



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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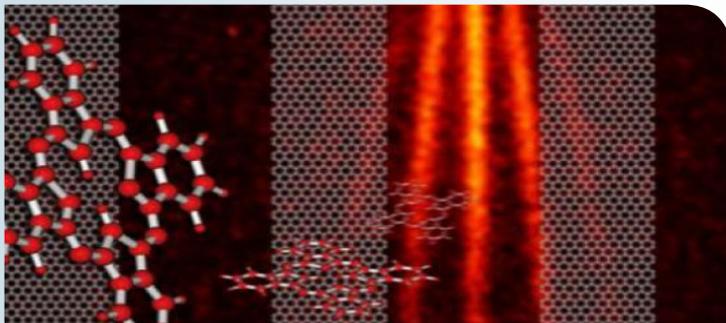
FEATURE ARTICLES

[Quantum diffraction at a breath of nothing](#)

[Science Daily, 25AUG2015](#)

Quantum physics tell us that even massive particles can behave like waves, as if they could be in several places at once. This phenomenon is typically proven in the diffraction of a matter wave at a grating. An international team of scientists (Austria, Spain, Israel, USA -Stanford University, Germany) has now carried this idea to the extreme and observed the delocalization of molecules at the thinnest possible grating, a mask milled into a single layer of atoms. **TECHNICAL ARTICLE**

Tags: Quantum science, Featured Article



Modern fabrication methods allow for making atomically thin nanomasks which prove to be sufficiently robust for experiments in molecular quantum optics.

Credit: Copyright Quantennanophysik, Fakultät für Physik, Universität Wien; Bild-Design: Christian Knobloch

[‘Magic’ sphere for information transfer](#)

[Nanowerk, 21AUG2015](#)

Our computers, nanoantennas and other kinds of equipment will operate on the base of photons, rather than electrons. The spheres, studied by an international team of researchers (Russia, France, Spain), will definitely become one of the elementary components of new photonic devices. Nanoscale spheres can be used in a wide range of different fields: telecommunication systems; recording, processing and storing of information; diagnosis and treatment of different diseases. **TECHNICAL ARTICLE**

Tags: Photonics, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[“MultiFab” 3-D prints a record 10 materials at once, no assembly required](#)

[MIT News, 24AUG2015](#)

Developed by researchers at MIT, the "MultiFab" system delivers resolution at 40 microns and is the first 3-D printer to use 3-D-scanning techniques from machine vision. It can self-calibrate and self-correct, freeing users from having to do the fine-tuning themselves. It gives users the ability to embed complex components, such as circuits and sensors, directly onto the body of an object, meaning that it can produce a finished product, moving parts and all, in one fell swoop.

Tags: Advanced manufacturing

ADVANCED MATERIALS

[Birth of photo-sensitive magnets: New functional photonic materials and devices based on magnetism](#)

[PhysOrg.com, 25AUG2015](#)

Researchers in Japan have found through the study of photo-excited precession of magnetization using ultra-short weak laser pulses of $1\mu\text{J}/\text{cm}^2$ or less, that spins in ultra-thin Co/Pd multi-layer films are very susceptible to light. It could be a candidate for photo-sensitive magnets. They demonstrated polarization modulation of light signals in an optical waveguide with the same class of magnets. **TECHNICAL ARTICLE 1, 2**

Tags: Advanced materials, S&T Japan

[‘Diamonds from the sky’ approach turns CO2 into carbon nanofibers](#)

[Nanowerk, 19AUG2015](#)

Researchers at George Washington University have found a way to use atmospheric CO_2 to produce high-yield carbon nanofibers. The system uses electrolytic syntheses to make the nanofibers. Because of its efficiency, this low-energy process can be run using only a few volts of electricity, sunlight and a whole lot of carbon dioxide.

Tags: Advanced materials

continued...

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Formation of swarms in nanosystems[PhysOrg.com, 18AUG2015](#)

One of the striking features of self-organization in biomolecular systems is the capacity of assemblies of filamentous particles for synchronous motion. Researchers in Germany provide new insights into how such movements are coordinated. A better understanding of the physics of actively propelled systems would permit scientists to construct entirely novel nanosystems that display collective behaviors. [TECHNICAL ARTICLE](#)
Tags: Advanced materials, S&T Germany

AUTONOMOUS SYSTEMS & ROBOTICS**Video Friday: Giant Fighting Robots, Glass 3D Printer, and 10 New Robots from Fetch**[IEEE Spectrum, 21AUG2015](#)

Flimmer is a UAV that can fly and swim, but only in that order.

