



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[SyNAPSE Program Develops Advanced Brain-Inspired Chip](#)

[DARPA News, 07AUG2014](#)

Designed by researchers at

IBM in San Jose, California, under DARPA's [Systems of Neuromorphic Adaptive Plastic Scalable Electronics \(SyNAPSE\)](#) program, the chip is loaded with more than 5 billion transistors and boasts more than 250 million "synapses," or programmable logic points, analogous to the connections between neurons in the brain. That's still orders of magnitude fewer than the number of actual synapses in the brain, but a giant step toward making ultra-high performance, low-power neuro-inspired systems a reality. [TECHNICAL ARTICLE](#)

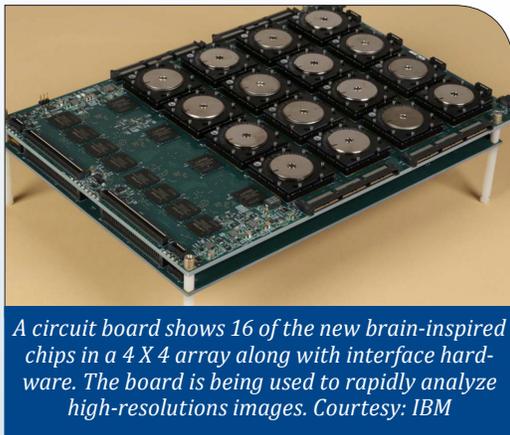
Tags: Microelectronics, Breakthrough technology, Featured Article

[Researchers enable robots to see through solid walls with Wi-Fi \(w/ Video\)](#)

[PhysOrg.com, 06AUG2014](#)

Researchers at UC Santa Barbara have developed a technology which enables robots to see objects and humans behind thick walls through the use of radio frequency signals. It allows users to see the space on the other side and identify not only the presence of occluded objects, but also their position and geometry, without any prior knowledge of the area. Additionally, it has the potential to classify the material type of each occluded object such as human, metal or wood.

Tags: Imaging technology, Featured Article



A circuit board shows 16 of the new brain-inspired chips in a 4 X 4 array along with interface hardware. The board is being used to rapidly analyze high-resolutions images. Courtesy: IBM

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Beyond six nines: Ultra-enriched silicon paves the road to quantum computing](#)

[Nanowerk, 12AUG2014](#)

Using a relatively straightforward technique, researchers at NIST have created what may be the most highly enriched silicon currently being produced. The material is more than 99.9999% pure silicon-28 (^{28}Si), with less than 1 part per million (ppm) of the problematic isotope silicon-29 (^{29}Si). Many quantum computing schemes require isotopically pure silicon. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Government S&T, Materials science

[Graphene-based planar micro-supercapacitors for on-chip energy storage](#)

[Nanowerk, 12AUG2014](#)

In a new overview article an international team of researchers (Germany, China) present the latest advances in on-chip graphene-based planar interdigital Micro-supercapacitors (MSCs). MSCs with a short ion diffusion distance are newly emerging miniaturized high-power microelectrochemical energy-storage devices that can deliver high power density, fast charge and discharge, and a superior cycling lifetime.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Nanocubes get in a twist](#)

[Science Daily, 11AUG2014](#)

An international team of researchers showed that given the right conditions, cube-shaped nanoparticles are able to align into winding helical structures. Their results reveal how nanomaterials can self-assemble into unexpectedly beautiful and complex structures.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Changing Surface Properties in a Flash](#)

[University of Cambridge, 08AUG2014](#)

An international team of researchers (Lebanon, Russia, Germany) proposes a new type of polymer coating that

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they say could change properties in less than a second—faster than any current design. Such quick switching could lead to a variety of uses, such as tiny temperature sensors or medical assays. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Quantum Materials Database accelerates the development of new materials](#)

[Nanowerk, 08AUG2014](#)

Researchers at Northwestern University performed systematic analyses of both known and imagined chemical compounds to find their key properties and established a database of the results. The Open Quantum Materials Database (OQMD) is the largest database in the world of its kind. So far it contains analyses of 285,780 compounds and continues to grow. [OQMD, TECHNICAL ARTICLE](#)

