

[Advanced materials \(5\)](#)[Cyber security \(3\)](#)[Energy \(1\)](#)[Information Technology \(4\)](#)[Materials science \(4\)](#)[Microelectronics \(3\)](#)[Neuroscience \(3\)](#)[Photonics \(2\)](#)[Quantum science \(3\)](#)[S&T policy \(1\)](#)[Science without borders \(1\)](#)[Sensors \(2\)](#)

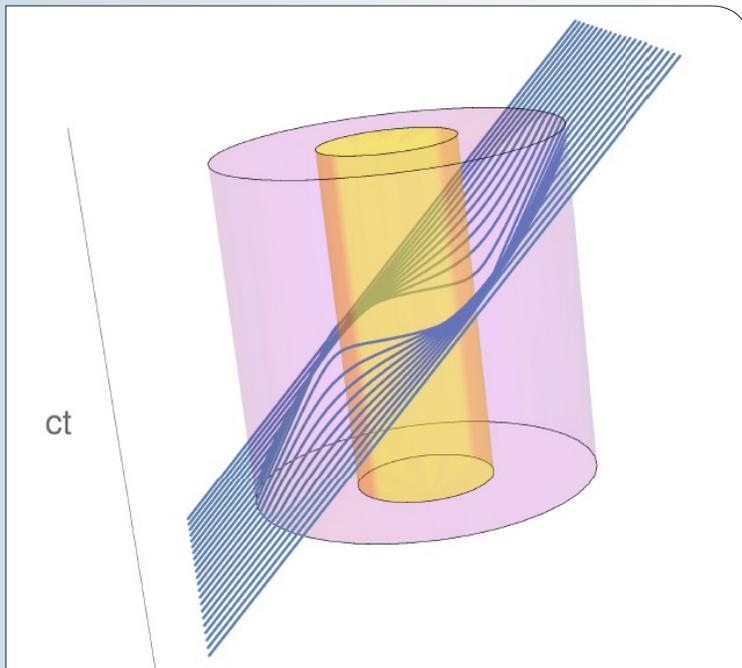
FEATURE ARTICLE

[Invisibility cloaks can never hide objects from all observers](#)

[PhysOrg.com](#), 10MAR2016

An international team of researchers (Germany, New Zealand) demonstrate that in full-spectrum cloaking, time delay can lead to visible distortions. When moving at fast speeds, single-frequency cloaks become visible due to a relativistic Doppler effect that shifts the frequency of incoming light away from the cloak's operating frequency. "Amplitude cloak" preserves only the amplitude of light, and not its phase which is shifted by the time delay. It would only work when both the cloaked object and an observer are completely stationary. If one or the other were to move, then the cloaked object would become visible. [TECHNICAL ARTICLE](#)

Tags: [Sensors](#), [Advanced materials](#), [Featured Article](#)



Researchers have found that invisibility cloaks cannot hide objects from all moving observers. Credit: Halimeh and Thompson. ©2016 American Physical Society

S&T NEWS ARTICLES

ADVANCED MATERIALS

[A foldable material that can change size, volume and shape](#)

[Nanowerk](#), 13MAR2016

Researchers at Harvard University designed a three-dimensional, thin-walled structure made from extruded cubes with 24 faces and 36 edges. The embedded pneumatic actuators in the structure can be programmed to deform specific hinges, changing the cube's shape, size, and stiffness. The actuated changes in material properties add a fourth dimension to the material. It works from the nanoscale to the meter-scale and could be used to make anything from surgical stents to portable pop-up domes for disaster relief. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

[Nanomotors could help electronics fix themselves](#)

[Nanowerk](#), 13MAR2016

A team of researchers in the US (UC San Diego, University of Pittsburgh) designed and built nanoparticles out of gold and platinum that are powered by hydrogen peroxide. Platinum spurs the fuel to break down into water and oxygen, which propels the particles. Testing showed that the nanomotors zoomed over the surface of a broken electronic circuit connected to an LED. When they approached the scratch, they got lodged in it and bridged the gap between the two sides. Because the particles are made of conductive metals, they allowed current to flow again, and the LED lit up.

