



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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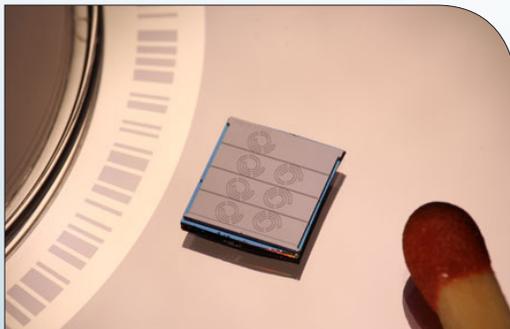
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FEATURE ARTICLES

[Combs of light accelerate communication](#)

Nanowerk, 14APR2014



Optical microresonator of silicon nitride: a single laser light is used to produce a multitude of spectral lines, hence forming a frequency comb (Photo: KIT/ J. Pfeifle)

Applying a miniaturized frequency comb as optical source researchers in Switzerland transmitted data over a distance of 300 km at

a rate of 1.44 terabits per second. This corresponds to a data volume of more than 100 million telephone calls or up to 500,000 HD videos. For the first time, the study shows that miniaturized optical frequency comb sources are suited for coherent data transmission in the terabit range. [TECHNICAL ARTICLE](#)

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

[Device turns flat surface into spherical antenna](#)

Science Daily, 14APR2014

By depositing an array of tiny, metallic, U-shaped structures onto a dielectric material, researchers in China have created a new artificial surface that can bend and focus electromagnetic waves the same way an antenna does. The device they call broadband transformation optics metasurface lens, may lead to the creation of new types of antennas that are flat, ultra low-profile or conformal to the shape of curved surfaces. [TECHNICAL ARTICLE](#)

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

ADVANCED MATERIALS

[Engineers develop new materials for hydrogen storage](#)

Nanowerk, 15APR2014

Researchers at UC San Diego have created compounds made from mixtures of calcium hexaboride, strontium and barium hexaboride that could be used to store hydrogen safely and efficiently. The compounds could be manufactured using a simple, low-cost manufacturing method known as combustion synthesis.

Tags: [Advanced materials](#)

[Topological insulator—a novel optical and microwave-absorbing material](#)

Nanowerk Spotlight, 15APR2014

For the first time, researchers in China experimentally demonstrated that TI may be a novel microwave-absorbing material. Besides their potential applications in next-generation electronic devices, topological insulators may also give rise to significant changes in photonics. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#), [Materials science](#), [S&T China](#)

[Using strong lasers, investigators observe frenzy of electrons in a new material](#)

Nanowerk, 15APR2014

A research team at the University of Kansas has used high-powered lasers to track the speed and movement of electrons inside an innovative material that is just one atom thick. The finding could help point the way to next-generation transistors and solar panels made of solid, atomically thin materials. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

[Stopping Sound with Foam](#)

American Physical Society Spotlight, 11APR2014

Researchers in France report that liquid foam completely blocked the transmission of ultrasound waves in a certain range of frequencies. Their experiments are the first demonstration that a foam can act

S&T NEWS ARTICLES

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as a metamaterial. Such foams may have practical value as acoustic insulators. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T France

[Acoustic metamaterial can be reconfigured in a jiffy](#)

Physics World, 10APR2014

Developed by researchers in the UK, the device comprises tiny polystyrene spheres suspended in water. The spheres arrange themselves in a cubic lattice that is defined by criss-crossing acoustic standing waves. The lattice blocks sound at certain frequencies that depend on the spacing between the spheres. With further development, it could be used to create lenses that focus sound or even acoustic cloaks.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T UK

[Creating self-assembling nanoparticle films with a common spray gun](#)

Nanowerk, 10APR2014

Researchers in Japan have developed a simple approach of applying a surface coating of thin, flat nanoplatelets using a common spray gun to create a surface coating in which nanoplatelets spontaneously self-assemble into “nanowalls.” The same degree of order can be achieved without the need for clean room facilities. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T Japan

