



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Electronic nose smells pesticides and nerve gas](#)

[PhysOrg.com](#), 04JUL2016

A team of international researchers (Belgium, Australia, Singapore) created a metal-organic framework that absorbs phosphonates found in pesticides and nerve gases. This means you can use it to find traces of chemical weapons such as sarin or to identify the residue of pesticides on food. The chemical sensor can easily be integrated into existing electronic devices. [TECHNICAL ARTICLE](#)

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



Detecting pesticides and nerve gas in very low concentrations. An international team of researchers led by Ivo Stassen and Rob Ameloot from KU Leuven, Belgium, have made it possible. Credit: © KU Leuven / Joris Snaet

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Shape-changing 'smart' material: Heat, light stimulate self-assembly](#)

[Science Daily](#), 30JUN2016

A team of researchers in the US (Washington State University, Oak Ridge National Laboratory) worked with a class of long-chain molecules, called liquid crystalline networks, which provide order in one direction and give material unique properties. The researchers took advantage of the way the material changes in response to heat to induce a unique three-way shape shifting behavior. They added groups of atoms that react to polarized light and used dynamic chemical bonds to improve the material's reprocessing abilities. The materials have a variety of potential applications, such as for actuators, drug delivery systems and self-assembling devices. [OPEN ACCESS TECHNICAL ARTICLE, VIDEO](#)

Tags: [Advanced materials](#)

AUTONOMOUS SYSTEMS & ROBOTICS

[Study exposes major flaw in classic artificial intelligence test](#)

[Science Daily](#), 05JUL2016

Researchers in the UK looked at transcripts of a number of conversations from actual Turing tests in which the hidden machine remained silent. In each case, the human judge was unable to say for certain whether they were interacting with a person or a machine. They argue that if an entity can pass the test by remaining silent, this cannot be seen as an indication it is a thinking entity, therefore, they conclude that 'taking the Fifth' fleshes out a serious flaw in the Turing test. [TECHNICAL ARTICLE](#)

Tags: [Autonomous systems & robotics](#), [Artificial intelligence](#)

[Video Friday: Pneumatic RoboDog, Drone Crash, and Nao With Eyebrows](#)

IEEE Spectrum, 01JUL2016

Stefanie Tellex from Brown gave a talk at Microsoft Research about human-robot collaboration. If you've ever collaborated with a robot there's some interesting stuff here.

Tags: Autonomous systems & robotics

[AI Is Learning to See the World—But Not the Way Humans Do](#)

MIT Technology Review, 30JUN2016

The AI and human, both looking at the same image, both being asked the same question arrive at the same conclusions using different visual features. Unsupervised learning systems that ingest content from video and images to learn what human faces and everyday objects look like, without any human intervention shun supervised learning, instead learn to recognize statistical patterns in images to teach itself what edges, textures, and other features should look like. It is perhaps even less likely that the knowledge of the AI will be generated through a process aping that of a human. Once inspired by human brains, AI may beat us by simply being itself.

Tags: Autonomous systems & robotics, Artificial intelligence

BIOTECHNOLOGY

[Biological Cells Form Electric Circuits](#)

American Physical Society Focus, 01JUL2016

Researchers have previously engineered cells to create an artificial tissue capable of producing coordinated electrical activity. Now researchers at Harvard University have added the ability to monitor their electrical state by detecting fluorescent emission. They have also fashioned the cells into “living circuits” that might act as model systems for studying heart behavior. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Biotechnology

[Tiny DNA ‘legs’ walk with record fuel efficiency](#)

PhysOrg.com, 30JUN2016

Researchers in Singapore have demonstrated a DNA nanomotor that can “walk” along a track with sustainable motion, illustrating how purely physical effects can enable the efficient harvest of chemical energy at the single-molecule level. By operating on chemical energy, the new motor functions completely differently than any macroscopic motor, and brings researchers a step closer to replicating the highly efficient biomotors that transport cargo in living cells. [TECHNICAL ARTICLE](#)

Tags: Biotechnology

CYBER SECURITY

[How “Fansmitter” Malware Steals Data from Air-Gapped Computers](#)

