



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

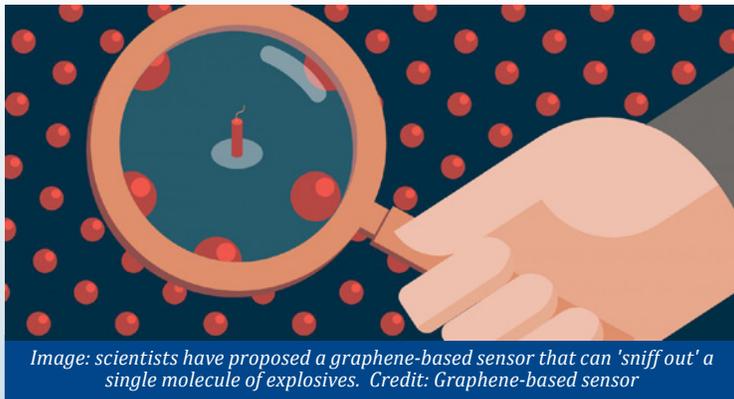


Image: scientists have proposed a graphene-based sensor that can 'sniff out' a single molecule of explosives. Credit: Graphene-based sensor

[‘Sniffer plasmons’ could detect explosives](#)

[EurekaAlert](#), 15AUG2016

A spaser is similar to a laser and operates on the same basic principle. To produce radiation, it relies on optical transitions in the gain medium, and emits surface plasmons. Researchers in Russia used the graphene spaser to design compact spectral measurement devices capable of detecting organic molecules based on their characteristic vibrational transitions, as the light emitted/absorbed falls into the medium infrared region, which is exactly where the graphene-based spaser operates. [TECHNICAL ARTICLE](#)

Tags: [Sensors](#), [S&T Russia](#), [Featured Article](#)

[Germs add ripples to make ‘groovy’ graphene](#)

[PhysOrg.com](#), 11AUG2016

A team of researchers in the US (University of Illinois, Chicago, Clemson University) invented a unique way to introduce circumscribed, guided, and regular graphene ripples using bacillus bacteria, using graphene itself as a check-valve to alter the volume of the cells. After the bacteria have been vacuum-shrunk, graphene reconfirms, but with wrinkles. After heat treatment, the resulting permanent ripples atop the bacteria are all aligned longitudinally. This is a new carbon allotrope—a half carbon nanotube linked to graphene. The structure is different, and the fundamental electronic properties are new. [TECHNICAL ARTICLE](#)

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

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Researchers resolve a problem that has been holding back a technological revolution](#)

[PhysOrg.com](#), 16AUG2016

A major problem standing in the way of new technology has been untangling metallic and semiconducting carbon nanotubes, since both are created simultaneously in the process of producing the microscopic structures. Researchers in Canada managed to reverse the electronic characteristics of a polymer known to disperse semiconducting nanotubes—while leaving the rest of the polymer’s structure intact. By so doing, they have reversed the process, leaving the semiconducting nanotubes behind while making it possible to disperse the metallic nanotubes.

Tags: [Advanced materials](#), [S&T Canada](#)

[A nanotechnology perspective for manufacturing](#)

[Nanowerk](#), 11AUG2016

In a review article, researchers at NIST take silicon integrated circuit manufacturing as a baseline in order to consider the factors involved in matching processes with products, examining the characteristics and potential of top-down and bottom-up processes, and their combination. They discuss how a careful assessment of the way in which function can be made to follow form can enable high-volume manufacturing of nanoscale structures with the desired useful, and exciting, properties. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#), [Government S&T](#)

[Quantum dots with impermeable shell: A powerful tool for nanoengineering](#)

[Nanowerk](#), 11AUG2016

Researchers in Poland developed a method to produce nanoparticles that are spherical, crystalline, and have almost the same size and characteristics of typical quantum dots. Every nanoparticle is stabilized by an impermeable protective jacket, built of organic

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compounds, strongly anchored on the surface of the semiconductor core. As a result, the quantum dots remain stable for a long time and do not aggregate. The ZnO dots are non-toxic; they do not aggregate, and can be bound to many chemical compounds. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Quantum science

[Smarter self-assembly opens new pathways for nanotechnology](#)

[Science Daily, 08AUG2016](#)

Researchers at Brook Haven National Laboratory used electron beam lithography to etch patterns to direct the self-assembly of multiple molecular patterns within a single material. They then added a solution containing a set of block copolymers onto the template, spun the substrate to create a thin coating, and baked. Thermal energy drives interaction between the block copolymers and the template, setting the final configuration. This is a significant conceptual leap in self-assembly that could change the way we design and manufacture electronics.

[OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Advanced materials, Advanced manufacturing, Government S&T

AUTONOMOUS SYSTEMS & ROBOTICS

[AI's Language Problem](#)

[MIT Technology Review, 09AUG2016](#)

Systems like Siri and IBM's Watson can follow simple spoken or typed commands and answer basic questions, but they can't hold a conversation and have no real understanding of the words they use. As AI systems become increasingly sophisticated and complex, it is hard to envision how we will collaborate with them without language—without being able to ask them, "Why?". More than this, the ability to communicate effortlessly with computers would make them infinitely more useful.

Tags: Autonomous systems & robotics, Artificial intelligence

BIG DATA

[The big deal with big data is not \(just\) the data](#)

[MIT Technology Review, 11AUG2016](#)

One of big data's primary concerns is the potential for threat to personal privacy through greater access to information—data ethics take center stage. This demand for privacy retention has given rise to solutions such as MIT's bitcoin-inspired Enigma, which promises, through a magical mix of math and code, to allow anyone to share their data in the cloud while still keeping it private.

Tags: Big data

BIOTECHNOLOGY

[A Synthetic Multicellular Memory Device](#)

[ACS Synthetic Biology, 21JUL2016](#)

An international team of researchers (Spain, MIT - Santa Fe Institute) engineered yeast cells that can communicate and retain memory of changes in the extracellular environment. These cells were able to produce and secrete a pheromone and sense a different pheromone following NOT logic. When the two strains were cocultured, they behaved as a double-negative-feedback motif with memory. Memory can be effectively changed by the use of external inputs. The research could lead to new multicellular circuits that exhibit memory over a broad range of biological inputs.

Tags: Biotechnology, Synthetic biology

CYBER SECURITY

[Android apps can secretly track users' whereabouts, researchers find](#)

[Science Daily, 10AUG2016](#)

Researchers at Northeastern University built and tested an Android app that can reach inside your mobile phone to track your whereabouts and traffic patterns, all without your knowledge or consent. Their system uses an algorithm that inserts data from the phone's built-in sensors into graphs of the world's roads. The researchers applied the algorithm to various simulated and real road trips. For each trip the system generated the five most likely paths taken. There is a 50 percent chance that the actual path traveled was one of the five.

Tags: Cyber security

ENERGY

[Lithium-ion batteries: Capacity might be increased by six times](#)

[Science Daily, 08AUG2016](#)

An international team of researchers (Germany, France) has shown, through neutron measurements, that lithium ions do not penetrate deeply into the silicon. During the charge cycle, a 20-nm anode layer develops containing an extremely high proportion of lithium. This means extremely thin layers of silicon would be sufficient to achieve the maximal load of lithium. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

IMAGING TECHNOLOGY

[Seeing the invisible: Visible light superlens made from nanobeads](#)

[Science Daily, 12AUG2016](#)

An international team of researchers (China, UK) created minute droplet-like lens structures on the surface to be examined using high-index titanium dioxide as the

“The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.” STEVE JOBS

building element of the lens. Each sphere bends the light to a high magnitude and splits the light beam, creating millions of individual beams of light which enable us to view previously unseen detail. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Imaging technology

INFORMATION TECHNOLOGY

[New computer programme replicates handwriting](#)

[PhysOrg.com, 12AUG2016](#)

Researchers in the UK have created ‘My Text in Your Handwriting’, a programme which semi-automatically examines a sample of a person’s handwriting, which can be as little as one paragraph, and generates new text saying whatever the user wishes, as if the author had handwritten it themselves. Forgery and forensic handwriting analysis are still almost entirely manual processes but by taking the novel approach of viewing handwriting as texture-synthesis, the software can be used to characterise handwriting to quantify the odds that something was forged.

Tags: Information technology

[Sketch-based query for searching for relationships among objects in images](#)

[PhysOrg.com, 11AUG2016](#)

An international team of researchers (UK, Saudi Arabia) developed a query called a “relation-augmented image descriptor (RAID)” that takes either a written description or sketch of objects in a specific spatial relationship and searches for matches in the image database based on relatively simple geometric processing. RAID provides a new way to describe images and has potential applications in computer graphics, computer vision and automated object classification. The team is currently working on a three-dimensional version of the descriptor that could help with computer interpretation of entire scenes. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Information technology

[Wearable cloud could be less expensive, more powerful form of mobile computing](#)

[Science Daily, 11AUG2016](#)

Using 10 low-cost, credit-card-sized computers called Raspberry Pi’s, an old winter jacket, three power banks and a small remote touch screen display, researchers at the University of Alabama developed a wearable system that brings all mobile computing solutions together, creating

the ultimate smart device. The cloud jacket could make the design of mobile and wearable devices simple, inexpensive and lightweight by allowing users to tap into the resources of the wearable cloud, instead of relying solely on the capabilities of their mobile hardware.

