Advanced manufacturing (1)
Advanced materials (3)
Autonomous systems & robotics (1)
Communications technology (2)

Feature Articles

Historic Demonstration Proves Laser Communication Possible
NASA News, 28OCT2013

Compared to the days of dial-up, today’s web-sites load at lightning speed. Just like you need web-pages to load quickly and securely, NASA scientists and engineers want the same quick connectivity with their data-gathering spacecraft. To meet these demands NASA is moving away from their form of dial-up (radio frequency-based communication) to their own version of high-speed Internet; using laser communications.

In the early morning hours of Oct. 18, NASA's Lunar Laser Communication Demonstration (LLCD) made history, transmitting data from lunar orbit to Earth at a rate of 622 Megabits-per-second (Mbps). That download rate is more than six times faster than previous state-of-the-art radio systems flown to the moon. The LLCD system was designed, built and being operated by the MIT/LL team in Lexington, Mass. MORE ABOUT LLCD Tags: Communications Technology, Government S&T, Featured Article

New Material for Quantum Computing Discovered out of the Blue
Science Daily, 27OCT2013

Researchers from the London Centre for Nanotechnology at UCL and the University of British Columbia have shown that the electrons in the pigment, copper phthalo-cyanine (CuPc), which is similar to the light harvesting section of the chlorophyll molecule CuPc can remain in ‘superposition’ for surprisingly long times. This simple dye molecule has potential as a medium for quantum technologies.

Tags: Quantum science, Materials science, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Using genetic algorithms to discover new nanostructured materials
Nanowerk, 28OCT2013
Researchers at Columbia University and Brookhaven Laboratory have developed an inverse design framework using genetic algorithms. The study could help speed up the materials discovery process. It also shows the potential of machine learning and ‘big data’ approaches. TECHNICAL ARTICLE Tags: Advanced manufacturing, Government S&T

ADVANCED MATERIALS

Making complex nanoparticles easily reproducible
Nanowerk, 28OCT2013
Researchers at Case Western Reserve University are working to streamline manufacturing and assembly for two-sided nanoparticles. Two sided particles applications range from medicine, photonics, to data storage.
Tags: Advanced materials

Persuading Light to Mix It Up With Matter
Science Daily, 24OCT2013
Researchers at MIT have succeeded in producing and measuring a coupling of photons and electrons on the surface of a topological insulator. The researchers suggest that this finding could lead to the creation of materials whose electronic properties could be “tuned” in real time simply by shining precise laser beams at them. TECHNICAL ARTICLE Tags: Advanced materials

Researchers Advance Scheme to Design Seamless Integrated Circuits Etched On Graphene
Science Daily, 22OCT2013
Researchers at UC Santa Barbara have introduced and modeled an integrated circuit design scheme in which transistors and interconnects are monolithically patterned seamlessly on a sheet of graphene. The demonstration continued...
offers possibilities for ultra energy-efficient, flexible, and transparent electronics. TECHNICAL ARTICLE
Tags: Advanced materials, Flexible electronics

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Robokind on Kickstarter, Atlas Breaks an Ankle, and FirstLook Gets Armed
IEEE Spectrum, 25OCT2013
Last week, DARPA hosted a public presentation day for all the Track A and Track B/C teams that’ll be competing in the DRC this December. Not all of those presentations have been put online (yet), but here’s one from Team DRC-Hubo.
Tags: Autonomous systems & robotics

COMMUNICATIONS TECHNOLOGY

The Clever Circuit That Doubles Bandwidth
MIT Technology Review, 28OCT2013
Kumu Networks, a startup spun out of Stanford, says it has solved an age-old problem in radio communications with a new circuit and algorithm that allow data to be sent and received on the same radio frequency—thus doubling wireless capacity, at least in theory. The underlying technology, known as full-duplex radio, tackles a problem known as “self-interference.” TECHNICAL ARTICLE
Tags: Communications Technology

