



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[World's First Quantum Metamaterial Unveiled](#)

[MIT Technology Review, 30SEP2013](#)

Researchers in Germany have designed, built, and tested the first metamaterial made out of superconducting quantum resonators. They accomplished this by minimizing the differences between each quantum circuit so there was less than a 5 per cent difference in the current passing through each and embedding the quantum circuits inside a microwave resonator—a chamber about a wavelength long in which the microwaves become trapped. [TECHNICAL ARTICLE](#)

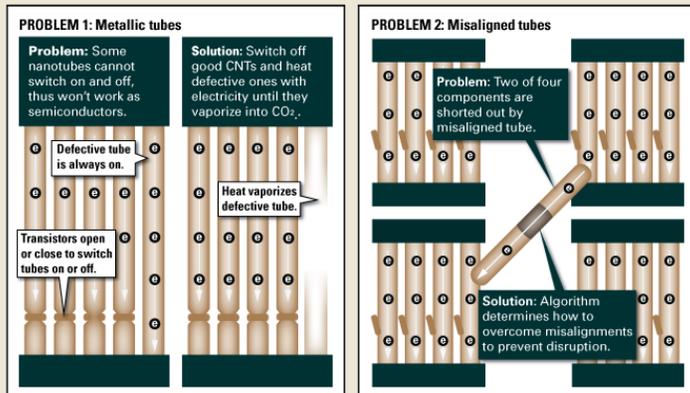
Tags: Quantum science, Advanced materials, S&T Germany, Featured Article

[Engineers Build Computer Using Carbon Nanotube Technology \(CNT\)](#)

[Science Daily, 25SEP2013](#)

How Stanford Team Made World's First Basic Carbon Nanotube Computer

As silicon transistors shrink, they get faster. They also get hotter. Feel the bottom of your laptop. This heat issue could limit the effort to make smaller, faster, cheaper silicon chips. Carbon nanotube (CNT) technology could create fast yet cool electronic circuits. But two obstacles have stood in the way. Some carbon nanotubes become "metallic," meaning they can't be switched on and off, which is the whole purpose of a semiconductor; and some nanotubes become misaligned in ways that can short-circuit CNT-based systems. Here's how Stanford scientists solved both dilemmas to make the first basic computer to use CNT transistors instead of the traditional silicon variety.



SOURCE: Stanford Electrical Engineering/Computer Science, Max Shulaker

Interconnection scheme of phase-change memory (PCM) synapses to reach ultrahigh density and compactness of brain is shown. In the crossbar array architecture, PCM synapses lie between postspike and prespike electrodes, inspired by biological synapses formed between presynaptic and postsynaptic neurons. The cross sections of depressed (mushroom shaped amorphous region shown in red) and potentiated synapses are shown in the schematic. (Image: Duygu Kuzum, Stanford University)

Stanford researchers created a powerful algorithm that maps out a circuit layout that is guaranteed to work no matter whether or where CNTs might be askew. They used this imperfection-immune design to assemble a basic computer with 178 transistors. The CNT computer performed tasks such as counting and number sorting. In a demonstration of its potential, the researchers also showed that the CNT computer could run MIPS.

[TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Information technology, Nanoelectronics, Featured Article

[Seeing Light in a New Light: Scientists Create Never-Before-Seen Form of Matter](#)

[Science Daily, 25SEP2013](#)

MIT and Harvard researchers have managed to coax photons into binding together to form molecules—a state of matter that, until recently, had been purely theoretical. The research demonstrates that interactions between individual quanta is possible so that quantum systems can be switched to perform information processing. [TECHNICAL ARTICLE](#)

Tags: Photonics, Quantum science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[NASA plans first 3D printer space launch in 2014](#)

[BBC News, 30SEP2013](#)

It will be the first time a 3D printer has been used in space to help astronauts manufacture spare parts and tools in zero gravity. It could help reduce the costs of future missions. [More information](#)

Tags: Advanced manufacturing, Government S&T, NASA

continued...

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ADVANCED MATERIALS

Nanotechnology approach to corrosion sensing coatings

Nanowerk, 30SEP2013

Researchers in Portugal have developed an active protective coating which is able to indicate when corrosion processes start under the coatings or in different defects. An important feature of these nanoreactors is that the indicating molecules are not released from the mesoporous nanocarriers, thereby preventing spontaneous leaching and ensuring long service time. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials*

AUTONOMOUS SYSTEMS & ROBOTICS

Professor Develops 'Brain' for Robots

Science Daily, 26SEP2013

A researcher at Missouri University of Science and Technology has developed a new feedback system to remotely control mobile robots. This innovative research will allow robots to operate with minimal supervision and could eventually lead to a robot that can learn or even become autonomous.