*Tags: Autonomous systems & robotics***Team Designs Robots to Build Things in Messy, Unpredictable Situations**[MIT Technology Review, 20AUG2015](#)

A team of researchers in the US (Harvard University, SUNY) have designed two robots: one that deposits expandable, self-hardening foam and another that drags and piles up sandbags. These robots work with materials that are highly unpredictable. The system is applicable for any climbing, manipulating robot that's using any unpredictable materials, not just foam or sandbags. The system can work with multi-robot teams. Because the algorithm is adaptable, it doesn't matter whether the uncertainty that a robot confronts comes from the environment, a material, or another robot's behavior.

*Tags: Autonomous systems & robotics***CYBER SECURITY****Securing data from tomorrow's supercomputers**[Science Daily, 18AUG2015](#)

Transport Layer Security Internet encryption protocol uses a variety of mathematical techniques to protect information, some of which would need to be updated to be resistant to quantum computers. Researchers in Australia have developed and tested a new quantum-proof version of TLS that incorporates a mathematical technique called the 'ring learning with errors problem', a fairly recent technique that mathematicians think has the potential to resist quantum attacks. [TECHNICAL ARTICLE](#)
Tags: Cyber security, Quantum science, S&T Australia

ENERGY**Going solid-state could make batteries safer and longer-lasting**[MIT News, 17AUG2015](#)

A team of researchers in the US (MIT, UC San Diego, University of Maryland, UC Berkeley, Lawrence Berkeley National Laboratory) proposes solid electrolyte, which could greatly improve both device lifetime and safety while providing a significant boost in the amount of power stored in a given space. The solid-electrolyte versions can function at frigid temperatures and allow for greater power density. [TECHNICAL ARTICLE](#)
Tags: Energy, Battery

IMAGING TECHNOLOGY**FBI Wants Better Automated Image Analysis for Tattoos**[IEEE Spectrum, 19AUG2015](#)

The FBI maintains a database of tattoos as part of its Next Generation Identification Program. As categories aren't granular enough, the FBI would prefer to use image-based tattoo recognition technology which would use an algorithm to compare and match features extracted from the image itself. NIST issued a challenge last fall to assess the state of the art of such technology. Algorithms developed by six participants did well in three searches, but did poorly in identifying visually similar tattoos on different people, and searching for similar tattoos across a variety of medium.

*Tags: Imaging technology, Government S&T***INFORMATION TECHNOLOGY****Crash-tolerant data storage: Formally verified working file system could end data loss**[PhysOrg.com, 24AUG2015](#)

At an ACM symposium, MIT researchers will present the first file system that is mathematically guaranteed not to lose track of data during crashes. They established the reliability of their file system through formal verification. What distinguishes the MIT researchers' work is that they prove properties of the file system's final code, not a high-level schema.

*Tags: Information technology, Cyber security***Information storage and retrieval in a single levitating colloidal particle**[Nanowerk, 18AUG2015](#)

An international team of researchers (Switzerland, Italy) presents a generic methodology for precise and parallel spatiotemporal control of nanometre-scale matter in a fluid. They demonstrate the ability to attain digital functionalities such as switching, gating and data

“The whole of science is nothing more than a refinement of everyday thinking.”

—ALBERT EINSTEIN

storage in a single colloid, with further implications for signal amplification and logic operations. The principle generalizes to any system where spatial perturbation of a particle elicits a differential response amenable to readout. [TECHNICAL ARTICLE](#)

Tags: Information technology

[Intel's Reinvention of the Hard Drive Could Make All Kinds of Computers Faster](#)

[MIT Technology Review, 18AUG2015](#)

Intel's Optane drives are based on a technology called 3D Xpoint. A 3D Xpoint chip has a grid formed from metal wires layered over one another; data is stored by using electricity to change the arrangement of atoms inside material trapped at each junction of the grid. Just like flash, 3D Xpoint chips hold onto data even when powered down. They can't currently store data as densely, but stacking grids vertically provides a route to storing more data on one chip.