ENERGY

Scientists’ New Approach Improves Efficiency of Solar Cells
Science Daily, 25OCT2013
The new approach developed by an international team (UK, Belgium, China) achieves highly efficient broad-band light trapping in thin films in order to maximise absorption and electricity generation. TECHNICAL ARTICLE
Tags: Energy, S&T UK, Solar energy

Inexpensive Material Boosts Battery Capacity
Science Daily, 24OCT2013
Researchers in Singapore have developed next generation lithium-ion batteries, made with iron oxide nanoparticles, that could extend the driving distance of electronic cars.
TECHNICAL ARTICLE
Tags: Energy, Battery

FORECASTING

Scientists identify a mathematical ‘crystal ball’ that may predict calamities
PhysOrg.com, 28OCT2013
A study by a team of researchers from the UK and Australia could have far-reaching implications. If the principle is generalised in other real-world complex systems, such as climate change or disease control, it could open up the possibility of catastrophes being averted before they happen.
TECHNICAL ARTICLE
Tags: Forecasting

IMAGING TECHNOLOGY

Startup Gets Computers to Read Faces, Seeks Purpose Beyond Ads
MIT Technology Review, 28OCT2013
A technology for reading emotions on faces can help companies sell candy. Now its creators hope it also can take on bigger problems. While people notoriously have a hard time articulating how they feel, now it is clear that machines can not only read some of their feelings but also go a step farther and predict the statistical likelihood of later behavior.
Tags: Imaging technology, Sensors

South Korean Research Center Unveils Radar Absorbing ‘Stealth Paint’
Defense Update, 27OCT2013
The radar-absorbing material developed by researchers in South Korea can be sprayed on the surface of the protected platform, providing a lighter, durable and cheaper application, compared to contemporary tile or metal sheet-type electromagnetic wave absorbers. The new material is expected to be applied in naval weapons systems, following successful certification in 11 categories by the Korea Testing & Research Institute.
Tags: Imaging technology, Military technology

100 Percent of an Image Restored Using a Version Containing Between One and 10 Percent of the Information
Science Daily, 24OCT2013
Researchers in Spain have developed algorithms to reduce and optimize images; using a reduced image (with between 1% and 10% of the information from the original image), they allow 100% of the pixels in the initial image to be restored. The main idea underpinning the algorithms developed is to divide the image into small zones that are processed individually.
Tags: Imaging technology

INFORMATION TECHNOLOGY

Rewritable, transferable, and flexible sticker-type organic memory
Nanowerk, 25OCT2013
Researchers in Taiwan have demonstrated a rewritable, transferable, and flexible sticker-type organic memory on arbitrary nonconventional substrates through a simple, low-temperature and cost-effective one-step methodology.
TECHNICAL ARTICLE
Tags: Information Technology, Flexible electronics

continued...
MATERIALS SCIENCE

Breakthrough in Study of Aluminum Should Yield New Technological Advances
Science Daily, 28OCT2013
Researchers at Oregon State University and the University of Oregon announced a platform to study and fully understand the aqueous chemistry of aluminum, one of the world’s most important metals. The findings should open the door to significant advances in electronics and many other fields, ranging from manufacturing to construction, agriculture and drinking water treatment. TECHNICAL ARTICLE
Tags: Materials science

Tin for faster chips
Nanowerk, 28OCT2013
An international team of researchers (USA, Switzerland, Germany) have succeeded in creating topological insulators made from tin, a simple and readily available material. TECHNICAL ARTICLE
Tags: Materials science

Learning How to Convert Heat Directly Into Power: A Thermoelectric Materials Emulator
Science Daily, 24OCT2013
Researchers in Switzerland have created a “thermoelectric material emulator” to better understand the thermoelectric materials. TECHNICAL ARTICLE
Tags: Materials science, S&T Switzerland