Tags: *Autonomous systems & robotics*

BIG DATA

Bringing 'common sense' to text analytics

MIT News, 24SEP2013

Luminoso technology aims to quickly mine and analyze vast quantities of online text and—using a database of world knowledge—quickly identify opinions, patterns and underlying themes in the text. It has this 'backbone' of common sense that allows our technology to spontaneously infer meaning from text.

Tags: *Big data*

BIOTECHNOLOGY

Human on a chip

KurzweilAI, 01OCT2013

Army scientists at the Edgewood Chemical Biological Center (ECBC) and academic collaborators are conducting research on organoids (small swatches of human tissue) on microchips. The research focuses on in vitro human organ constructs (for the heart, liver, lung and the circulatory system) in communication with each other. The goal is to assess the effectiveness and toxicity of drugs in a way that is relevant to humans and their ability to process these drugs.

Tags: *Biotechnology, Government S&T***Engineers Invent Programming Language to Build Synthetic DNA**

Science Daily, 30SEP2013

A team led by the University of Washington has developed a programming language for chemistry that it hopes will streamline efforts to design a network that can guide the

behavior of chemical-reaction mixtures in the same way that embedded electronic controllers guide cars, robots and other devices. [TECHNICAL ARTICLE](#)

Tags: *Biotechnology, Synthetic biology***Novel Technology to Produce Gasoline by a Metabolically-Engineered Microorganism**

Science Daily, 29SEP2013

Researchers in Korea succeeded in producing 580 mg of gasoline per litre of cultured broth by converting in vivo generated fatty acid. [TECHNICAL ARTICLE](#)

Tags: *Biotechnology, Energy, Synthetic biology*

COMMUNICATIONS TECHNOLOGY

Researchers work to squeeze more data from bandwidth in mobile devices

PhysOrg.com, 01OCT2013

Researchers at the University of North Carolina are working to develop a new radio receiver system that will allow small mobile devices to use MIMO technology. The system will include multiple antennas, a reconfigurable circuit, and new signal processing algorithms.

Tags: *Communications Technology***Building disaster-relief phone apps on the fly**

MIT News, 30SEP2013

Researchers at MIT and Qatar have developed new tools that allow people with minimal programming skill to rapidly build cellphone applications that can help with disaster relief. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology***Spirals of Light May Lead to Better Electronics**

Science Daily, 26SEP2013

Researchers from Caltech have created the optical equivalent of a tuning fork—a device that can help steady the electrical currents needed to power high-end electronics and stabilize the signals of high-quality lasers. The device miniaturized to fit on a chip may pave the way to improvements in high-speed communications, navigation, and remote sensing. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology***Establishing basic formulas for squeezing wireless energy from radio frequency systems**

PhysOrg.com, 25SEP2013

To squeeze the maximum power from an RF source, circuit designers have to repeat a process of rectifier topology implementation and element parameter optimization for each system. Researchers in Japan have established a set of mathematical formulas that can characterize RF diode rectifiers which opens up a clear vista for circuit designers in RF power electronics. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology, S&T Japan**continued...*

“Be a yardstick of quality. Some people aren’t used to an environment where excellence is expected.” STEVE JOBS

CYBER SECURITY

UK to create new cyber defence force

BBC News, 29SEP2013

The Ministry of Defence is set to recruit hundreds of reservists as computer experts to work alongside regular forces in the creation of the new Joint Cyber Reserve Unit. The role of the unit is to protect computer networks and safeguard vital data.

Tags: Cyber security, S&T Policy

Kaspersky Lab exposes “Icefog:” a new cyber-espionage campaign focusing on supply chain attacks

Kaspersky Forum, 26SEP2013

The new report describes “Icefog”, a small yet energetic APT group that focuses on targets in South Korea and Japan, hitting the supply chain for Western companies. The operation started in 2011 and has increased in size and scope over the last few years. REPORT

Tags: Cyber security

ENERGY

Nanotechnology researchers fabricate foldable Li-ion batteries

Nanowerk Spotlight, 01OCT2013

Researchers at Arizona State University have shown that paper-folding concepts can be applied to Li-ion batteries in order to realize a device with higher areal energy densities. Together with the development of paper-based foldable electronics and foldable displays, foldable batteries are important for integration of the power source and other components into a single, entirely foldable device.

