Volume 2, Issue 13 ■ 30MAR2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Has modern science become dysfunctional?

PhysOrg.com, 27MAR2012

At the heart of the problem is an economic incentive system fueling a hypercompetitive environment that is fostering poor scientific practices, including frank misconduct. The root of the problem is a lack of sufficient resources to sustain the current enterprise. Too many researchers are competing for too little funding, creating a survival-of-the-fittest, winner-take-all environment where researchers increasingly feel pressure to publish, especially in high-prestige journals. More editorials

Tags: S&T policy, Featured Article

Quantum copies do new tricks

Nanowerk, 22MAR2012

It is impossible to take a single photon and make a number of photons that are in the exact same quantum state. This may seem minor, but it's not. If perfect copying was possible, it would, among other things, be possible to send signals faster than the speed of light. This is forbidden by Einstein's theory of relativity. Researchers in Canada showed that it is possible to perfectly recover the original from the imperfect quantum copies. They also proposed a way that his could be done in practice.

Tags: Breakthrough technology, Quantum science, Featured Article

'Copper interconnects for advanced performance and reliability' (Copper) project

A groundbreaking, waterless approach to micro-chip making

Nanowerk, 21MAR2012

A team of EU researchers focused on the methods and materials used to interconnect the billions of tiny transistors on a modern microchip. Specifically, the Copper team developed a process that enables reactive metals to be used directly as a barrier between copper interconnects and the silicon wafer of the chip by using non-aqueous solvents instead of water-based ones—a world first in the semiconductor industry.

Tags: Microelectronics, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Developing the next generation of fuel cells

R&D Magazine, 27MAR2012

Researchers at the University of Connecticut have developed a prototype manufacturing process for the fuel cells that uses 10 times less catalyst material with little waste. The low-temperature process allows for important industrial controls and flexibility, and can be easily scaled up for mass production. The flexibility and control standards of the process further allow manufacturers to manage the thickness of the material layers that are applied, which is important in fuel cell technology.

Tags: Advanced manufacturing, Energy

ADVANCED MATERIALS

New Plastics "Bleed" When Cut or Scratched—and Then Heal Like Human Skin

Newswise, 26MAR2012

Researchers at the University of Mississippi have developed plastics with small molecular links or "bridges" that span the long chains of chemicals that compose plastic. When plastic is scratched or cracked, these links break and change shape. Unlike self-healing plastics that rely on embedded healing compounds that can self-repair only once, this plastic can heal itself over and over again. They change color to warn of wounds and heal themselves when exposed to light.

Tags: Advanced materials, Materials science

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BACK TO TOP

Materials inspired by Mother Nature: A 1-pound boat that could float 1,000 pounds

Nanowerk, 25MAR2012

At the American Chemical Society meeting researchers described the new buoyant material, engineered to mimic the water strider's long, thin feet and made from an "aerogel" composed of the tiny nano-fibrils from the cellulose in plants. Aerogels are so light that some of them are denoted as "solid smoke." The nanocellulose aerogels also have remarkable mechanical properties and are flexible and highly buoyant, capable of absorbing huge amounts of oil opening the way for potential use in cleaning up oil spills. In everyday terms, a boat made from 1 pound of the substance could carry about 1,000 pounds.

Tags: Advanced materials, Biomimetics, Nanomaterials

Diatom biosensor could shine light on future nanomaterials

EurekAlert, 23MAR2012

A biosensor made of fluorescent proteins embedded in the shell of microscopic marine algae called diatoms could help detect chemicals in water samples. The same research could also lead to new, diatom-inspired nanomaterials that could solve problems in sensing, catalysis and environmental remediation.

Tags: Advanced materials, Government S&T, Sensors

Researchers take first-ever measurement of auroral turbulence using a nanosatellite radar receiver

EurekAlert, 22MAR2012

The project's mission was to use small satellites called CubeSats to remotely explore formation of charged particle filaments created in response to intense electrical currents in space. These plasma structures, a form of turbulence called field-aligned irregularities (FAIs), can distort communication and navigation signals such as GPS.

Tags: Advanced materials

Catalytic Clothing—Purifying Air Goes Trendy

Scientific American, 21MAR2012

Researchers in the UK have produced a simple nanoparticle formulated green laundry product with potential to turn the public into an air-purifying altruistic community. Nano-titania, or nanosized particles of titanium dioxide, work as powerful catalyst agents that speed up the conversion of harmful NOx air pollutants to harmless byproducts that can be washed away with the rain.

Tags: Advanced materials, Environment, Nanoparticles

Graphene Doesn't Mind a Pair of Defects: Synopsis

American Physical Society, 21MAR2012

According to researchers in Spain the presence of double vacancies does strongly modify graphene's electronic structure, creating new electronic states. As a consequence, double vacancies are expected to limit the electron mobility of graphene by acting as traps for charge carriers around the defects. Calculations also show that double vacancies aren't magnetic like single vacancies, so they do not contribute to the magnetism that has been observed in irradiated graphene systems.

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

Warehouse Robots Get Smarter With Ant Intelligence

IEEE Spectrum, 26MAR2012

What Fraunhofer is trying to do is mimic the ant swarm system with robots. For example, instead of having one central computer control the movements of every robot (as with Kiva), Fraunhofer's system utilizes robots that make their own decisions with onboard computers. Each robot communicates with all the other robots in the swarm simultaneously using WLAN, and they use algorithms based on a model for how ants forage for food to cooperatively decide which of them should go where and do what.

