



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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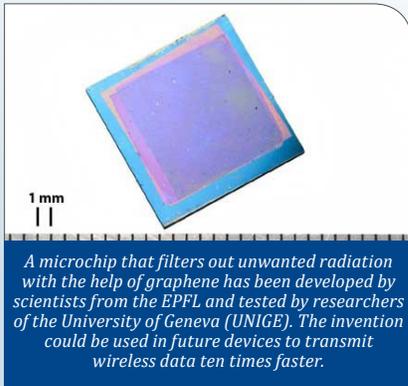
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FEATURE ARTICLES

[A graphene chip filters light to boost communications](#)

[Nanowerk, 07APR2016](#)



A microchip that filters out unwanted radiation with the help of graphene has been developed by scientists from the EPFL and tested by researchers of the University of Geneva (UNIGE). The invention could be used in future devices to transmit wireless data ten times faster.

Researchers in Switzerland have developed a graphene based microchip which is an essential building block for faster wireless telecommunications in terahertz frequency bands. It could help wireless telecommunications share data at a rate that

is ten times faster than currently possible. Like polarized glasses, the microchip makes sure that radiation that only vibrates in a certain way gets through. In this way, graphene is both transparent and opaque to radiation, depending on the orientation of vibration and signal direction. [TECHNICAL ARTICLE](#)

Tags: Communications technology, S&T Switzerland, Featured article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Nanoparticle clumps recycle themselves into complex structures](#)

[Nanowerk, 07APR2016](#)

Researchers in the Netherlands have developed a method to control the building process of colloids by adding salt or oil to the colloidal solution at specific times. This enables them to control the attractive Van der Waals forces and the surface tension. Under the influence of these forces, the randomly shaped chunks swell and reconfigure in a specific way. The type and concentration of salt and oil determine which structures the colloids form. In the future it might be possible to build tiny light switches, or medical robots. [TECHNICAL ARTICLE](#)

Tags: Advanced manufacturing

ADVANCED MATERIALS

[A new approach to simulating nanoscale heat transfer](#)

[Nanowerk, 07APR2016](#)

The strategy employed by researchers at the University of Delaware is to use nanoparticles to scatter phonons. The team is developing tools to study phonon scattering so that the size, shape, and composition of nanoparticles can be optimized for thermoelectric applications. The new framework significantly reduces the amount of computational power needed to simulate phonon scattering and greatly increases the maximum size of the systems that can be studied using computers. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

[Graphene-based remote controlled molecular switches](#)

[Science Daily, 07APR2016](#)

Under the EU sponsored Graphene Flagship, an international team of researchers (France, Belgium, UK, Italy) found that alkoxy-substituted azobenzene has a high affinity for the basal plane of graphene, thereby hindering inter-flake stacking. When exposed to UV light the azobenzene molecule switches from the trans to the cis isomer, a fully reversible process. By depositing the graphene-azobenzene hybrid ink onto a SiO₂ substrate patterned with gold electrodes, the authors made a light-modulated molecular switch which is also reversible. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T EU

[Metal foam obliterates bullets - and that's just the beginning](#)

[PhysOrg.com, 06APR2016](#)

A team of researchers in the US (North Carolina State University, U. S. Army Research, Development and Engineering Center) has developed composite metal foam which can stop an armor piercing bullet. In a video they showed that a 7.62 x 63 millimeter M2 armor piercing projectile fired according to the standard

continued...

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testing procedures was stopped by less than an inch of composite metal foam. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[2-D Boron Is an Intrinsic Superconductor](#) IEEE Spectrum, 05APR2016

Researchers at Rice University reported the results of their first-principles analysis. The upshot: They predict that a one-atom-thick sheet of boron should achieve superconductivity at 10 to 20 Kelvin. Boron's in-plane stiffness is high, about half of graphene's, but it is very flexible; its bending rigidity is just a fraction of graphene's. It is a very light element (lightest among possible 2-D materials), with strong interatomic bonding. These properties are favorable for a material to have a higher critical temperature. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

[Nanotubes line up to form films](#) EurekAlert, 04APR2016

Using a simple filtration process, an international team of researchers (USA - Rice University, Houston, Los Alamos National Laboratory, China) has created flexible, wafer-scale films of highly aligned and closely packed carbon nanotubes. Under the right conditions, the tubes assemble themselves by the millions into long rows that are aligned better than once thought possible. They offer possibilities for making flexible electronic and photonic devices.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, Photonics

[Researchers present a direct first proof of stable, ultra-long 1D carbon chains](#)

