Volume 4, Issue 50 ■ 12DEC2014

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

"Nanobuds" Could Turn Almost Any Surface Into a Touch Sensor

MIT Technology Review, 08DEC2014

A flexible film of made of plastic and carbon nanotubes could bring touch screens to new applications.

Making carbon nanotubes films conventionally is a complex process that requires costly purification steps that can sometimes damage the nanotubes. A process developed by researchers in Finland starts with carbon-containing gases, which are converted directly into nanobuds and deposited to make a transparent film in one step, without the need for purification. The nanobud films can stretch by more than 200 percent without losing much performance.

Tags: Materials science, Flexible electronics, Featured Article

Superconductivity without cooling

PhysOrg.com, 04DEC2014

With the aid of short infrared laser pulses, scientists have succeeded for the first time in making a ceramic superconducting at room temperature—albeit for only a few millionths of a microsecond. Now an international team of researchers (Germany, France, Switzerland, USA, UK) believes that laser pulses cause individual atoms in the crystal lattice to shift briefly and thus enhance the superconductivity. TECHNICAL ARTICLE

Tags: Materials science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Researchers looking to 4-D printing to create biosensors from edible gels

PhysOrg.com, 08DEC2014

Traditionally, objects printed with 3D printers are hard. Researchers in Australia want to take the technology further, into the 4D realm, which is where objects that are printed change shape after the printing is complete. They believe that combining gels that are already eaten by people, such as those made using gelatin or other foods that jiggle, such as puddings, could lead to the creation of gels that could serve as a biosensor.

Tags: Advanced manufacturing, S&T Australia

ADVANCED MATERIALS

Unusual electronic state found in new class of unconventional superconductors

Nanowerk, 08DEC2014

An international team of researchers (USA, Japan) describe an unexpected connection between a new group of titanium-oxypnictide superconductors and the more familiar cuprates and iron-pnictides, providing scientists with a whole new family of materials from which they can gain deeper insights into the mysteries of high-temperature superconductivity.

Tags: Advanced materials

Broadband and ultrathin polarization manipulators developed

PhysOrg.com, 04DEC2014

Researchers in South Korea arranged and connected helical metamaterials that are smaller than the wavelength of light. They verified that broadband polarized rotational 3D metamaterials were found to be rotating the polarized microwave within the range of 0.1 GHz to 40GHz by 45 degrees regardless of its frequency. The technology has applications in ultra-shallow broadband optical devices. TECHNICAL ARTICLE

Tags: Advanced materials

continued...

BACK TO TOP

AUTONOMOUS SYSTEMS & ROBOTICS

Researchers design a Mars rover that can choose its own paths

EU Research, 08DEC2014

An international team of researchers working on the EU funded project PRoViScout experimented with a rover called Idris on the Spanish island of Tenerife in September 2012. The test-run demonstrated that the vehicle's on-board camera system could scan the terrain for hazards, pinpoint objects to study, decide which pictures to take and which to transmit back to Earth, as well as which trajectory to follow – all without receiving any instructions.

Tags: Autonomous systems & robotics, Artificial intelligence, Space technology

Video Friday: Terrible Robots, Dash vs. Dog, and the Age of Machine Consciousness

IEEE Spectrum, 05DEC2014

The DelFly Explorer flapping-wing micro-UAV has learned to use onboard vision to localize and escape from a room through a window.