Tags: Information technology, Flexible electronics

[User-friendly language for programming efficient simulations](#)

[MIT News, 10AUG2016](#)

A team of researchers in the US (MIT, Stanford University, California Polytechnic State University, UT Austin) has developed a new programming language that handles switching automatically. In experiments, simulations written in the language were dozens or even hundreds of times as fast as those written in existing simulation languages. According to the researchers for a large class of problems the trade-off between concise code and good performance is false. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Information technology

MATERIALS SCIENCE

[Researchers demonstrate acoustic levitation of a large sphere](#)

[PhysOrg.com, 12AUG2016](#)

By using three ultrasonic transducers in a tripod configuration, an international team of researchers (Brazil, UK) obtained vertical and lateral acoustic forces and levitated a 50-mm solid polystyrene sphere to a height of about 7 mm using ultrasound without any contact with external surfaces. They predict that the method can be used to levitate even larger spheres, and can also be extended to levitate objects of different shapes and sizes and at different positions. Acoustic levitation has applications in handling and manipulating very hot materials and liquid samples in space and control and analyze these large liquid samples. [TECHNICAL ARTICLE](#)

Tags: Materials science

[New method helps stabilize materials with elusive magnetism](#)

[Science Daily, 10AUG2016](#)

Researchers in Switzerland introduced two new theoretical approaches to stabilise the ferromagnetic state in quantum gases to help study the characteristics of itinerant ferromagnetic materials. In their study, they discussed two new improved stability conditions. The first approach involves imposing a moderate optical lattice, which extends the ferromagnetic phase to smaller

scattering lengths. In a second approach, they suggest to prepare two initially separated clouds and study their time evolution. The ferromagnetic domains have a longer life time because of the reduced overlap region between the two spins. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Switzerland

[Researchers immobilize underwater bubbles](#)

[Science Daily, 09AUG2016](#)

Researchers in France demonstrated the immobilization of a single microbubble in water. After a bubble is produced (at the apex of the nanoelectrode) it is immobilized by rapidly increasing the frequency of the electric current. It is a stable situation: No matter which direction the electrode moves, the bubble remains above and at the same distance from the electrode. The discovery could lead to new applications in medicine and the nuclear industry. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Materials science, S&T France

FEATURED RESOURCE

[COSIS.net](#)

COSIS.net is an online community for scientists and their affiliated organizations for the exchange of information and the discussion of ideas and results. Membership is open to researchers affiliated with an organization.

MICROELECTRONICS

[Making flexible memories at room temperature](#)

[Nanowerk, 15AUG2016](#)

An international team of researchers (USA - Rice University, University of Central Florida, South Korea) developed a new way to make a flexible, resistive random access memory device in a room-temperature process. The method is based on nanoporous tungsten oxide which is a bipolar switch and has a high on/off current ratio of more than 105. It can also be bent and unbent over 103 cycles without suffering any significant loss in performance. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

[See-through circuitry](#)

[PhysOrg.com, 11AUG2016](#)

Researchers in Saudi Arabia used atomic layer deposition to build up a single layer of atoms at a time. Volatile vapors of aluminum and zinc in the form of trimethyl aluminum and diethyl zinc were alternately introduced onto the transparent substrate, where they adhere to the surface in a single layer before reacting in situ to form AZO. The process simplifies circuit fabrication

and it requires a temperature of 160 degrees Celsius to form each layer, which is low enough for the transparent circuitry to be formed on flexible plastic substrates as well as on rigid glass. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

NEUROSCIENCE

[Researchers 'reprogram' network of brain cells in mice with thin beam of light](#)

[Medical Express, 11AUG2016](#)

Researchers at Columbia University were able to control and observe the brain of a living mouse using optogenetic tools. They injected the mouse with a virus containing light-sensitive proteins engineered to reach specific brain cells. Once inside a cell, the proteins allowed researchers to remotely activate the neuron with light. The findings suggest that groups of activated neurons may form the basic building blocks of learning and memory, as originally hypothesized in the 1940s. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

QUANTUM SCIENCE

[Prototype chip could help make quantum computing practical](#)

[Science Daily, 08AUG2016](#)

A team of researchers in the US (MIT, MIT Lincoln Laboratory) describes a prototype chip that can trap ions in an electric field and, with built-in optics, direct laser light toward each of them. They designed and built a suite of on-chip optical components that can channel laser light toward individual ions. In ongoing work, the researchers are investigating the addition of light modulators to the diffraction gratings, so that different qubits can simultaneously receive light of different, time-varying intensities.

[TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[Enabling Extreme New Designs for Optics and Imagers](#)

[DARPA News, 15AUG2016](#)

DARPA's EXTREME Optics and Imaging program aims to introduce engineered optical materials (EnMats) and associated design tools for creating innovative optical systems with improved performance, new functionality, and drastically reduced size and weight. To achieve its goal, EXTREME is focused on developing new EnMats—both two dimensional metasurfaces as well as 3-D volumetric optics and holograms—that manipulate light in ways beyond classical rules of reflection and refraction. It will address multiscale modelling to enable design and optimization of EnMats across vastly different scales, from nanometer to centimeter. [Proposers Day details.](#)

Tags: S&T policy, DARPA, Government S&T

[Russia developing combat lasers with a main focus on blinding optoelectronic sensors](#)

Next Big Future, 14AUG2016

A powerful laser system mounted on an Il-76, a multi-purpose four-engine turboprop strategic airlifter, will be able to counter enemy reconnaissance systems. It is guaranteed to disrupt optoelectronic equipment and field sensors operating in the infrared range in space, at sea, and on land.

Tags: *S&T policy, Military technology, S&T Russia*

[China targets 2030 for operational hybrid hypersonic spaceplane](#)

Next Big Future, 12AUG2016

The hybrid space plane's combined cycle engines would use turboprop or turbojet engines to takeoff horizontally from a landing strip. Once airborne, the engine then shifts to ramjet propulsion and, as speed increases, adjusts into a scramjet engine with supersonic airflow. At the scramjet stage it would enter hypersonic flight in 'near space'. Finally the hybrid spaceplane would use its rocket motors to push out of near space and into orbit.

Tags: *S&T policy, Military technology, S&T China*

[Wanted: Ideas for Protecting Against Small Unmanned Air Systems](#)

DARPA News, 11AUG2016

To expedite the development of capabilities to defend U.S. forces against quickly evolving airborne threats and their potentially revolutionary benefits, DARPA has issued an RFI. DARPA is interested in identifying novel, flexible, and mobile layered defense systems and component technologies. They are looking for scalable, modular, and affordable approaches that could be fielded within the next three to four years and could rapidly evolve with threat and tactical advancements.

Tags: *S&T policy, DARPA*

[World should consider limits to future internet expansion to control energy consumption](#)

Science Daily, 11AUG2016

Researchers in the UK argue that the growth of the Internet of Things has the potential to bring unprecedented and, in principle, almost unlimited rises in energy consumed by smart technologies despite improvements in energy efficiencies. Some predictions claim information technologies could account for as much as 20 per cent of total energy use by 2030. The researchers believe serious consideration should be given to how limits to data growth could be planned, before the forecast growth of the Internet of Things occurs. There are currently 6.4 billion connected Internet of Things devices and it is estimated this could reach 21 billion by 2020. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: *S&T policy, S&T UK*

SCIENCE WITHOUT BORDERS

[Carnegie Mellon professor creates software to improve data sharing in research and academia](#)

PhysOrg.com, 15AUG2016

Researchers at Carnegie Mellon University have developed open source software called scimax, designed to improve data sharing in applications such as engineering education and scientific publishing. The software uniquely integrates data processing and analysis directly into plain text, bringing plain text to life, allowing for a multitude of applications in research, teaching, and writing. For example, scimax streamlines the process of writing scientific papers and eliminates the need for using multiple programs like word processors, reference managers, and data/analysis plotting programs. The software does not require the user to know how to code. [More information](#)

Tags: *Science without borders*

[This is why a lot of peer-reviewed research is wrong](#)

Science Alert, 12AUG2016

Despite the lengthy process of the scientific method, a lot of peer-reviewed research out there is actually wrong, and it highlights a serious problem in the way we do science. But the important thing to know here is that most scientists aren't doing this maliciously—a lot of these false results are a symptom of the system: the only way to get jobs is to publish papers, and you don't publish papers with non-significant or replicated results. The good news is that many scientists now recognise that there's a reproducibility crisis in science and they are actively looking for ways to change the publication process and make it more accurate and transparent.

Tags: *Science without borders*

[Chemists to get their own preprint server](#)

Nature News, 11AUG2016

The American Chemical Society announced that it wants to establish a site to help chemists to share early results and data with colleagues online, ahead of formal publication. The repository would follow on the heels of preprint server arXiv which is used widely by physicists, computer scientists and mathematicians, and the bioRxiv, for biologists. 2016 has seen the launch of the SocArXiv for social sciences, engrXiv for engineering, and PsyArXiv, for psychology, is rumoured to be on the way.

Tags: *Science without borders*

SENSORS

[Hexagonal boron nitride semiconductors enable cost-effective detection of neutron signals](#)[PhysOrg.com](#), 16AUG2016

By using a 43-micron-thick hexagonal boron-10 enriched nitride layer, researchers at Texas Tech University have developed a thermal neutron detector with 51.4 percent detection efficiency. Higher detection efficiency is anticipated by further increasing the material thickness and improving materials quality. Compared to helium gas detectors, boron nitride technology improves the performance of neutron detectors in terms of efficiency, sensitivity, ruggedness, compactness and weight. Beyond special nuclear materials and weapons detection, solid-state neutron detectors also have medical, environmental and industrial applications. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Sensors, Counter WMD

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