MIT Technology Review, 30JUN2016

Researchers in Israel have found another way called “fansmitter” to hack air-gapped computers. The basis of their approach is that changing a computer's fan speed produces an audio signal that can be hijacked to steal data. They have created malware that alters the rotation speed, and hence sound, of a computer fan to encode data. The malware transmits information using a special protocol. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Cyber security

[Internet attacks: Finding better intrusion detection](#)

Science Daily, 28JUN2016

Researchers in the Netherlands propose a ‘flow based’ approach: it looks at the data flow from a higher level and detects patterns. The major advantage is that this detection method can take place at a central spot, and can be scaled up easily if the number of devices connected to this router grows rapidly. The analysis is further narrowed by zooming in on attacks that have effect. In tests, the method proved to be effective, and reduced the number of incidents, with detection accuracy up to 100%—depending on the actual application and the type of network.

Tags: Cyber security

ENERGY

[Li-ion rechargeable batteries that last longer, re-charge more rapidly](#)

PhysOrg.com, 04JUL2016

Researchers in Switzerland checked existing battery components with a view to fully exploit their potential. Simply by optimizing the graphite anode—or negative electrode—on a conventional Li-ion battery, they were able to boost battery performance and enhance storage capacity by a factor of up to 3. The procedure is scalable in size, so the use of rechargeable batteries will be optimized in all areas of application—whether in wrist-watches, smartphones, laptops or cars. Battery storage capacity will be significantly extended, and charging times reduced. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

“Science has not yet mastered prophecy. We predict too much for the next year and yet far too little for the next ten.” **NEIL ARMSTRONG**

Charging ahead with nanowire magnesium batteries

Nanowerk, 29JUN2016

Constraints of Li-ion batteries include low power and limited battery life due to dendrites. Magnesium metal does not form dendrites and has a higher volumetric energy density than lithium metal. Using supercomputer modeling to scan for potential cathode material, researchers in Singapore found molybdenum selenide nanowire to be a suitable cathode material for Mg-ion batteries. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

FORECASTING

How we want to live in 2053

PhysOrg.com, 01JUL2016

As part of the “Shaping Future” research project, researchers in Germany have developed an original participatory foresight methodology with which laymen can describe their future technology requirements and share them with scientists. Initial results show that people want to have technologies that improve their mental and physical capabilities, protect their privacy and store and transport emotions. They developed a total of eight technology roadmap blueprints for new research projects or innovative products.

Tags: Forecasting, S&T Germany

IMAGING TECHNOLOGY

Imaging at the speed of light

PhysOrg.com, 01JUL2016

Researchers at Washington University have improved upon a new camera technology that can image at speeds about 100 times faster than today’s commercial cameras while also capturing more image frames. The new technology opens a host of new possibilities for studying extremely fast processes such as neurons firing, chemical reactions, fuel burning or chemicals exploding. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Imaging technology

INFORMATION TECHNOLOGY

Data storage—staying on track

Nanowerk, 29JUN2016

The problem with existing servo systems is the need to minimize the number of servo spokes on a disk as they take up disk space that could otherwise be used to store data. Researchers in Singapore developed a dedicated servo

scheme consisting of two stacked magnetic layers: the top one for data and an underlayer to hold servo information. This means that servo information can be available all the time rather than just when the head is over the servo spokes. The scheme also frees up space on the data layer to hold more information. [TECHNICAL ARTICLE](#)

Tags: Information technology

Scientists suggest a PC to solve complex problems tens of times faster than with massive supercomputers

PhysOrg.com, 29JUN2016

An international team of researchers (Russia, Kazakhstan) has used a personal computer for calculating the scattering of a few quantum particles, representing a quantum mechanical analog of the Newtonian theory of three-body systems which is usually solved using supercomputers. This work is useful for solving a large number of computing tasks in plasma physics, electrodynamics, geophysics and medicine. Researchers in universities that do not have access to supercomputers could use PCs instead. [TECHNICAL ARTICLE](#)