Tags: [Advanced materials](#)

[Spray-on coating could ice-proof airplanes, power lines, windshields](#)

[PhysOrg.com](#), 11MAR2016

Using a blend of common synthetic rubbers, a team of researchers in the US (University of Michigan, AFRL) has developed a thin, clear and slightly rubbery to the touch, spray-on formula. The coating could make ice slide off equipment, airplanes and car windshields

with only the force of gravity or a gentle breeze because of interfacial cavitation, where a small amount of force can deform the rubbery surface, breaking the solid free.

TECHNICAL ARTICLE

Tags: Advanced materials

Down the rabbit hole: How electrons travel through exotic new material

[Science Daily](#), 10MAR2016

A team of researchers in the US (Princeton University, UCLA) found that the crystals made of layers of tantalum and arsenic behave like Weyl semi-metal, which acts both like an electrical conductor and an insulator. They observed the electrons sink into the depths of the crystal through special conductive channels. A better understanding of these and other “topological” materials someday could lead to new, faster electronic devices.

TECHNICAL ARTICLE

Tags: Advanced materials

Team works on reconfigurable magnetic nanopatterns

[PhysOrg.com](#), 09MAR2016

An international team of researchers (Italy, USA - Georgia Institute of Technology, University of Illinois Urbana-Champaign, University of Notre Dame, Spain) has developed a method which is based on thermal scanning probe lithography. It uses a hot nano-tip to perform a highly localized field heating and cooling in antiferromagnetic and ferromagnetic thin film and align the spins in the material in any desired direction with nanoscale resolution. The properties and functionality of the nanopatterns can be programmed and reprogrammed on-demand. TECHNICAL ARTICLE

Tags: Advanced materials

CYBER SECURITY

CyberEye

[Government Computer News](#), 11MAR2016

A quantum computer capable of factoring the numbers behind RSA and other encryption methods may still be another decade away, but that’s substantially less than the 20 to 30 years many had figured it would take. Some experts are already concerned that there may not be enough time to prepare adequately for the arrival of those large-enough quantum computers. One thing the MIT/Innsbruck team proved is that the development of quantum computers that can break very complex encryption is no longer theoretical.

Tags: Cyber security, Quantum science

Computer security: With Boxmate malicious programs have no place left to hide

[Science Daily](#), 09MAR2016

Researchers in Germany have developed a new approach called “Boxmate” which is set to prevent other programs from surreptitiously changing their behavior. It systematically generates program inputs in order to investigate the program’s regular behavior. By preventing unexpected behavior changes, the “Boxmate” approach defends existing embedded systems, mobile devices, and even servers against known and as-yet unknown forms of attack.

Tags: Cyber security, S&T Germany

Nations ranked on their vulnerability to cyberattacks

[Science Daily](#), 09MAR2016

Data-mining experts from the University of Maryland and Virginia Tech recently co-authored a book that ranked the vulnerability of 44 nations to cyberattacks. The United States ranked 11th safest, while several Scandinavian countries (Denmark, Norway and Finland) ranked the safest. China, India, Russia, Saudi Arabia and South Korea ranked among the most vulnerable.

Tags: Cyber security

ENERGY

Supercondenser stores heat as electricity

[Science Daily](#), 11MAR2016

An international team of researchers (Sweden, China) has developed a type of battery that consists of an electrolyte of ions between two electrodes. The charge is stored next to the electrodes, most often in carbon nanotubes. If a supercapacitor is exposed to a temperature gradient the ions rush towards the cold side and an electric current arises. How much heat is converted to electricity depends both on which electrolyte is used and how great the temperature difference is. The research opens up new possibilities of storing solar electricity. TECHNICAL ARTICLE

Tags: Energy, Solar energy

INFORMATION TECHNOLOGY

New ‘machine unlearning’ technique wipes out unwanted data quickly and completely

[PhysOrg.com](#), 14MAR2016

Widely-used learning systems such as Google Search are, for the most part, only able to forget a user’s raw data upon request and not that data’s lineage. A team of researchers in the US (Lehigh University, Columbia University) proposes a “machine unlearning” method which introduces a layer of a small number of summations between the learning algorithm and the training data to eliminate dependency on each other. The learning algorithms depend only on

“We are trying to prove ourselves wrong as quickly as possible, because only in that way can we find progress.” **RICHARD FEYNMAN**

the summations and not on individual data. Simply re-computing a small number of summations would remove the data and its lineage completely—and much faster than through retraining the system from scratch.