PhysOrg.com, 04APR2016

An international team of researchers (Austria, Japan, Spain, Turkey, Germany, Switzerland, Ecuador) has developed a novel route for the bulk production of carbon chains composed of more than 6,400 carbon atoms by using thin, double-walled carbon nanotubes as protective hosts for the chains. It is an elegant forerunner toward the final goal of carbon's bulk production. Besides the potential applications, these findings open the possibility of answering fundamental questions about electron correlations, electron-phonon interactions and quantum phase transitions in one-dimensional materials. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

[Gestures improve communication, even with robots](#)

Science Daily, 04APR2016

Researchers in the UK have discovered that by getting robot avatars to "talk with their hands" we understand

them as well as we do our fellow human beings. Their research showed that their method of translating human gestures to an avatar was successful. More importantly, they are confident that the avatar gestures, when used with speech, are as easily understood as from a human.

[TECHNICAL ARTICLE](#)

Tags: Autonomous systems & robotics, S&T UK

BIOTECHNOLOGY

[Biotech breakthrough: Sunlight can be used to produce chemicals and energy](#)

Science Daily, 04APR2016

An international team of researchers (Denmark, Sweden) has discovered a natural process they describe as reverse photosynthesis. In the process, the energy in solar rays breaks down, rather than builds plant material, as is the case with photosynthesis. Sunlight is collected by chlorophyll, the same molecule as used in photosynthesis. Combined with a specific enzyme the energy of sunlight now breaks down plant biomass, with possible uses as chemicals, biofuels or other products, that might otherwise take a long time to produce. [TECHNICAL ARTICLE](#)

Tags: Biotechnology, Energy

[Researchers develop synthetic tissue with light-activated communications](#)

PhysOrg.com, 04APR2016

Using a 3D printer, researchers in the UK created synthetic tissue made of synthetic cells in it that can be caused to communicate with other cells in the same tissue using light. Communications can be controlled by controlling which part of the tissue is exposed to the light and when. At the present time, the tissue is still experimental, though it represents progress in creating truly useful synthetic tissue types. [TECHNICAL ARTICLE](#)

Tags: Biotechnology, S&T UK

COMMUNICATIONS TECHNOLOGY

[World record for fastest optical communications for data centers](#)

Science Daily, 08APR2016

The higher the transmission speed and the longer the distance, the more severe is the distortion, rendering the light signal unrecognizable at the receiver. Instead of using costly components, researchers in Hong Kong performed big data statistical analysis of massive amounts of transmitted and received light signals, they identified the distortion pattern, and reversed distortion. In doing so, they achieved a significant increase in transmission speed with inexpensive and mature components.

Tags: Communications technology

“If we all did the things we are capable of, we would astound ourselves.”

THOMAS A. EDISON

ENERGY

[Clean energy generated using bacteria-powered solar panel](#)

Science Daily, 11APR2016

Researchers at the State University of New York-Binghamton connected nine biological-solar (bio-solar) cells into a bio-solar panel. They continuously produced electricity from the panel and generated the most wattage of any existing small-scale bio-solar cells -- 5.59 microwatts. The research could also enable crucial understanding of the photosynthetic extracellular electron transfer processes in a smaller group of microorganisms with excellent control over the microenvironment, thereby enabling a versatile platform for fundamental bio-solar cell studies. [TECHNICAL ARTICLE](#)

Tags: Energy, Solar energy

[Will orbiting flying carpets light the world?](#)

PhysOrg.com, 08APR2016

Researchers at Caltech and their industry partner are developing technology that would enable one to build the largest-ever-built orbiting solar panels to provide electricity. It is easier to install ground stations that can receive power from spacecraft and transmit it to local communities. The orbiting system would beam energy to Earth in the form of microwaves, to be converted to electricity on the ground.

Tags: Energy

[A step towards new, faster-charging, and safer batteries](#)

Science Daily, 05APR2016

An international team of researchers (USA - Stanford University, Taiwan, China) found a simple solution to the limited durability in aluminum-ion batteries—an electrode composed of graphite. In this research, the internal gaps in the foam allowed faster motion of the ions inside the negative electrode that enhance the rate of charging. Also, the electrodes are connected by a safe salt that is liquid at room temperature, rather than a flammable liquid as in conventional lithium-ion batteries. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

[Potential for capturing waste heat via nanotubes](#)

Science Daily, 05APR2016

According to an international team of researchers (USA - University of Wisconsin, NREL, University of Colorado) a finely tuned carbon nanotube thin film has the potential to act as a thermoelectric power generator that captures

and uses waste heat. The research could help guide the manufacture of thermoelectric devices based on either single-walled carbon nanotube films or composites containing these nanotubes. Because more than half of the energy consumed worldwide is rejected primarily as waste heat, the idea of thermoelectric power generation is emerging as an important part of renewable energy and energy-efficiency portfolios. [TECHNICAL ARTICLE](#)