Tags: Autonomous systems & robotics

BIG DATA

Big Data infrastructure for science

PhysOrg.com, 05DEC2014

A new project called SciServer, led by Johns Hopkins University, is supported by NSF and set to launch in phases over the next four years. SciServer will deliver significant benefits to the scientific community by extending the infrastructure developed earlier for Sloan Digital Sky Survey. TECHNICAL ARTICLE

Tags: Big data

BIOTECHNOLOGY

Solid-state proteins maximize the intensity of fluorescent-protein-based lasers

Nanowerk, 08DEC2014

Through millions of years of biological evolution, Nature optimized fluorescent proteins for maximal brightness. An international team of researchers (USA, UK) has shown that use of fluorescent proteins in solid form rather than in solution greatly increases the intensity of light produced. They have harnessed this property to develop several miniature solid-state lasers. The discovery can guide the design of future, more efficient synthetic materials. TECHNICAL ARTICLE

Tags: Biotechnology, Photonics

COMMUNICATIONS TECHNOLOGY

Navy's nano-satellites could boost tactical communications

Defense Systems, 08DEC2014

The Navy is developing a low-cost nano-satellite called the Integrated Communications Extension Capability, or ICE-Cap, that would be less than a foot long and weigh less than 25 pounds. ICE-Cap would catch a ride on a larger satellite that has room for it, then be shot into its own orbit from a spring-loaded canister.

Tags: Communications Technology, Government S&T, Satellite technology

Powering space craft of the future

Science Daily, 08DEC2014

Researchers in the UK are working on a project to maximise 'energy harvesting' on a space craft of the future. They will look at how mechanical energy generated by the vibration of the aircraft's wings can be transferred, stored and used to support the communications system.

Tags: Communications Technology, S&T UK, Space technology

The first broadband amplifier using vertical inductors

PhysOrg.com, 05DEC2014

The vertical inductor, designed by researchers in Germany, has been compared with three different octagonal inductors, and the vertical inductor featured the highest inductance per unit area. The same vertical inductor implemented in a differential broadband amplifier increased the bandwidth by 25%. TECHNICAL ARTICLE

Tags: Communications Technology, S&T Germany

ENERGY

World record for compact 'tabletop' particle accelerator

PhysOrg.com, 08DEC2014

Researchers at the DOE's Lawrence Berkeley National Laboratory sped up the electrons inside a nine-centimeter long tube of plasma. The speed corresponded to an energy of 4.25 giga-electron volts. The acceleration over such a short distance corresponds to an energy gradient 1000 times greater than traditional particle accelerators and marks a world record energy for laser-plasma accelerators. TECHNICAL ARTICLE

Tags: Energy, Government S&T, Particle physics

continued...

"We are trying to prove ourselves wrong as quickly as possible, because only in that way can we find progress." RICHARD FEYNMAN

In world first, researchers convert sunlight to electricity with over 40 percent efficiency

Science Daily, 07DEC2014

Researchers in Australia used a custom optical bandpass filter to capture sunlight that is normally wasted by commercial solar cells on towers and convert it to electricity at a higher efficiency than the solar cells themselves ever could.

Tags: Energy, S&T Australia

New technique offers spray-on solar power

Science Daily, 05DEC2014

Researchers in Canada have invented a new way to spray solar cells onto flexible surfaces using miniscule light-sensitive materials known as colloidal quantum dots (CQDs)—a major step toward making spray-on solar cells easy and cheap to manufacture. TECHNICAL ARTICLE 1, 2, 3

Tags: Energy, S&T Canada

Small engine packs a punch

MIT News, 05DEC2014

Researchers in the USA have developed a rotary internal combustion engine that is significantly smaller, lighter, and quieter, as well as 20 percent more fuel-efficient than the ICEs used in many such small-engine devices. This 70 cubic-centimeter engine, the X Mini, produces about 3.5 horsepower at 10,000 RPM and weighs 4 pounds. When fully complete the X Mini could churn out about 5 horsepower at 15,000 revolutions per minute, and weigh 3 pounds.

Tags: Energy

IMAGING TECHNOLOGY

Finger vein authentication technology for smooth and accurate walkthrough-style personal verification

PhysOrg.com, 08DEC2014

The technology, developed by researchers in Japan, captures a clear finger vein image by automatically controlling the lighting to illuminate the fingers from optimal positions regardless of the position or orientation of fingers presented. Further, by combining the vein pattern from several fingers, an even higher level of verification accuracy was obtained compared to illuminating just one finger.