Tags: Information technology

MATERIALS SCIENCE

New discovery could better predict how semiconductors weather abuse

Science Daily, 05JUL2016

Existing methods to determine material stability have been hit or miss. An international team of researchers (USA - Lawrence Berkeley National Laboratory, CalTech, Germany) used carefully selected experimental methods to analyze bismuth vanadate before and after its use, as well as directly under operational conditions. They found an accumulation of light-generated charge at the surface of the film, which led to structural destabilization and chemical attack of the metal oxide semiconductor. The study may spark further improvements in the screening and development of new materials with enhanced stability under operating conditions. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Materials science, Semiconductors

Physicists find missing link between glass formation and crystallization

PhysOrg.com, 01JUL2016

Using a clever combination of light scattering and microscopy, researchers in Germany were able to demonstrate that within a melt of hard spheres, small

compacted regions form comprising a few hundred spheres called precursors. They are the starting point for both crystallization at moderate undercooling and glass formation at large undercooling. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Germany

MICROELECTRONICS

[How We'll Put a Carbon Nanotube Computer in Your Hand](#)

IEEE Spectrum, 30JUN2016

Researchers are pursuing many options to keep integrated electronics on its exponential arc. To get bigger gains, we're left with one option: use novel nanotechnologies to supplant silicon altogether. The most exciting and mature contender by far is the single-walled carbon nanotube.

FEATURED RESOURCE

[Asia Research News](#)

Research SEA is a one-stop centre where journalists and members of the public can gain access to news and local experts from the research world in Asia. [RSS](#) - [Science](#); [Technology](#)

Thanks to the recent improvements in carbon-nanotube fabrication and design—and the fact that the material can actually complement silicon—that goal is becoming more and more realistic.

Tags: Microelectronics

[Low-current, highly integrable spintronics device developed](#)

Science Daily, 30JUN2016

Researchers in Japan have developed a device capable of controlling magnetism at a lower current level than conventional spintronics devices. The new device was fabricated by combining a solid electrolyte with a magnetic material, and enabling insertion/removal of ions into/from the magnetic material through application of voltage. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T Japan

NEUROSCIENCE

[Research team reproduces major functional principles of the brain using technology](#)

PhysOrg.com, 01JUL2016

To track the efficiency of the human brain using technology and to implement its method of operation in artificial neural networks, researchers in Germany succeeded in electronically reproducing the principles of how the brain works, namely, storing memory content in

the synapses and the synchronicity of the neural impulses within an electronic circuit. They coupled two oscillators to each other using memristors in their electronic circuit. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

PHOTONICS

[Combining electrons and lasers to create designer beams for materials research](#)

Science Daily, 29JUN2016

Researchers at Lawrence Berkeley National Laboratory have developed an extreme ultraviolet (EUV) probe to measure dynamic behavior of materials on ultrafast timescales. The probe is highly controlled (with respect to polarization, energy spectrum, and pulse shape) and can be used to extract dynamic information on electronic and magnetic properties. Lasers from tabletop systems create these probes by interacting with electrons in parent gas atoms, emitting EUV light. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Photonics, Materials science

QUANTUM SCIENCE

[Bowtie-shaped nanostructures may advance the development of quantum devices](#)

PhysOrg.com, 05JUL2016

Researchers in Israel manufactured two-dimensional bowtie-shaped silver nanoparticles with a gap of about 20 nanometers in the center and dipped them in a solution containing quantum dots. Some of the quantum dots became trapped in the bowtie gaps. Under exposure to light, the trapped dots became sufficiently strongly "coupled" with the bowties. The findings may help quantum computing, quantum information processing, and developing components of quantum devices.

[OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Quantum science

[Quantum fingerprinting surpasses classical limit](#)

PhysOrg.com, 05JUL2016

An international team of researchers (China, USA - MIT) showed that quantum fingerprinting can transmit less information than that required by the classical limit, in some cases up to 84% less, by transmitting only the tiny amount of information that is contained in a quantum fingerprint. The achievement could lead to a wide variety of applications in quantum communications, the development of low-energy communication methods and lead to new tests of the foundations of quantum physics. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Communications technology

A Single-Photon Cheshire Cat—Synopsis**American Physical Society Synopsis, 01JUL2016**