TECHNICAL ARTICLE

Tags: Energy, Advanced materials, Battery

Improving Lithium-Ion Batteries With Nanoscale Research

Science Daily, 30SEP2013

Researchers at the University of California, San Diego, created nanowires that block diffusion of lithium across their silicon surface and promote layer-by-layer axial lithiation of the nanowire’s germanium core. This work could lead to tailored volume expansion of lithium ion battery electrodes which could potentially minimize their cracking, improve their durability, and different electrode architectures. TECHNICAL ARTICLE

Tags: Energy, Battery

Wormlike Hematite Photoanode Breaks the World-Record for Solar Hydrogen Production Efficiency

Science Daily, 25SEP2013

Researchers in Korea have developed a “wormlike” hematite photoanode that can convert sunlight and water to clean hydrogen energy with a record-breaking high efficiency of 5.3%. TECHNICAL ARTICLE

Tags: Energy, Solar energy

How to store electrical energy as heat

Physics World, 24SEP2013

An idealized model for a system that would store large amounts of electrical energy by heating a tank of fluid has been developed by a physicist in Germany. The model is based on the concept of pumped heat electricity storage (PHES). This latest research could help boost both the energy and cost efficiencies of these storage systems.

TECHNICAL ARTICLE

Tags: Energy, S&T Germany, Solar energy

ENVIRONMENTAL SCIENCE

Lunar Orbiters Discover Source of Space Weather Near Earth

Science Daily, 26SEP2013

Researchers from the US, Austria and Japan report that they have measured the release of magnetic energy close up using an unprecedented alignment of six Earth-orbiting spacecraft and NASA’s first dual lunar orbiter mission, ARTEMIS. “Space weather” near Earth is known to cause hazards ranging from interference with communications systems and GPS errors to extensive power blackouts and the complete failure of critical satellites. TECHNICAL ARTICLE

ARTICLE

Tags: Environmental science

IMAGING TECHNOLOGY

New speech recognition model: Hidden Conditional Neural Fields

PhysOrg.com, 25SEP2013

The speech recognition model proposed by researchers in Japan has the discriminative property for sequences from HCRF (Hidden Conditional Neural Fields) and the ability to extract non-linear features from an MLP (Multi-Layer Perceptron). Furthermore, the HCNF can incorporate many types of features from non-linear features and is trained by sequential criteria. TECHNICAL ARTICLE

Tags: Imaging technology, Pattern recognition, S&T Japan

MATERIALS SCIENCE

3-D Models of Electrical Streamers

Science Daily, 27SEP2013

In dielectrics, streamers can cause catastrophic damage to electrical equipment, harm the surrounding environment, and lead to large-scale power outages. Researchers at MIT have developed an accurate 3-D model of streamer propagation that qualitatively and quantitatively describes the streamer development, an advance that may impact applications such as power transmission, atmospheric sensing, natural sciences, sensing technologies and large-scale industry. [TECHNICAL ARTICLE](#)

Tags: *Materials science*

FEATURED RESOURCE

Asia Research News

ResearchSEA 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](#)**How to Make Ceramics That Bend Without Breaking: Self-Deploying Medical Devices?**

Science Daily, 26SEP2013

A team of researchers (USA, Singapore) has developed a way of making minuscule ceramic objects that are not only flexible, but also have a “memory” for shape: when bent and then heated, they return to their original shapes. The material could be an important tool for those developing micro- and nanodevices, for biomedical applications.

[TECHNICAL ARTICLE](#)Tags: *Materials science***New Energy Storage Capabilities Between the Layers of Two-Dimensional Materials**

Science Daily, 26SEP2013

Researchers from the US and France discovered atomically thin, two-dimensional materials, “MXenes”, similar to graphene, that have good electrical conductivity and a surface that is hydrophilic. They report that two-dimensional, titanium carbide MXene electrodes show excellent volumetric super capacitance of up to 350 F/cm³ due to intercalation of cations between its layers. This capacity is significantly higher than what is currently possible with porous carbon electrodes. [TECHNICAL ARTICLE](#)

Tags: *Materials science, Energy***Water Glides Freely Across ‘Nanodrapes’ Made from the World’s Thinnest Material**

Science Daily, 26SEP2013

Researchers at Rensselaer Polytechnic Institute demonstrated how droplets of water encounter significantly

less friction when moving across a surface covered with a nanodrape. This innovation holds the potential to benefit lab-on-chip devices, high-throughput assays, and self-cleaning surfaces. [TECHNICAL ARTICLE](#)