[Graphene nanoribbons as electronic switches](#)

Science Daily, 08APR2014

A team of researchers from Argentina and Brazil has calculated the conditions of the transport in graphene nanoribbons. The results yield a clearer theoretical understanding of conductivity in graphene samples of finite size, which have applications in externally controlled electronic devices. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

[Improving the human-robot connection](#)

KurzweilAI, 14APR2014

Researchers in Canada provide empirical evidence that using humanlike gaze cues during human-robot handovers can improve the timing and perceived quality of the handover event. Handovers serve as the foundation of many human-robot tasks. Fluent, legible handover interactions require appropriate nonverbal cues to signal handover intent, location and timing.

Tags: Autonomous systems & robotics, S&T Canada

BIOTECHNOLOGY

[Lab-grown human blood may reduce donor dependency](#)

Wired (UK), 15APR2014

A team of researchers in the UK are working on transforming pluripotent stem cells into red blood cells. It has

gone from delivering a proof of principle to generating 5ml of blood in the lab with great efficiency. The team is planning on trialling lab grown blood in humans by 2016. The project is funded by the Wellcome Trust.

Tags: Biotechnology, Medical Sciences, S&T UK

[Researchers achieve complete control over on/off switching of the movement of a nanomachine](#)

Nanowerk, 14APR2014

According to researchers in Japan photoresponsive azo-peptide inhibitors can reversibly regulate microtubule motility over many cycles. If the concentration of the inhibitor is sufficiently high, the velocity of the microtubule can be stopped completely with photoirradiation.

[TECHNICAL ARTICLE](#)

Tags: Biotechnology, S&T Japan

COMMUNICATIONS TECHNOLOGY

[New physical phenomenon on nanowires seen for the first time](#)

Nanowerk, 11APR2014

For the first time, scientists at IBM in Switzerland and Norway have demonstrated that both efficient light emission and detection functionalities can be achieved in the very same nanowire material by applying mechanical strain. Using this new physical phenomenon, scientists might be able to integrate the light emitter and the detector functions in the very same material. This would drastically reduce the complexity of future silicon nanophotonic chips. [TECHNICAL ARTICLE](#)

Tags: Communications Technology, S&T EU

ENERGY

[Navy researchers demonstrate flight powered by fuel created from seawater](#)

KurzweilAI, 11APR2014

The U.S. Naval Research Laboratory has developed a technology for simultaneously extracting carbon dioxide and hydrogen from seawater and converting the two gases to a liquid hydrocarbon fuel, as a possible replacement for petroleum-based jet fuel.

Tags: Energy, Government S&T

INFORMATION TECHNOLOGY

[Portable robot prints documents by driving over paper](#)

Wired (UK), 14APR2014

A company in Israel has developed a little printing robot that connects with your mobile and then moves around a piece of paper to draw the desired picture or text. The wheeled Pocket Printer has an inkjet that can last over 1,000 pages and a battery—charged via USB—that lasts for more than an hour.

Tags: Information Technology

continued...

“Science is a moral imperative drawn from a larger narrative whose purpose is to give perspective, balance, and humility to learning.” NEIL POSTMAN

MATERIALS SCIENCE

Scientists gain new insight into mysterious electronic phenomenon

PhysOrg.com, 14APR2014

Researchers at the DOE's Argonne National Laboratory have identified and solved the phenomenon in high-temperature superconductors, called "pseudogap," a region of energy levels in which relatively few electrons are allowed to exist. [TECHNICAL ARTICLE](#)

Tags: Materials science, Government S&T

Dual role of carbon dioxide in photosynthesis: Pioneering findings

Science Daily, 13APR2014

Researchers in Sweden have found that carbon dioxide, in its ionic form bicarbonate, has a regulating function in the splitting of water in photosynthesis. This means that carbon dioxide has an additional role to being reduced to sugar. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Sweden