In a quantum Cheshire cat, one property of a particle is present detached from the particle itself. Researchers at the University of Portland have successfully separated a single photon from its polarization. The effect was previously demonstrated with neutrons and also with light in a classical scenario, but the latest experiment uses single photons. The effect might someday improve precision experiments if an unwanted property could be moved away from the property being measured. [TECHNICAL ARTICLE](#)

*Tags: Quantum science***Berkeley Lab prepares for quantum-classical computing future****PhysOrg.com, 01JUL2016**

A team of researchers in the US (UC Berkeley, Lawrence Berkeley National Laboratory) is yoking quantum processors with classical HPC systems into a hybrid computer. They are developing algorithms using classical computing to define the problem. The quantum processor prepares an analog to the problem being studied and gathers classical information about its properties. The classical computer uses that information to determine how close the algorithm is to finding the objective function. The algorithm undergoes multiple iterations until it converges on an answer.

*Tags: Quantum science***'Quantum' bounds not so quantum after all****PhysOrg.com, 01JUL2016**

Researchers in Spain found that the probabilities originating from the detection of wave intensities at the end of the transmission line follow the same distribution as the probabilities of detecting violations of the quantum inequalities. This suggests a future in which quantum technologies are actually built using quantum systems plus classical systems imitating quantum systems. It also raises the question as to whether similar 'quantum' features with potential functionalities can emerge in other supports as complex networks of artificial or biological nature. [OPEN ACCESS TECHNICAL ARTICLE](#)

*Tags: Quantum science***A Bird's Eye View of Circuit Photons****American Physical Society Viewpoint, 30JUN2016**

A team of researchers in the US (Princeton University, Northwestern University) has delivered an attractive solution by developing a technique, called scanning defect microscopy, that determines the number of photons occupying each mode of a 2D microwave circuit. It is this information that would serve as the

fundamental input and output for certain quantum simulations. [OPEN SOURCE TECHNICAL ARTICLE](#)

*Tags: Quantum science***SCIENCE WITHOUT BORDERS****Record speed and accuracy achieved with single-electron pumps****Nanowerk, 05JUL2016**

At present, the definition of the ampere links it to kilogram, and there is no practical method to directly realise the ampere with the accuracy required for present-day electrical measurements. An international team of researchers (Japan, UK) has developed and tested a high-precision small-electrical-current measurement system. The device paves the way towards practical primary standards for electric current. [TECHNICAL ARTICLE](#)

*Tags: Science without borders, Particle physics***Expedition to test new technologies for deep sea deposit exploration****Science Daily, 30JUN2016**

Seafloor hot-springs, or hydrothermal vents, form deposits of minerals rich in copper, zinc, gold, and rare-earth elements, and may prove to be the future resources for these important metals. An international team of researchers (UK, Germany, Norway) will address the massive technical challenges in exploring for sea-floor mineral deposits. The team will test innovative technology to detect deposits and assess their constituent minerals. The robotic drilling rig will bore holes deep-into the deposits to extract samples of the minerals and take readings of the interior conditions.

*Tags: Science without borders, Ocean science***Research News: Editors' Choice****American Physical Society News, 30JUN2016**

A monthly recap of papers selected by the Physics editors.

*Tags: Science without borders***SENSORS****Researchers determine fundamental limits of invisibility cloaks****PhysOrg.com, 05JUL2016**

Researchers at UT Austin have created a quantitative framework that now establishes boundaries on the bandwidth capabilities of electromagnetic cloaks for objects of different sizes and composition. As a result, researchers can calculate the expected optimal performance of invisibility devices before designing and developing a specific cloak for an object of interest. [OPEN ACCESS TECHNICAL ARTICLE](#)

Tags: Sensors

Resonating Drums Made Out of Graphene Could Lead to Better Sensors

IEEE Spectrum, 30JUN2016

An international team of researchers (USA - Cornell University, Finland) fabricated graphene membranes into micrometer-scale drums they call “phonon cavities” that could produce three different frequencies of vibration. They found that it can be stimulated by a voltage to transfer one type of mechanical vibration into another. The researchers believe this capability can lead to new applications in telecommunications where graphene-based mechanical resonators could be used as frequency mixers, used to modulate carrier waves with signals, and used in research labs to study ultra-weak forces. TECHNICAL ARTICLE

Tags: Sensors, Advanced materials

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