Tags: *Materials science***Turning Plastic Bags Into High-Tech Materials**

Science Daily, 25SEP2013

Researchers in Australia have developed an innovative nanotechnology which uses non-biodegradable plastic grocery bags to make ‘carbon nanotube membranes’ with a variety of potential advanced applications including filtration, sensing, energy storage and a range of biomedical innovations. [TECHNICAL ARTICLE](#)

Tags: *Materials science, Energy, Environment, Nanotechnology*

MICROELECTRONICS

The Tunneling Transistor

IEEE Spectrum, 30SEP2013

Researchers at Penn State and the University of Notre Dame have shown higher currents in TFETs made from a mix of aluminum gallium antimonide and indium arsenide. This enables creation of tunnel junctions that have a natural overlap between bands, which means less voltage is needed to turn them on. And because the barrier can be quite thin—just a single atom or so wide—they permit more current.

Tags: *Microelectronics***Accelerator On a Chip: Technology Could Spawn New Generations of Smaller, Less Expensive Devices for Science, Medicine**

Science Daily, 27SEP2013

Researchers at the SLAC National Accelerator Laboratory and Stanford University used a laser to accelerate electrons at a rate 10 times higher than conventional technology in a nanostructured glass chip smaller than a grain of rice.

[TECHNICAL ARTICLE](#)Tags: *Microelectronics*

PHOTONICS

Trapping light by mimicking gravitational lensing

Nature Photonics, 29SEP2013

A team of researchers from the USA and China propose to mimic curved spacetimes caused by gravity, with high precision by utilizing a microstructured optical waveguide around a microsphere. They experimentally demonstrate both far-field gravitational lensing effects and the critical phenomenon in close proximity to the photon sphere of astrophysical objects under hydrostatic equilibrium.

Tags: *Photonics*

QUANTUM SCIENCE

[Superfast Switching of Quantum Light Sources](#)

Science Daily, 27SEP2013

Researchers in the US and France have shown that a light source can be coaxed to emit light at a desired moment in time, within an ultrashort burst. The superfast switching of a light source has applications in fast stroboscopes without laser speckle, in the precise control of quantum systems and for ultrasecure communication using quantum cryptography. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Headway Towards Quantum Information Transfer Via Nanomechanical Coupling](#)

Science Daily, 23SEP2013

Researchers at UC Santa Barbara demonstrated that a nanomechanical transducer is an effective conduit for translating electrical signals (microwaves) into light (photons). Operating the device at the single phonon limit, the scientists were able to generate coherent interactions between electrical signals, very high frequency mechanical vibrations, and optical signals. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Communications Technology

SENSORS

[Developing unique origami-shaped antennas](#)

PhysOrg.com, 01OCT2013

Researchers at Georgia Tech are working to develop a unique approach to making extremely compact and highly efficient antennas and electronics. The new technology will use principles derived from origami paper-folding techniques to create complex structures that can reconfigure themselves by unfolding, moving and even twisting in response to incoming electromagnetic signals.

Tags: Sensors

[NIST unveils prototype video imaging system for remote detection of hidden threats](#)

EurekAlert, 30SEP2013

By adapting superconducting technology used in advanced telescope cameras, researchers at NIST have built a prototype video imaging system for detecting hidden weapons and other threats at distances up to 28 meters away. [VIDEO](#)

Tags: Sensors, Government S&T

[Tiny Sensor Used in Smart Phones Could Create Urban Seismic Network](#)

Science Daily, 29SEP2013

According to researchers in Italy a tiny chip used in smart phones to adjust the orientation of the screen could serve to create a real-time urban seismic network, easily increasing the amount of strong motion data collected during a large earthquake.

Tags: Sensors, S&T Italy

[NASA tests space radar for finding buried victims](#)

PhysOrg.com, 25SEP2013

A portable radar device FINDER (Finding Individuals for Disaster and Emergency Response) can locate people as many as 30 feet (nine meters) under crushed materials. It uses advanced algorithms to "isolate the tiny signals from a person's moving chest by filtering out other signals, such as those from moving trees and animals. A similar technology is used by NASA's Deep Space Network to locate spacecraft.

Tags: Sensors, Government S&T, NASA ■

RFI ANNOUNCEMENT

[IARPA RFI #13-06](#)

The Intelligence Advanced Research Projects Activity (IARPA) is seeking information on methods for analyzing scientific and technical (S&T) activities, investments, and developments, and for forecasting S&T trends and milestones. IARPA RFI #13-06 is open from 27 September 2013 through 25 October 2013. Details are at http://www.iarpa.gov/RFI/rfi_sti.html.

Additionally, SciCast, the world's largest prediction market for science & technology, is now open for registration at <http://scicast.org>.

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