How 'frustrated' magnets escape magnetic deadlock at low temperatures

PhysOrg.com, 11APR2014

Frustrated magnets are a special type of magnet in which the crystal structure prevents the most energetically favorable arrangement of magnetic spins from being achieved, resulting in a magnet that is deadlocked in an unfavorable state. Researchers from Japan have discovered how small changes in crystal structure can help such magnets release their frustration. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Japan

Emerging research suggests a new paradigm for 'unconventional superconductors'

Nanowerk, 10APR2014

A team of researchers from the USA and Germany find that the emergence of superconductivity in TiSe_2 is connected with the formation of domain walls between commensurate and incommensurate phase transitions. The discovery of this new phase boundary has implications for our understanding of superconducting behavior. [TECHNICAL ARTICLE](#)

Tags: Materials science

MICROELECTRONICS

Nanostructures with applications in infrared and terahertz ranges

Science Daily, 11APR2014

Researchers at UC Santa Barbara have created a compound semiconductor of nearly perfect quality with embedded nanostructures containing ordered lines of atoms that can manipulate light energy in the mid-infrared range. More efficient solar cells, less risky and higher resolution biological imaging, and the ability to transmit massive amounts of data at higher speeds are only a few applications that this unique semiconductor will be able to support. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Advanced materials

Electromagnetically induced transparency in a silicon nitride optomechanical crystal

PhysOrg.com, 10APR2014

Researchers from NIST have observed electromagnetically induced transparency at room temperature and atmospheric pressure in a silicon nitride optomechanical system. This work highlights the potential of silicon nitride as a material for producing integrated devices in which mechanical vibrations can be used to manipulate and modify optical signals. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Government S&T

Genetic circuits: Bacterial 'FM radio' created

Science Daily, 09APR2014

Researchers at UC San Diego have developed a 'rapid and tunable post-translational coupling' for genetic circuits. The team's breakthrough involves a form of "frequency multiplexing" inspired by FM radio. Enabling this breakthrough is the development of an intracellular wiring mechanism that enables rapid transmission of protein signals between the individual modules. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Biology, Synthetic biology

Novel ultra-fast electrical circuits use light-generated tunneling currents

Science Daily, 09APR2014

Using 'quantum plasmonic tunnelling' researchers in Singapore have shown that by changing the molecules in the molecular electronic device, the frequency of the circuits can be altered in hundreds of terahertz regime. The new circuits have applications in constructing ultra-fast computers or single molecule detectors and developing nano-electronic devices. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Information technology

NEUROSCIENCE

[New bodily illusion: Would you believe your hand could turn into marble?](#)

Science Daily, 24MAR2014

A team of researchers from Italy and Germany has demonstrated how we can rapidly update our assumptions about the material qualities of our bodies based on recent multi-sensory perceptual experience. This surprising perceptual plasticity might help to explain why tools and prostheses can merge so easily into our body schemas despite being made of non-biological materials. [TECHNICAL ARTICLE](#)

Tags: Neuroscience, S&T Germany, S&T Italy

FEATURED RESOURCE

[The Materials Project](#)

Harnessing the power of supercomputing and state-of-the-art electronic structure methods, the Materials Project provides open web-based access to computed information on known and predicted materials as well as powerful analysis tools to inspire and design novel materials.

PHOTONICS

[Lasers could divert lightning from buildings](#)

Wired (UK), 15APR2014

Researchers at the University of Arizona embedded a high-intensity laser inside a second beam at a lower intensity. When the primary beam travels through the air, the second beam—the “dress beam”—works to refuel it with energy, sustaining the central beam over much longer distances. The research is still in the laboratory phase, but could one day guide electrical discharges, such as lightning, away from buildings. [TECHNICAL ARTICLE](#)

Tags: Photonics

[High power laser sources at exotic wavelengths](#)

PhysOrg.com, 14APR2014

Researchers in China present a photonic crystal fibre (PCF) FOPO (Fibre Optical Parametric Oscillator) with high conversion efficiency, to show the feasibility of FOPOs as practical light sources. They achieved energy conversion efficiency up to 36%. That means a high output power can be obtained at the new wavelengths in a wide wavelength regime.