TECHNICAL ARTICLE

Tags: Information technology

Toward the Internet of Things—A framework for data analytics on digital device networks

PhysOrg.com, 11MAR2016

Researchers at Rensselaer Polytechnic Institute are building a framework of software that sits on all IoT devices and the cloud that will automatically manage communication between the devices and deal with device and network failures. The project is sponsored by NSF.

Tags: Information technology

Light helps the transistor laser switch faster

Science Daily, 09MAR2016

Diode lasers have two ports: an electrical input and a light output. By contrast, the transistor laser has three ports: an electrical input, and both electrical and light outputs. Researchers at the University of Illinois Urbana-Champaign found that not only does photon-assisted tunneling occur in the transistor laser, but that it in turn stimulates the photon absorption process within the laser cavity, making optical switching in the device even faster and allowing for ultra-high-speed signal modulation. They also proved that the stimulated photon-assisted tunneling process is much faster than regular photon-assisted tunneling.

TECHNICAL ARTICLE

Tags: Information technology, Microelectronics, Photonics

System loads Web pages 34 percent faster by fetching files more effectively

MIT News, 09MAR2016

A team of researchers in the US (Harvard University, MIT) has developed a system called “Polaris,” that determines how to overlap the downloading of a page’s objects, such that the overall page requires less time to load. As pages increase in complexity, they often require multiple trips that create delays that really add up. Polaris minimizes the number of round trips in order to substantially speed up a page’s load-time. The paper will be presented at the upcoming USENIX symposium.

Tags: Information technology

MATERIALS SCIENCE

Tuning in to soft vibrations

Nanowerk, 11MAR2016

Researchers in Japan used terahertz absorption spectroscopy to analyze a copper-rich metal cluster complex and showed that the technique can deepen our understanding of the structure and behavior of metal cluster complexes. Metal cluster complexes are important molecules in nature and industry alike: they help plant leaves capture energy from sunlight as a key cog in the machinery of photosynthesis and are used as powerful catalysts in industry.

TECHNICAL ARTICLE

Tags: Materials science, S&T Japan

‘Sticky waves: ‘ molecular interactions at the nanoscale

Science Daily, 10MAR2016

An international team of researchers (Germany, Italy, USA - Cornell University, Luxembourg) has put forth a new proposition for describing van der Waals forces among objects at the nanoscale. They demonstrate that the fundamental forces between nanostructures must also be described by the electrostatic interactions between wavelike (or delocalized) charge density fluctuations instead of the particle-like (or local) induced dipoles. They believe their work could help to bridge the gap between these two belief systems, and help scientists understand and control the interactions between objects at the nanoscale.

TECHNICAL ARTICLE

Tags: Materials science

Accelerating discovery in materials science

PhysOrg.com, 09MAR2016

Under the NSF’s Materials Innovation Platforms (MIPs) program that aims to significantly accelerate materials research and development, Penn State University and Cornell University will serve as “platforms” to develop new bulk and thin film crystalline hard materials through state-of-the-art instrumentation. They will foster an environment that combines multidisciplinary expertise with the best tools available, providing access to the instrumentation, data and new materials created.