Tags: Energy

MATERIALS SCIENCE

[New magnetism research brings high-temp superconductivity applications closer](#)

PhysOrg.com, 08APR2016

An international team of researchers (USA - Argonne National Laboratory, Northern Illinois University, Northwestern University, University of Minnesota, Germany, Russia) showed that the magnetism in iron-based superconductors was produced by mobile electrons that are not bound to a particular iron atom, producing waves of magnetization throughout the sample. They discovered that, in some iron arsenides, two waves interfere to cancel out, producing zero magnetization in some atoms. The discovery would allow for the development of magnetic energy-storage systems, fast-charging batteries for electric cars and a highly efficient electrical grid. [TECHNICAL ARTICLE](#)

Tags: Materials science, Government S&T

[Crumpling approach enhances photodetectors' light responsivity](#)

Nanowerk, 07APR2016

Researchers at the University of Illinois at Urbana-Champaign have demonstrated a new approach to modifying the light absorption and stretchability of atomically thin two-dimensional materials by surface topographic engineering using only mechanical strain. The highly flexible system has future potential for wearable technology and integrated biomedical optical sensing technology when combined with flexible light-emitting diodes. [TECHNICAL ARTICLE](#)

Tags: Materials science, Sensors

[Scientists push valleytronics one step closer to reality](#)

Science Daily, 04APR2016

An international team of researchers (USA - UC Berkeley, University of Colorado Boulder, Lawrence Berkeley National Laboratory, China, Saudi Arabia) experimentally demonstrated, for the first time, the ability to electrically

continued...

generate and control valley electrons in a two-dimensional semiconductor. This is an especially important advance because transition metal dichalcogenides are considered to be more “device ready” than other semiconductors that exhibit valleytronic properties. [TECHNICAL ARTICLE](#)

Tags: Materials science, Microelectronics

MEDICAL SCIENCES

[Co-evolving Antivirals Aim to Keep Ahead of Fast-Changing Viruses](#)

[DARPA News, 07APR2016](#)

With INTERCEPT, the goal is to develop viral therapies that are effective against a broad spectrum of viral strains, and that can co-evolve and outpace new strains. The program will focus on three technical goals—develop Therapeutic Interfering Particles (TIP), conduct long-term (four- to eight-month) studies of safety and efficacy, develop computer models that can help inform the design of improved TIPs. [More information](#)

Tags: Medical Sciences, DARPA, Government S&T

FEATURED RESOURCE

[Fraunhofer Research News](#)

Fraunhofer is Europe’s largest application-oriented research organization. Their research efforts are geared entirely to people’s needs: health, security, communication, energy and the environment. [RSS](#)

MICROELECTRONICS

[World’s Smallest Diode Is Made of DNA](#)

[IEEE Spectrum, 04APR2016](#)

An international team of researchers (USA - University of Georgia, Israel) used DNA to fashion a new diode. By itself, DNA does not act like a diode. However, when the researchers inserted two small molecules of coralyne into certain points within DNA and applied 1.1 volts to the complex, electric current flowed through the DNA diode 15 times as strongly in one direction than the other. Theoretical models of the diode revealed that this rectification resulted from the way the lopsided distributed of electrons coralyne causes within the DNA. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Biotechnology

PHOTONICS

[Breaking metamaterial symmetry with reflected light](#)

[Science Daily, 05APR2016](#)

According to an international team of researchers (UK, Singapore), breaking the symmetry of metamaterials with reflected light will enable novel applications because it causes optical activity of unprecedented magnitude—far exceeding previously known specular or “mirror-like” optical activity. The discovery paves the way for a whole new class of extremely thin and light devices for controlling and detecting the polarization of light, such as polarization rotating and circularly polarizing beam splitters and mirrors, as well as optical isolators for circularly polarized light.

[TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

[Exotic quantum effects can govern the chemistry around us](#)

[PhysOrg.com, 08APR2016](#)

Researchers in Poland have shown that in a molecule, it is also possible for protons to tunnel. They have proof that a basic chemical reaction can occur as a result of tunneling in solution and at room temperature or higher. The discovery makes it possible to accurately control reactions taking place under conditions typical for our environment. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Quantum dots enhance light-to-current conversion in layered semiconductors](#)

[Science Daily, 08APR2016](#)

A team of researchers in the US (Brookhaven National Laboratory, Stony Brook University, University of Nebraska) combined the excellent light-harvesting properties of quantum dots with the tunable electrical conductivity of a layered tin disulfide semiconductor to produce a hybrid material that exhibited enhanced light-harvesting and energy transfer properties. The research paves the way for using these materials in optoelectronic applications such as energy-harvesting photovoltaics, light sensors, and LEDs.