Tags: Advanced materials, Quantum science

[Crumpled graphene boosts performance of high-energy lithium storage materials](#)

[Nanowerk, 06AUG2014](#)

To overcome the intrinsic intercalation/de-intercalation mechanism limitation of lithium-ion batteries, an international team of researchers (USA, China) developed a three-dimensional crumpled graphene-encapsulated nickel sulfide electrode which they report is a superior high-energy lithium storage material. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Energy

[Novel process for creation of fuel and chemical compounds](#)

[Science Daily, 05AUG2014](#)

Researchers at the University of Wisconsin-Madison have identified the genes and enzymes that create a promising compound—the 19 carbon furan-containing fatty acid (19Fu-FA). The compound has a variety of potential uses as a biological alternative for compounds currently derived from fossil fuels. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Energy

[The next graphene?](#)

[EurekaAlert, 05AUG2014](#)

Researchers at UC Riverside are investigating electrical, optical, and thermal phenomena in van der Waals materials, and heterostructures implemented with such materials. The research is expected to produce new material synthesis techniques and enable practical applications of ultra-thin film materials in electronic switches, optical detectors, low-power information processing and direct energy conversion.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

[Multiple UAVs perform autonomous formation flight \(w/ Video\)](#)

[PhysOrg.com, 08AUG2014](#)

In one of the first autonomous demonstrations, the Georgia Tech Research Institute has successfully commanded three fully autonomous, collaborating UAVs. The machines flew in close formation at the same altitude, separated by approximately 50 meters as they executed figure-eight patterns.

Tags: Autonomous systems & robotics

[Robot folds up, walks away](#)

[Harvard University, 07AUG2014](#)

A team of researchers from Harvard University and MIT used little more than paper and Shrinky Dinks to build a robot that assembles itself into a complex shape in four minutes flat, and then crawls away without human intervention. It demonstrates the potential to build, quickly and cheaply, sophisticated machines that interact with the environment, and to automate much of the design and assembly process. [VIDEO](#)

Tags: Autonomous systems & robotics

CYBER SECURITY

[Building Mind-Controlled Gadgets Just Got Easier \(w/video\)](#)

[IEEE Spectrum, 11AUG2014](#)

With the launch of an online store selling brain-computer interface (BCI) gear, a company in the US hopes to unleash a wave of neurotech creativity. Their system enables DIYers to use brain waves to control anything they can hack—a video game, a robot, you name it. And since their technology is open source, the creators hope hackers will also help improve the BCI itself.

Tags: Cyber security, Disruptive technology, Emerging technology

ENERGY

[Pushing the envelope in power electronics](#)

[MIT News, 11AUG2014](#)

Researchers at MIT have a set of interrelated technologies that enable size reductions and efficiency improvements in a broad range of applications, and the techniques they have developed can be applied, or modified and improved for use in a wide range of other applications. Their work focuses on ultrahigh-frequency conversion and ultraminia-turized converters.

Tags: Energy

“Everything must be made as simple as possible. But not simpler.”

ALBERT EINSTEIN

Stacking Cells Could Make Solar as Cheap as Natural Gas

MIT Technology Review, 06AUG2014

Using three key innovations—a cheap, fast way to stack cells, a proprietary way to electrically connect cells, and a new kind of glue for holding the cells together—a company in the US can produce very efficient stacked solar cells quickly and cheaply, opening the door to efficiencies as high as 50 percent. In their design they use tiny individual solar cells, each just a millimeter across. That reduces costs for cooling and also helps improve efficiency.