Tags: Materials science, S&T Policy

[Red wonder: Chemists pave way for phosphorus revolution](#)

Science Daily, 09MAR2016

Researchers at Florida State University were able to activate red phosphorus using inexpensive potassium ethoxide in ethanol. The reaction can be performed with mild heating and provides access to soluble polyphosphide compounds. Phosphorene is also an excellent conductor of electricity, unlike graphene it allows the flow of electricity to be controlled, making it ideal for use in future electronics. [TECHNICAL ARTICLE](#)

Tags: *Materials science*

FEATURED RESOURCE

Edge

To arrive at the edge of the world's knowledge, seek out the most complex and sophisticated minds, put them in a room together, and have them ask each other the questions they are asking themselves. [RSS](#)

MICROELECTRONICS

[Scientists develop a control system for rapid superconducting memory cells](#)

PhysOrg.com, 16MAR2016

An international team of researchers (Russia, the Netherlands) proposed creating basic memory cells based on quantum effects in Josephson junctions. By studying the superconductor-normal metal/ferromagnet-superconductor-insulator-superconductor junctions, the scientists discovered that in certain longitudinal and transverse dimensions, the layers of the system may have two energy minima, meaning they are in one of two different states. These two minima can be used to record data—zeros and ones. [TECHNICAL ARTICLE](#)

Tags: *Microelectronics, Information technology*

[Configurable analog chip computes with 1,000 times less power than digital](#)

PhysOrg.com, 11MAR2016

Researchers at the Georgia Institute of Technology have built a Field-Programmable Analog Array (FPAA) System-On-Chip (SoC), using analog technology supported by digital components to achieve unprecedented power and size reductions. According to the researchers, for many applications these low-power analog-based chips are likely to work as well as or better than configurable digital arrays. [TECHNICAL ARTICLE 1, 2](#)

Tags: *Microelectronics, Information technology*

[Solid-state integrated supercapacitors for silicon microelectronics](#)

Nanotechweb, 10MAR2016

Researchers at UCLA demonstrate a foundry-realizable process to integrate solid-state supercapacitors on silicon wafers for on-chip microelectronic applications. Replacing on-chip capacitors with integrated supercapacitors could lead to lower noise and wider dynamic range imaging sensors, denser computer memory/storage with integrated backup elements, smaller system-on-chip designs with embedded power decoupling, and smaller, lower-cost mobile energy-storage systems. [TECHNICAL ARTICLE](#)

Tags: *Microelectronics*

NEUROSCIENCE

[Unlocking the secrets of the brain's intelligence to develop smarter technologies](#)

PhysOrg.com, 11MAR2016

An international team of researchers (USA - Baylor University, Rice University, Canada) is working on Machine Intelligence from Cortical Networks (MICrONS) to discover the algorithms and learning rules that the brain implements and use these discoveries to create fundamentally smarter artificial neural networks. The project is supported by IARPA.

Tags: *Neuroscience, Artificial intelligence*

[Brain study finds that practice doesn't always make perfect](#)

Medical Express, 10MAR2016

An international team of researchers (South Korea, Israel, USA - Baylor University, Duke University) reports that the response of a given neuron varies in its activity even when we see exactly the same scene—essentially producing a certain kind of brain noise that affects our responding movements. The exact timing of a neuron as it produces spikes of electrical activity transmits crucial information. But a single neuron fires irregularly—and inconsistently, even when a person is performing the same motion repeatedly.

[TECHNICAL ARTICLE](#)

Tags: *Neuroscience*

[Less than meets the eye: How do computers — or our brains — recognize images?](#)

Science Daily, 10MAR2016

An international team of researchers (Israel, USA - MIT) suggests that the differences between computer and human capabilities lie in the fact that computer algorithms adopt a “bottom-up” approach that moves from simple features to complex ones. Human brains, on the other hand, work in “bottom-up” and “top-down” modes simultaneously, by comparing the elements in an image to a sort of model stored in their memory banks. The findings also suggest there may be something elemental in our brain that is tuned to work with a minimal amount—a basic “atom”—

of information. These “atoms of recognition” could prove to be valuable tools for further research into the workings of the human brain and for developing new computer and robotic vision systems. [TECHNICAL ARTICLE](#)

Tags: Neuroscience, Pattern recognition

PHOTONICS

[Bending light with silicon nanoparticles](#)

[Science Daily, 09MAR2016](#)

Researchers in Singapore have demonstrated that using silicon nanoparticles as nanoantennae, in place of metals, allows full control of an incoming light beam while keeping it essentially transparent, allowing transmission rates above 85%. By controlling the spatial distribution of the silicon nanoparticles, they were able to bend a light beam with record efficiencies of about 50%. This may open the door to the development of new light-based technologies.

