develop a prototype for a module that will ensure that a defunct spacecraft pose no danger to other vehicles in space. They will investigate three different removal technologies: solid propulsion, drag augmentation systems and electrodynamic tether.

Tags: S&T policy, S&T EU, Space technology

[Nobel prize winners warn leaving EU poses 'risk' to science](#)

BBC, 11JUN2016

In a letter to the Daily Telegraph, a group of scientists said science should be "front and centre in the EU debate" as it was a key driver in health, innovation and economic growth. The EU contains a critical mass of expertise, with more than one in five of the world's researchers moving freely within its boundaries. EU decisions about scientific policy, funding and regulatory frameworks affect science the world over, and are influenced by British scientists.

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

[Gene-Drive Modified Organisms Are Not Ready to Be Released Into Environment; New Report Calls for More Research and Robust Assessment](#)

National Academies Of Science, 10MAY2016

To navigate the uncertainty posed by this fast-moving field of study and make informed decisions about the development and potential application of gene-drive modified organisms, the National Academies of Sciences, Engineering, and Medicine committee that conducted the study and wrote the report recommended a collaborative, multidisciplinary, and cautionary approach to research on and governance of gene drive technologies. REPORT

Tags: S&T policy, Biotechnology, Medical technology

SCIENCE WITHOUT BORDERS

[Fighting malevolent AI—artificial intelligence, meet cybersecurity](#)

The Conversation, 13JUN2016

Today's narrowly focused AI systems are good only at specific assigned tasks. Their failures are just a warning. The threat is vastly underappreciated. Of the roughly 10,000 researchers working on AI around the globe, only about 100 people—one percent—are fully immersed in studying how to address failures of multi-skilled AI systems. And only about a dozen of them have formal training in the relevant scientific fields.

Tags: Science without borders, Artificial intelligence

[France launches massive meteor-spotting network](#)

Nature News, 10JUN2016

Scientists in France have launched an unprecedented campaign to catch shooting stars, an effort that will rely on thousands of volunteers to comb the ground for bits of space rock. The French network's cameras are very densely and evenly spaced, sitting roughly 70–80 kilometres apart at laboratories, science museums and other buildings. That is close enough together to yield good information about where meteorites land. The researchers will then face the arduous job of searching this area to find the object.

Tags: Science without borders, S&T France

[Google DeepMind and FHI collaborator to present research at UAI 2016](#)

FHI Oxford News, 06JUN2016

Oxford academics and Google DeepMind published a study explaining that it would take more than just unplugging a computer to stop a malfunctioning program. Their research explores a method to ensure that reinforcement learning agents can be repeatedly safely interrupted by human or automatic overseers. Safe interruptibility can be useful to take the robot out of a delicate situation, or even

to temporarily use it to achieve a task it did not learn to perform. Interruptibility and the related general idea of corrigibility, allow such changes to happen without the agent trying to resist them or force them. UAI Conference, June 25-29, New York. TECHNICAL ARTICLE

Tags: Science without borders, Artificial intelligence ■

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