Polymer Scientists Jam Nanoparticles, Trapping Liquids in Useful Shapes
Science Daily, 24OCT2013
U Mass researchers discovered how to kinetically trap and control one liquid within another, locking and separating them in a stable system over long periods, with the ability to tailor and manipulate the shapes and flow characteristics of each. The discovery holds promise for a wide range of different applications including in drug delivery, biosensing, fluidics, photovoltaics. TECHNICAL ARTICLE
Tags: Materials science

Minuscule bumps improve an anti-reflective coating
Nanowerk, 23OCT2013
Researchers in Singapore have developed a coating that matches the optical properties of the best conventional anti-reflective coatings (ARCs), while being more robust and easier to produce. ARCs are used in a variety of applications to reduce glare and increase the proportion of light transmitted through the glass or plastic beneath—potentially boosting the output of a solar module, for example. TECHNICAL ARTICLE
Tags: Materials science

MICROELECTRONICS

Super-Thin Membranes Clear the Way for Chip-Sized Pumps
Science Daily, 28OCT2013
University of Rochester scientists have created a super-thin silicon membrane that could be used to cool electronic devices. As electronic devices get smaller, components are packed more tightly, making it easier for the devices to overheat. With miniature power supplies, it may be possible to use Electroosmotic pumps (EOPs) to help cool laptops and other portable electronic devices. TECHNICAL ARTICLE
Tags: Microelectronics, Advanced materials

The Status of Moore’s Law: It’s Complicated
IEEE Spectrum, 28OCT2013
When will the scaling stop? Today’s patterning technology, which relies on 193-nm laser light, is becoming an ever more costly challenge, and its natural successor, shorter-wavelength extreme ultraviolet lithography, has been long delayed.
Tags: Microelectronics

‘Getting the Edge’ On Photon Transport in Silicon
Science Daily, 23OCT2013
A research team from NIST and the University of Maryland has demonstrated their recent theory about how particles of light flow within a novel device they built. The team’s solution could help computer designers use light instead of electricity to carry information in computer circuits, potentially leading to vast improvements in efficiency. TECHNICAL ARTICLE
Tags: Microelectronics, Government S&T

NEUROSCIENCE

The Man Who Would Teach Machines to Think
The Atlantic, 01NOV2013
"Cognition is recognition," Douglas Hofstadter likes to say. He describes "seeing as" as the essential cognitive act: you see some lines as "an A," you see a hunk of wood as "a table." That’s what it means to understand. But how does understanding work? For three decades, Hofstadter and his students have been trying to find out, trying to build "computer models of the fundamental mechanisms of thought.”
Tags: Neuroscience, Artificial intelligence
continued...
Does brain training make you smarter?
The Conversation, 28OCT2013
No one really disputes that extensive training on a specific task will improve performance on that task. But the acid test for brain training is whether it can be reliably demonstrated that training on some tasks transfers more widely to a range of other tasks and thought processes. MORE
STUDIES
Tags: Neuroscience

Study With Totally Blind People Shows How Light Helps Activate the Brain
Science Daily, 28OCT2013
In a study, researchers from the US and Canada have shown that light enhances brain activity during a cognitive task even in some people who are totally blind, according to a new study. The findings contribute to scientists’ understanding of everyone’s brains, as they also revealed how quickly light impacts on cognition. TECHNICAL ARTICLE
Tags: Neuroscience

Smart Neurons: Single Neuronal Dendrites Can Perform Computations
Science Daily, 27OCT2013
Researchers at the University of North Carolina at Chapel Hill and the UK have shown that dendrites do more than relay information from one neuron to the next. They actively process information, multiplying the brain’s computing power. TECHNICAL ARTICLE
Tags: Neuroscience

Nanoscale Engineering Boosts Performance of Quantum Dot Light Emitting Diodes
Science Daily, 25OCT2013
The new research developed by the Los Alamos National Laboratory aims to improve QD-LEDs by using a new generation of engineered quantum dots tailored specifically to have reduced wasteful charge-carrier interactions that compete with the production of light. TECHNICAL ARTICLE
Tags: Photonics, Government S&T, Quantum science