Tags: Photonics, S&T China

[Plasmonic waveguide stops light in its tracks](#)

Physics World, 14APR2014

According to researchers in the UK, their device—which has yet to be built in the lab—would be straightforward to create and could be used as an interface between electronic

and optical circuits. The waveguide could also lead to the development of new lasers and molecular-imaging systems.

[TECHNICAL ARTICLE](#)

Tags: Photonics, S&T UK

QUANTUM SCIENCE

[“Snowflake Crystal” Traps Light and Sound](#)

American Physical Society Spotlight, 14APR2014

In their new snowflake-crystal design, researchers at the California Institute of Technology, Pasadena, first disrupted the regular arrangement to create a linear defect in the 2D periodic structure, which, on its own, would form a 1D waveguide. They then modified this structure along the waveguide direction to create localized modes. This approach simplifies the design, avoids overlap with waves that radiate out of the slab, and makes the structure more robust against disorder. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Materials science

[Single-atom gates open the door to quantum computing](#)

Physics World, 11APR2014

A quantum-information analogue of the transistor has been unveiled by two independent groups in Germany and the US. Both devices comprise a single atom that can switch the quantum state of a single photon. The results are a major step towards the development of practical quantum computers. [Podcast](#)

Tags: Quantum science

[Toward new tests of quantum mechanics at macroscopic scale](#)

Nanowerk, 10APR2014

The scheme proposed by researchers in Switzerland to probe non-classical states of macroscopic systems is based on cavity optomechanics, a rapidly developing field of research in which a mechanical oscillator is coupled to the light field of a highly reflective cavity. The scheme has applications in optomechanical systems as on-demand single-photon sources and quantum memories needed to build quantum repeaters. [TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T Switzerland

[Computing with a quantum trick](#)

Nanowerk, 09APR2014

As a central element of their quantum gate, researchers in Germany are using an atom trapped between two mirrors of a resonator. By reflecting the atom off the resonator with a photon, they are able to switch the state of the photon. The computational operation can entangle the atom with the photon. Entanglement opens up whole new horizons in information processing. The discovery makes it possible to design quantum networks in which information is transferred between parallel quantum processors in the form of photons. [TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T Germany

continued...

Scalable, universal quantum computer? Quantum information processed with system comprising optical photon and trapped atom

Science Daily, 09APR2014

Researchers in Germany are pursuing a different concept towards the development of a quantum computer. They follow the strategy of combining two rather dissimilar techniques: quantum communication using photons, and information processing using stationary atoms. For the first time the team has realized a quantum logic gate between a single photon and a single atom. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Communications Technology, S&T Germany

SCIENCE WITHOUT BORDERS

10 inventions that owe their success to World War One

BBC News, 13APR2014

A material called Cellucotton had already been invented before war broke out by a small US firm, Kimberly-Clark. Once the US entered the war in 1917, they started producing the wadding for surgical dressing at a rate of 380-500ft per minute.

Tags: Science without borders

SENSORS

Sensitive detection method may help impede illicit nuclear trafficking

PhysOrg.com, 15APR2014

Researchers at the University of Texas, Austin, report that coupling commercially available spectral X-ray detectors with a specialized algorithm can improve the detection of uranium and plutonium in small, layered objects such as baggage. This approach enhances the detection powers of X-ray imaging and may provide a new tool to impede nuclear trafficking. [TECHNICAL ARTICLE](#)

Tags: Sensors

New 'tunable' semiconductors will allow better detectors, solar cells

Science Daily, 14APR2014

Researchers at Georgia State University have discovered a way to use existing semiconductors to detect a far wider range of light than is now possible, well into the infrared range. The team hopes to use the technology in detectors and in improved solar cells that could absorb infrared light as well as the sun's visible rays. [TECHNICAL ARTICLE](#)

Tags: Sensors, Advanced materials ■

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