Tags: Energy, Solar energy

ENVIRONMENTAL SCIENCE

Trapped atmospheric waves triggering more weather extremes: Trend expected to continue

Science Daily, 11AUG2014

An international team of researchers (USA, Germany) reports that the observed change in the magnitude and duration of extreme weather events are linked to the trapping of giant waves in the atmosphere. A new data analysis now shows that such wave-trapping events are indeed on the rise. TECHNICAL ARTICLE

Tags: Environmental science

FORECASTING

US Bots Flagged Ebola Before Outbreak Announced

Pharmaceutical Processing, 12AUG2014

The Ebola outbreak in West Africa is focusing a spotlight on, HealthMap, an online tool that flagged a “mystery hemorrhagic fever” in forested areas of southeastern Guinea nine days before the World Health Organization formally announced the epidemic. HealthMap is operated by a group of 45 researchers, epidemiologists and software developers at Boston Children’s Hospital. It uses algorithms to scour tens of thousands of social media sites, local news, government websites, infectious-disease physicians’ social networks and other sources to detect and track disease outbreaks. [HealthMap Interactive Ebola Tool](#)

Tags: Forecasting, Big Data

IMAGING TECHNOLOGY

Japanese universities develop new world’s fastest camera

PhysOrg.com, 11AUG2014

The camera developed by researchers in Japan is motion-based femtophotography, performing single-shot bursts for

image acquisition, which means it has no need for repetitive measurements. It works via optical mapping of an object’s spatial profile which varies over time. With a frame interval of 4.4 trillion frames per second it is 1000 times as fast as cameras it supersedes. The camera also has a high pixel resolution (450 × 450). TECHNICAL ARTICLE

Tags: Imaging technology, S&T Japan

DARPA explores next-generation imaging radar

Defense Systems, 07AUG2014

In a posting to the FedBizOps site, DARPA announced that the agency is looking for proposals for its Advanced Scanning Technology for Imaging Radars (ASTIR) program. The program is looking to develop technologies to demonstrate new imaging radar architecture.

Tags: Imaging technology, Government S&T, Military technology

INFORMATION TECHNOLOGY

Charging with ultrasound: uBeam has functional prototype

PhysOrg.com, 08AUG2014

A company in the US has developed a fully functional prototype wireless charging platform that uses ultrasound to send electricity to devices through air which can charge portable electronics wirelessly. A thin charging station takes electricity and converts it into sound waves, which are transmitted over ultrasound. A receiver attached to a phone or any other device then catches those sound waves and converts them back into energy.

Tags: Information Technology

Team develops software for automatic summarization of long

PhysOrg.com, 07AUG2014

The direct application of the software developed by researchers in India will be to remove extraneous noise from bulk text allowing more efficient and faster text mining. A significant reduction in text length was achieved. They obtained a precision value of about 0.65, which is significantly better than fuzzy logic summarization software.

Tags: Information Technology

MATERIALS SCIENCE

New findings offer insights into a new class of semiconducting materials

Nanowerk, 12AUG2014

Researchers at the University of Notre Dame report that the photoexcited charges in hybrid perovskites exist in an inherently unbound state, thereby eliminating the additional

continued...

energy loss associated with interfacial charge separation. These results indicate that hybrid perovskites represent a 'best of both worlds' scenario, and have the potential to mitigate the compromise between low-cost and high-performance in light-harvesting devices.

Tags: Materials science

Pairing old technologies with new for next generation electronic devices

[EurekaAlert](#), 10AUG2014

Researchers in the UK show how applying an electric field in a common semiconductor material can dramatically increase the efficiency of the spin-Hall effect which is key for generating and detecting spin from an electrical input. They reported a 40-times-larger effect than previously achieved in semiconductor materials. This demonstrates that future spintronics might not need to rely on expensive, rare, heavy metals for efficiency.

Tags: Materials science, S&T UK

Electrons moving in a magnetic field exhibit strange quantum behavior

[Science Daily](#), 08AUG2014

An international team of researchers (Japan, Austria) has made first direct observations of free-electron Landau states and found that the internal rotational dynamics of quantum electrons is surprisingly different from the classical model, and in line with recent quantum-mechanical predictions. [TECHNICAL ARTICLE](#)

Tags: Materials science

Manipulating magnetic forces with light

[PhysOrg.com](#), 06AUG2014

Researchers in Germany have combined two state-of-the-art methods to calculate ultrarapid magnetism. They found that the magnetic forces could be quickly and effectively manipulated with light. This forms an important link in physics research and also creates possibilities for the further experimental study of magnetic manipulation with light. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Germany

FEATURED RESOURCE

Science Newslines

ScienceNewslines is a news portal targeted at industry, science and educational experts, decision makers, implementers and technical professionals. [RSS](#)

Learning how things fall apart: How bonded materials, from airplane wings to dental crowns, lose their bonding

[Science Daily](#), 04AUG2014

Researchers at MIT have found a way to study bonding failures directly, revealing the crucial role of moisture in setting the stage for failure. When bonded systems are exposed to moisture it initiates new molecules at the interface which interfere with the bonding mechanism. The findings could lead to exploration of new ways to prevent moisture from reaching into the bonded layer.