Long-sought pattern of ancient light detected
PhysOrg.com, 22OCT2013
The ancient light traveled billions of years to reach us, and along the way, its path was distorted by the pull of matter, leading to a twisted light pattern. This twisted pattern of light, called B-modes, has at last been detected. The discovery, which will lead to better maps of matter across our universe, was made using the National Science Foundation’s South Pole Telescope, with help from the Herschel space observatory.
Tags: Photonics

QUANTUM SCIENCE
Physicists aim to make transition to quantum world visible
Nanowerk, 25OCT2013
Researchers in Canada and Germany have developed a mathematical model for a type of microscopic test lab which will enable the simultaneous study of a hundred photons and their quantum entanglement—a far greater number than was previously possible. The researchers hope to gain new insights that will be of relevance to the development of quantum computers. TECHNICAL ARTICLE
Tags: Quantum science, S&T Canada, S&T Germany

When Scaling the Quantum Slopes, Veer for the Straight Path
Science Daily, 24OCT2013
Princeton University researchers found that a representation of quantum mechanics that allows the dynamics of atoms and molecules to be manipulated can be unexpectedly simple, which could help scientists realize the next generation of technology by harnessing atoms and molecules to create small but incredibly powerful devices.
Tags: Quantum science

Featured Resource
PhysOrg
Covers physical sciences, math, biology, medicine, earth science, computer sciences, and technologies.

PHOTONICS
New generation laser will herald technological breakthrough
PhysOrg.com, 28OCT2013
Researchers in the UK have demonstrated bosonic lasers which emit terahertz radiation. The bosonic terahertz laser will work in tandem with a conventional LED, which is a completely new approach. This will enable the miniaturisation of new optochips which, in turn, will help develop a whole new class of novel devices and applications.
Tags: Photonics

SCIENCE WITHOUT BORDERS
Ghostly Shape of ‘Coldest Place in the Universe’ Revealed
Science Daily, 24OCT2013
At a cosmologically crisp one degree Kelvin (minus 458 degrees Fahrenheit), the Boomerang Nebula is the coldest known object in the Universe—colder, in fact, than the faint continued...
afterglow of the Big Bang, which is the natural background temperature of space. TECHNICAL ARTICLE
Tags: Science without borders, Astronomy

SENSORS
Traces of DNA exposed by nanorod assemblies and twisted light
Nanowerk, 28OCT2013
Researchers at the University of Michigan and China have shown that structures that put a spin on light reveal tiny amounts of DNA with 50 times better sensitivity than the best current methods. Highly sensitive detection of DNA can help with diagnosing patients, solving crimes and identifying the origins of biological contaminants such as a pathogen in a water supply. TECHNICAL ARTICLE
Tags: Sensors, Materials science

Using sound waves for bomb detection
PhysOrg.com, 23OCT2013
The new system built by a multi-university collaboration (Vanderbilt, Purdue, Colorado School of Mines) consists of a phased acoustic array that focuses an intense sonic beam at a suspected improvised explosive device. At the same time a laser vibrometer is aimed at the object’s casing and records how the casing is vibrating in response. The nature of the vibrations can reveal a great deal about what is inside the container.
Tags: Sensors, Explosives

STEM
Corporate Recruiters Insist There Really Is a STEM Worker Shortage
IEEE Spectrum, 22OCT2013
Bayer Corp., the U.S. arm of the German chemical and pharmaceutical giant Bayer AG, is due to release a report this week showing that half of the recruiters from large U.S. companies surveyed couldn’t find enough job candidates with four-year STEM degrees in a timely manner; some said that had led to more recruitment of foreigners.
Tags: STEM

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:

Dr. Brian Beachkofski
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
OTI Corporate Librarian