Tags: Imaging technology, Biometrics, S&T Japan, Sensors

World's fastest 2-D camera, 100 billion frames per second, may enable new scientific discoveries

Science Daily, 03DEC2014

Using a technique called compressed ultrafast photography (CUP), researchers at Washington University have made movies of the images they took with single laser shots of four physical phenomena: laser pulse reflection, refraction, faster-than light propagation, and photon racing in two media. Ultrafast cameras have the potential to greatly enhance our understanding of very fast biological interactions and chemical processes and allow us to build better models of complex, dynamical systems. TECHNICAL ARTICLE

Tags: Imaging technology

INFORMATION TECHNOLOGY

Researchers transfer 65 terabytes of data in under just 100 minutes

PhysOrg.com, 04DEC2014

This achievement by researchers at DOE's Argonne National Laboratory required combining the embedded file system and virtual machine capabilities of the DDN storage controller, the high-speed wide-area data transfer capabilities of the Globus GridFTP server, and an advanced 100G wide-area network. The team expects that the approach can be used to achieve a 100+ Gbps wide-area transfer rate between storage systems.

Tags: Information Technology, Government S&T

UKtech50 2014 — The most influential people in UK IT

Computer Weekly, 03DEC2014

An expert judging panel representing every aspect of the IT profession helped decide the results, along with a reader vote, to determine who holds the most influence over the future of the UK IT sector in the next 12 months – and hence the future of IT professionals across the country.

Tags: Information Technology, Forecasting, S&T UK

MATERIALS SCIENCE

Landmark discovery in gold nanorod instability

Nanowerk, 08DEC2014

Researchers in Australia have shown that the reshaping mechanism for nanoparticles below melting point is surface atom diffusion, rather than melting. This is

continued...

important, for example, for solar panel manufacturers as the more needle-like these nanoparticles are shaped the less stable they become. If you put these particles into a solar panel to concentrate light they may not last long in the sun before they degrade. TECHNICAL ARTICLE

Tags: Materials science, S&T Australia

Finding the Achilles' heel of GaN-based LEDs in harsh radiation environments

EurekAlert, 07DEC2014

Researchers in Japan have discovered that proton irradiation of gallium nitride causes more damage in p-type material than n- doped layers. This unexpected finding is important for the application of GaN-based devices in extreme environments.

Tags: Materials science, S&T Japan

Featured Resource

Futurity

Futurity features the latest discoveries by scientists at top research universities in the US, UK, Canada, and Australia.

45-year physics mystery shows a path to quantum transistors

PhysOrg.com, 05DEC2014

Using torque magnetometry, researchers at the University of Michigan provide the first direct evidence that samarium hexaboride is a topological insulator. Their technique also showed that the surface of samarium hexaboride holds rare Dirac electrons, particles with the potential to help researchers overcome one of the biggest hurdles in quantum computing.

Tags: Materials science, Quantum science

A new look at the finer details of rust show an assumed atomic structure has been wrong all along

Science Daily, 04DEC2014

An international team of researchers (Austria, Germany) has shown that the surface of Fe_3O_4 is not Fe_3O_4 at all, but rather $Fe_{11}O_{16}$. The most surprising property of the magnetite surface is that single atoms placed on the surface stay perfectly in place instead of balling up and forming a nanoparticle. Because materials interact with their environment through the surface, it's really important to understand the structure of the surface and why it forms. TECHNICAL ARTICLE

Tags: Materials science

NEUROSCIENCE

Eleven maps for eleven rooms: Probing the brain's extensive capacity for storing memories

Science Daily, 08DEC2014

According to an international team of researchers (Norway, Czech Republic, Italy) their findings help explain a specific memory trick called "the method of loci" which involves making a connection between things that you want to remember and places that you know quite well. Their paper shows that rats (and most likely humans) have a map for each individual place. We have so many different maps so we can remember many similar places without mixing them up. TECHNICAL ARTICLE