Tags: Materials science

Which Structure has optimal resistive switching characteristics?

[Science Daily](#), 02AUG2014

Researchers in China fabricated Pt/TiO_x/ZnO/n⁺-Si structures by inserting TiO_x interlayer between Pt top electrode and ZnO thin film for nonvolatile resistive random access memory applications. They investigated the effects of TiO_x interlayer thickness on the resistive switching performance. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T China

MICROELECTRONICS

Future of fast computer chips could be in graphene and not silicon says new research

[Nanowerk](#), 06AUG2014

An international team of researchers (UK, Denmark) used a new material—bilayer graphene—in which two layers of graphene are placed one on top of the other, leaving a small band gap to encourage the transfer of energy between layers. Their results suggest that it could replace silicon transistors in electronic circuits. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Advanced materials

QUANTUM SCIENCE

Quantum-memory imprint discovered in light emission

[Nanowerk](#), 12AUG2014

An international team of researchers (Germany, Russia, USA) investigated optically pumped quantum-dot lasers and demonstrated that pumping induces a quantum memory between the pump excitation and the light emission. This quantum-memory was shown to induce intensity oscillations on top of the expected linear output. Even more striking, these oscillations could be either suppressed or significantly enhanced via the quantum fluctuations of the pump laser. [TECHNICAL ARTICLE](#)

Tags: Quantum science

Quantum simulators explained

Science Daily, 11AUG2014

A review article written by researchers in the UK and Singapore outlines various approaches used in quantum simulators. Specifically, the authors focus on the difference between the purpose of operations referred to as 'simulation' and 'computation.' TECHNICAL ARTICLE

Tags: Quantum science

Ion duet offers tunable module for quantum simulator

Science Daily, 06AUG2014

NIST's ion duet is a component for a flexible quantum simulator that could be scaled up in size and configured to model quantum systems of a complexity that overwhelms traditional computer simulations. Beyond simulation, the duet might also be used to perform logic operations in future quantum computers, or as a quantum-enhanced precision measurement tool.

TECHNICAL ARTICLE

Tags: Quantum science, Government S&T

SCIENCE WITHOUT BORDERS**Water tractor beam: Complex waves generate flow patterns to manipulate floating objects**

Science Daily, 10AUG2014

An international team of researchers (Australia, Israel, Russia) has created a tractor beam on water, providing a radical new technique that could confine oil spills, manipulate floating objects or explain rips at the beach. Advanced particle tracking tools developed by team members revealed that the waves generate currents on the surface of the water. TECHNICAL ARTICLE

Tags: Science without borders

European Space Agency Reaches Verge of Breakthrough Comet Landing

MIT Technology Review, 06AUG2014

Rosetta, European space probe, took these pictures after a series of maneuvers in which it fired thrusters to position itself less than 100 kilometers above the surface of the comet, known as 67P/Churyumov-Gerasimenko. The crucial next step is expected to come in November, when Rosetta will send down a lander to the surface. Scientists hope the lander's explorations will yield clues not only about this particular comet, but also about the role such chunks of rock and ice have played in celestial history.

Tags: Science without borders, S&T EU

SENSORS**Laser identifies explosives from afar**

Nature News, 11AUG2014

Researchers at Texas A&M University report that using Raman scattering lasers can be used to identify chemical powders such as explosives or fertilizers from hundreds of metres away. To boost the weak Raman signal they turned the sample itself into a laser. A fine powder can trap light within its dancing particles, which then scatter the photons. At a critical threshold the signal is exponentially amplified, and the laser light imprinted with the chemical's signature emerges from the sample in all directions.

Tags: Sensors, Explosives ■

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