Tags: Information technology

[INsight: A Neuromorphic Computing System for Evaluation of Large Neural Networks](#)

[arXiv, 05AUG2015](#)

Researchers in South Korea have developed a computing system which consists of a non-conventional compiler, a neuromorphic architecture, and a space-efficient micro-architecture that leverages existing integrated circuit design methodologies. They demonstrate an implementation of the neuromorphic computing system based on a field-programmable gate array that performs the MNIST hand-written digit classification with 97.64% accuracy.

[TECHNICAL ARTICLE](#)

Tags: Information technology

MATERIALS SCIENCE

[Self-healing hybrid gel system](#)

[Nanowerk, 25AUG2015](#)

The new hybrid gel, developed by a team of researchers in the US (UT Austin, Texas State University), is composed of conductive polymer and a metal-ligand supramolecule. It has high conductivity, appealing mechanical and electrical self-healing property without any external stimuli and enhanced mechanical strength and flexibility. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Researchers show that an iron bar is capable of decision-making](#)

[PhysOrg.com, 24AUG2015](#)

Researchers in Japan have shown that any rigid physical (i.e., non-living) object, such as an iron bar, is capable of decision-making by gaining information from its surroundings accompanied by physical fluctuations. These lower lifeforms exploit their underlying physics without needing any sophisticated neural systems. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Japan

[Thin films offer promise for ferroelectric devices](#)

[Nanowerk, 21AUG2015](#)

Researchers in Japan report insights into the properties of epitaxial hafnium-oxide-based thin films, confirming a stable ferroelectric phase up to 450°C. This temperature is sufficiently high for HfO₂-based ferroelectric materials to be used in stable device operation and processing as this temperature is comparable to those of other conventional ferroelectric materials. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Japan

MICROELECTRONICS

[CMOS-Integrable room-temperature operational single-electron transistors](#)

[Nanotechweb, 24AUG2015](#)

As CMOS devices shrink to sub 5 nm, interference due to quantum size effects becomes unavoidable. An international team of researchers (USA-University of Missouri, Singapore) addresses this by fabricating monodisperse ultra-small gold nanoparticles (AuNPs) deposited by a CMOS-compatible tilted-target sputtering technique.

[TECHNICAL ARTICLE](#)

Tags: Microelectronics

[GaN-based transistor blocking voltage exceeds 1kV](#)

[PhysOrg.com, 24AUG2015](#)

Researchers in Japan redesigned the thicknesses and doping concentrations of channel and drift layers to reduce the resistances of the epitaxial layers while maintaining a blocking voltage of over 1.2 kV. These findings are important for the application of nitride devices in automobiles and related areas. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T Japan

[A projection of expected progress for Neuromorphic chips and applications in public health and automated image and pattern related monitoring](#)

Next Big Future, 18AUG2015

Researchers in Singapore describe the advantages and disadvantages of synaptic chips when compared to conventional chips and how rapid rates of progress in speed, density, and power efficiency are making synaptic chips economically feasible for supercomputing applications. The biggest disadvantage for synaptic chips is in software; a new operating system and application software are needed.

Tags: Microelectronics, Biotechnology, Information technology

[Startup Knowm combines machine learning, quantum computing via memristors](#)

Next Big Future, 18AUG2015

Developed by a company in the US, an Anti-Hebbian and Hebbian machine learning approach using memristors allows customers to define their own specific learning algorithm using the same building blocks. The chip doesn't necessarily emulate a brain but instead provides adaptive-learning functions at a foundation 'physical' level and consequently beats other approaches on power and density.

Tags: Microelectronics, Information technology

FEATURED RESOURCE

[Report Linker](#)

Reportlinker provides access an online collection of industry, company and country reports. [RSS](#)

PHOTONICS

[Next generation of high power lasers developed](#)

Science Daily, 21AUG2015

Stimulated Raman backscattering in plasma is potentially an efficient method of amplifying laser pulses to reach exawatt powers. Researchers in the UK investigate Raman amplification of short duration seed pulses with different chirp rates using a chirped pump pulse in a preformed plasma waveguide. They propose methods for achieving higher efficiencies. [TECHNICAL ARTICLE](#)

Tags: Photonics, S&T UK

QUANTUM SCIENCE

[Magnon, meet phonon: Magnetoelastic waves can drive magnetic bubbles through photoexcitation](#)