Tags: Neuroscience

Mimicking the Brain

American Physical Society Spotlight, 01DEC2014

Researchers at Harvard University have now demonstrated neuromimetic circuits that replicate the plasticity of synapses. Their schemes are able to simulate a variety of neural processes: learning, unlearning, and storing memories. TECHNICAL ARTICLE

Tags: Neuroscience, Artificial intelligence

S&T POLICY

China develops new rocket for manned moon mission

PhysOrg.com, 08DEC2014

The first launch of the Long March-9 will take place around 2028. It will carry a load of 130 tonnes. The military-run project has plans for a permanent orbiting station by 2020 and eventually to send a human to the moon. The rocket will also be used for deep space exploration projects.

Tags: S&T policy, S&T China, Space technology

New research will help robots know their limits

PhysOrg.com, 08DEC2014

A consortium of universities in the UK has set up a project to address concerns that might arise around new technologies and link new developments to existing industrial standards and responsible innovation frameworks. The goal is to develop formal verification techniques for tackling questions of safety, ethics, legality and reliability across a range of autonomous systems.

Tags: S&T policy, S&T UK

SCIENCE WITHOUT BORDERS

Turns Out the Dot-Com Bust's Worst Flops Were Actually Fantastic Ideas

Wired, 08DEC2014

The bust was so big and so widespread, there are so many deliciously ideal symbols for this dark time in the history of the internet, a period when irrational exuberance trumped

continued...

sound business decisions. Fifteen years on, people—particularly people in Silicon Valley—still talk about these epic failures. The irony is that nowadays, they're all very good ideas.

Tags: Science without borders

MIT Technology Review Special Edition: Best In Tech

MIT Technology Review, 05DEC2014

In this special edition, The Best in Tech, we showcase our 2014 lists of 50 Smartest Companies, 10 Breakthrough Technologies and Innovators Under 35. Register for a free download.

Tags: Science without borders

The ever-smaller future of physics

Harvard University, 05DEC2014

If physicists want to find their long-sought "theory of everything," they have to get small. Nobel Prize-winning theoretical physicist Steven Weinberg thinks that the answers to fundamental questions will reveal themselves at around a million billionths of the radius of the typical atomic nucleus.

Tags: Science without borders

Thousands of Einstein Documents Are Now a Click Away

New York Times, 04DEC2014

The Princeton University Press and the Hebrew University of Jerusalem have been engaged in a mammoth effort to study some 80,000 documents he left behind. Starting on Friday, 12/5/2014, when Digital Einstein is introduced, anyone with an Internet connection will be able to share in the letters, papers, postcards, notebooks and diaries that Einstein left scattered in Princeton and in other archives, attics and shoeboxes around the world when he died in 1955.

Tags: Science without borders

SENSORS

Diamond Magnetometer Breaks Sensitivity Records

MIT Technology Review, 06DEC2014

An international team of researchers (Germany, Japan) used the spectra from nitrogen atoms embedded in diamond to build perhaps the most sensitive magnetometer ever made. They say their new device could soon be capable of measuring the magnetic field associated with protons. TECHNICAL ARTICLE

Tags: Sensors

Smaller lidars could allow UAVs to conduct underwater scans

PhysOrg.com, 04DEC2014

Researchers at the Georgia Tech Research Institute have designed a new approach that could lead to bathymetric lidars that are much smaller and more efficient than the current full-size systems. Advanced capabilities could support a range of military uses such as anti-mine and anti-submarine intelligence and nautical charting, as well as civilian mapping tasks. It could probe forested areas to detect objects under thick canopies.

Tags: Sensors ■

About This Publication

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To **SUBSCRIBE** or **UNSUBSCRIBE**, visit https://tin-ly.sainc.com/ASDRE. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com. This publication is authored and distributed by:

Kristopher Gardner
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
OTI Corporate Librarian