[TECHNICAL ARTICLE 1, 2](#)

Tags: Quantum science, Government S&T

[Long-distance transport of electron spins for spin-based logic devices](#)

[Nanowerk, 07APR2016](#)

Spin polarization in a semiconductor is easily randomized, and consequently, it is difficult to transport spin polarization over a long distance. Researchers in Japan have demonstrated long-distance spin transport by electrical means in

a semiconductor quantum well, which is designed to increase spin lifetime. They have demonstrated that the spin precession speed of drifting electrons in semiconductor quantum wells can be controlled by applying an external gate voltage. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Researchers use light and sound waves to control electron states](#)

[PhysOrg.com, 07APR2016](#)

A team of researchers in the US (University of Oregon, Oregon State University) studied diamond topped with a layer of zinc oxide containing electrical conductors at a temperature of 8 degrees Kelvin (-445.27 Fahrenheit, -265.15 Celsius). They used surface acoustic waves to change electron states that could foster data transfer between quantum bits. Using this new tool based on both light and sound can help create logic gates that serve to let qubits talk with one another. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Stabilizing quantum bits](#)

[Nanowerk, 07APR2016](#)

Superposition is fragile, and finding ways to preserve it is one of the chief obstacles to developing large, general-purpose quantum computers. Researchers at MIT describe a feedback-control system for maintaining quantum superposition that requires no measurement. The main advantage of this technique compared to previously reported results, like protection of spin using echoes, is that it is less sensitive to the time scale of the noise. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[Nanotechnology particle stratification technique provides new opportunities for innovation](#)

[Nanowerk, 04APR2016](#)

Researchers working on the EU funded program [BARRIER PLUS project](#) have shown how small nanotech particles suspended in a liquid separate out by size as the liquid evaporates, an effect that can lead to techniques for making layered structures that improve the performance of many everyday products, such as sun cream and electronics.

Tags: S&T policy, S&T EU

SCIENCE WITHOUT BORDERS

[Physicists build ultra-powerful accelerator magnet](#)

[Science Daily, 07APR2016](#)

Recent tests revealed that the United States and CERN have successfully co-created a prototype

superconducting accelerator magnet that is much more powerful than those currently inside the Large Hadron Collider. Engineers will incorporate more than 20 magnets similar to this model into the next iteration of the LHC, which will take the stage in 2026 and increase the LHC's luminosity by a factor of ten. That translates into a ten-fold increase in the data rate.

Tags: Science without borders, Particle physics

SENSORS

[HRL to develop next-generation inertial sensor technology](#)

[EurekAlert, 11APR2016](#)

While GPS provides sub-meter accuracy in optimal conditions, the signal is often lost or degraded due to natural interference or malicious jamming. With DARPA's funding, researchers in the US are developing vibration- and shock-tolerant inertial sensor technology that enables future system accuracy needs without utilizing GPS. It will combine intimate locking of a MEMS Coriolis Vibratory Gyroscope (CVG) sensor with an atomically-stable frequency reference in order to exploit the intrinsic accuracy of the atomic hyperfine transition frequency.

Tags: Sensors, Military technology

[Lighting the way to new sensors](#)

[Nanowerk, 05APR2016](#)

Researchers in Singapore developed a tiny optical temperature sensor just 120 by 80 micrometers and modeled on the Michelson Interferometer. The device does not require mirrors, instead it guides light through loops to bring it back to the interference point. The researchers found that it could measure a wide range of temperatures, and was also around 20 times more sensitive to small temperature changes than existing fiber-optic sensors. The sensors can provide accurate readings without being damaged by the toxic, corrosive or even explosive conditions within the machines. [TECHNICAL ARTICLE 1, 2](#)

Tags: Sensors

[New laser to shine light on remote sensing](#)

[Science Daily, 05APR2016](#)

The laser, developed by researchers in Australia, can operate over a large range within the infrared light spectrum. It is operating at a wavelength where many hydrocarbon gases, including the greenhouse gases, absorb light. Hence, by changing the wavelength of the laser, it is possible to measure the light absorption patterns of different chemicals with a high degree of sensitivity. [TECHNICAL ARTICLE](#)

Tags: Sensors, Photonics, S&T Australia ■

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