Tags: Photonics, Advanced materials

[Trapped Spike Steers Laser Light Through Fiber](#)

[Optics and Photonics News, 09MAR2016](#)

Researchers in Germany have developed a new type of optical trap, in which a laser beam aligns a tiny glass-fiber spike inside a hollow-core photonic crystal fiber. The technique also provides a way to launch very high-power laser light down an optical fiber without the external equipment to keep the beam aligned. The team wants to try this technique with gas-filled or liquid-filled hollow-core fibers, so that it can be extended to applications such as ultraviolet-light generation and biological cell trapping. [TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

[Chinese scientists realize quantum simulation of the Unruh effect](#)

[PhysOrg.com, 14MAR2016](#)

Researchers in China investigated the quantum correlations quantified by quantum discord between two fermionic modes as seen by two relatively accelerated observers. It is shown that the quantum correlations can be created by the Unruh effect from the classically correlated states. This could provide a promising window to explore the quantum physics of accelerated systems, which appear in black hole physics, cosmology and particle physics. [TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T China

[Physicists develop a formula that contradicts decades of published research](#)

[PhysOrg.com, 14MAR2016](#)

The discovery by a team of researchers at the University of Cincinnati concerns the conventional approach toward bosonization-debosonization. It involves how to solve problems when there are strong interactions between particles that need to work in harmony with each other—bosons or fermions. The discovery could affect calculations regarding the future of quantum computers as well as electronic devices as they become smaller, faster and more advanced.

Tags: Quantum science

[An Algorithm to Dream Up Quantum Experiments](#)

[Optics and Photonics News, 07MAR2016](#)

Because of the various manifestations of “quantum weirdness,” figuring out optical experiments to implement quantum phenomena poses a tough challenge for human researchers. An international team of researchers (Austria, Poland) created a computer algorithm christened “Melvin,” which has dreamt up a variety of new configurations for implementing complex quantum states, using standard laboratory optical components such as beamsplitters and nonlinear crystals. According to the researchers, most of the configurations, while viable, are not approaches they would have thought of themselves—and will prove a challenge to understand. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[China creating its own DARPA in a move that follows Japan and South Korea creating DARPA-like agencies](#)

[Next Big Future, 12MAR2016](#)

China is joining a trend in Asia: Japan has launched a DARPA-like agency, and South Korea is planning one, too. It is natural that China and other countries are trying to establish DARPA-like organizations that can marry cutting-edge science and technology for defense applications. But whether China can succeed is an open question as DARPA's success is rooted in U.S. protection of freedom of expression. China's central government plans to spend \$147 billion on defense this year; the amount allotted to defense R and D is a state secret.

Tags: S&T policy

SCIENCE WITHOUT BORDERS

8 awesome science resources that you can access for free online

Science Alert, 11MAR2016

Just knowing where to go to get that particular resource for free right when you need it is everything. Here is a list of great, free online repositories that offer everything from historical documents by your favourite scientist to beautiful sci-fi posters.

Tags: Science without borders

SENSORS

Three new developments for smarter sensor chips

Nanowerk, 10MAR2016

At the recent ISSCC-conference, researchers from the Netherlands presented a number of remarkable developments. Three trends are, Sensor Fusion—Combining Sensors for a Better Result, Local Processing: Processing Data on the Chip is Energy Efficient and Adaptive & Compressive Sampling: Monitoring Only When it is Needed. Other technologies that will be needed in this IoT-scenario are collecting and interpreting big data in the cloud, flexible electronics, and new standards for low-power radios.

Tags: Sensors

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