PhysOrg.com, 25AUG2015

Researchers in Japan discuss their earlier discovery that in iron garnet films, magnetoelastic waves can drive magnetic bubbles, or curved magnetic domain walls, using non-resonant photoexcitation where phonons are generated by impulsive stimulated Raman scattering (ISRS) – a process in which the incident photon in an ultrafast laser pulse is not absorbed in the material, but nevertheless imparts (or gains) a small amount of energy. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Microelectronics, S&T Japan

[A little light interaction leaves quantum physicists beaming](#)

Science Daily, 24AUG2015

Extreme weakness of photon–photon scattering has hindered any attempt to observe such interactions at the level of single particles. Researchers in Canada present an implementation of a strong optical nonlinearity using electromagnetically induced transparency, and a direct measurement of the resulting nonlinear phase shift for single post-selected photons. They show that the observed phase shift depends not only on the incident intensity of the (coherent-state) input signal, but also in a discrete fashion on whether 0 or 1 photons are detected at the output.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T Canada

[Physicists Unveil First Quantum Interconnect](#)

MIT Technology Review, 18AUG2015

An international team of researchers (UK, Italy, Japan) reports a quantum photonic interconnect demonstrating high-fidelity entanglement distribution and manipulation between two separate chips implemented using state-of-the-art silicon photonics. Entangled states are generated and manipulated on-chip, and distributed between the chips by interconverting between path-encoding and polarisation-encoding. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

Superconducting magnetic space radiation shielding

Next Big Future, 22AUG2015

The European Union SR2S project not only investigates the principles and the scientific problems of magnetic shielding, but it also faces the complex issues in engineering. On earth, superconducting materials must be cooled to very low temperatures using liquid helium to utilize their superconducting properties, however the project has already found a solution that will work in space.

Tags: S&T policy, Materials science, S&T UK, Space technology

SCIENCE WITHOUT BORDERS

Finalists Announced for the 2015 R&D 100 Awards

R&D Magazine, 22AUG2015

For the first time in its history, the winners of the R&D 100 Awards will be honored for exemplary accomplishments from across five categories: Analytical Test, IT/Electrical, Mechanical Devices/Materials, Process/Prototyping, and Software/Services. The 2015 Awards will also honor excellence in four new special recognition categories—Market Disruptor (Services), Market Disruptor (Products), Corporate Social Responsibility, and Green Tech. [A detailed list of the 2015 Finalists.](#)

Tags: Science without borders

Any Data, Any Time, Anywhere: Global Data Access for Science

arXiv, 05AUG2015

To make scientific data easily accessible, an international team of researchers (USA—University of Nebraska, University of Wisconsin, UC San Diego, Italy) present Any Data, Any Time, Anywhere (AAA) a global, unified view of storage systems—a “data federation,” a global filesystem for software delivery, and a workflow management system. [TECHNICAL ARTICLE](#)

Tags: Science without borders

SENSORS

Touchpad Has 20,000 Sensors and Can Interpret 16 Touches at Once

MIT Technology Review , 25AUG2015

A touchpad called Morph, developed by a company in the US, relies on a grid of 20,000 tiny force sensors that can also figure out how hard all kinds of objects—fingers, brushes, pens—are pressing on it. Flexible overlays embedded with magnets can snap on top of the Morph, giving it the look of, say, a piano or drum pad, and software running on the Morph can interpret the touches (up to 16 at once) and will map them to the different interfaces, the company says.

Tags: Sensors, Information technology

Shape-shifting Liquid-Metal Antennas

IEEE Spectrum, 21AUG2015

Normally, when you want to adjust the resonant frequency of an antenna, you add electronic components like inductors to the circuit. But you can only go so far with that approach; at some point you'll have to change the physical length of the antenna. Researchers at North Carolina State University used liquid metal to construct an antenna that lengthens or shortens on electronic command.

Tags: Sensors

Metamaterial wormhole teleports magnetic fields across space

New Scientist, 20AUG2015

Researchers in Spain modified their earlier mathematical constructions in a very clever way so that an artificial wormhole could be built using present engineering techniques. They fine-tuned concentration of attraction and repulsion so that the whole object is magnetically invisible because of this cancellation. [TECHNICAL ARTICLE](#)

Tags: Sensors

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