Tags: Autonomous systems & robotics, Robotics

No Bumps in the Road for DARPA's Robotic Suspension System

DARPA, 22MAR2012

If the current limitations on mobility and manipulation capabilities of robots can be overcome, robots could potentially assist warfighters across a greater range of missions. DARPA's Maximum Mobility and Manipulation (M3) program seeks to create and demonstrate significant scientific and engineering advances in robot mobility and manipulation capabilities. VIDEO

Tags: Autonomous systems & robotics, DARPA, Government S&T

Jellyfish Inspires Latest Ocean-Powered Robot

Science Daily, 21MAR2012

Constructed from a set of smart materials, which have the ability to change shape or size as a result of a stimulus, and carbon nanotubes, Robojelly is able to mimic the natural movements of a jellyfish when placed in a water tank and is powered by chemical reactions taking place on its surface. Being fuelled by hydrogen, it will never run out of energy, theoretically. VIDEO

Tags: Autonomous systems & robotics

COUNTER WMD

Standoff Sensing Enters New Realm with Dual-Laser Technique

Newswise, 22MAR2012

Researchers at Oak Ridge National Laboratory present a technique that uses a quantum cascade laser to "pump," or strike, a target, and another laser to monitor the material's response as a result of temperature-induced changes. That information allows for the rapid identification of chemicals and biological agents.

Tags: Counter WMD, Sensors

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"Never before in history has innovation offered promise of so much to so many in so short a time." BILL GATES

ELECTRONIC WARFARE

CYBERCOM Arming U.S. Combatant Commands

Defense News, 21MAR2012

The effort was alluded to by the NSA and the U.S. Cyber Command (CYBERCOM) chief, Army Gen. Keith Alexander, as part of the congressional testimony on March 20. It means that combatant commanders will be able to employ the weapons as part of overall mission planning, pairing traditional kinetic attacks with newly developed cyber capabilities. CYBERCOM will establish Cyber Support Elements (CSEs) at all six geographic combatant commands.

Tags: Electronic warfare, Cyber security

ENERGY

New dimension for solar energy: Innovative 3-D designs more than double the solar power generated per area

Science Daily, 27MAR2012

A team of MIT researchers has come up with a very different approach: building cubes or towers that extend the solar cells upward in three-dimensional configurations. Amazingly, the results from the structures they've tested show power output ranging from double to more than 20 times that of fixed flat panels with the same base area.

Tags: Energy, Solar energy

How wireless charging could boost the electric car (video)

BBC Technology, 23MAR2012

It may seem a distant dream but as Dan Simmons reports, the technology that allows electric toothbrushes to charge without wires is being developed to provide power for a whole range of devices.

Tags: Energy

Japan's Space Based Solar Power Schedule

Next Big Future, 21MAR2012

The concept of space solar power is to collect the sun's rays with large reflectors placed in geostationary orbit and then send that energy in the form of microwaves to facilities on the ground where it is used to produce electricity or hydrogen. JAXA (Japan Aerospace Exploration Agency) research will also be conducted to develop a technology to directly convert sunlight into laser beam. JAXA has started the development of demonstration systems on the ground of the wireless transmission of energy of 1 kW, both microwave and laser. These experiences should be completed late 2013.

Tags: Energy, S&T Japan, Solar energy

ENVIRONMENTAL SCIENCE

Trees May Play a Role in Electrifying the Atmosphere, Study Suggests

Science Daily, 21MAR2012

Scientists in Australia found that the positive and negative ion concentrations in the air were twice as high in heavily wooded areas than in open grassy areas, such as parks. Trees act as radon pumps, bringing the gas to the surface and releasing it to the atmosphere through transpiration. This is especially prevalent for trees with deep root systems, such as eucalypts.

Tags: Environmental science

FORECASTING

Consensus clustering in complex networks

Nature Scientific Reports, 27MAR2012

Consensus clustering is used in data analysis to generate stable results out of a set of partitions delivered by stochastic methods. Here we show that consensus clustering can be combined with any existing method in a self-consistent way, enhancing considerably both the stability and the accuracy of the resulting partitions. This framework is also particularly suitable to monitor the evolution of community structure in temporal networks.

Tags: Forecasting, Bibliometrics

IMAGING TECHNOLOGY

New surveillance camera can search 36 million faces for matches in one second

PhysOrg.com, 23MAR2012

A new surveillance camera by Hitachi Kokusai Electric can search, either still or video footage, process and display up to thirty-six million faces in just one second. Each hit is displayed immediately in its native format, i.e. still or video, in thumbnail form, which its makers say, allows the camera to display the actions of a person prior to, or even after, being seen by the surveillance camera. All they need do is click on the thumbnail to watch the video play.

Tags: Imaging technology

INFORMATION TECHNOLOGY

Not your average heat shield

EurekAlert, 26MAR2012

The key goal of this research was to control the way heat diffuses in a manner similar to those that have already been achieved for waves, such as light waves or sound waves, by using the tools of transformation optics. This may lead to novel ways to control heat in electronics and, on an even

continued...

larger scale, might someday prove useful for spacecraft and solar technologies. TECHNICAL ARTICLE: Sebastien Guenneau, et al., Transformation thermodynamics: cloaking and concentrating heat flux.

Tags: Information technology, Space technology

TVs and Tablets to Get the "Retina Display" Treatment

MIT Technology Review, 22MAR2012

Gadget manufacturers are adopting a manufacturing technique that will significantly increase resolution in coming months. Applied Materials's new machines perform plasma-enhanced chemical vapor deposition (PECVD), a process that deposits thin films of material onto surfaces. The machinery makes it possible to produce displays that use a different material for the display's backplane. That material, known as indium gallium zinc oxide, or IGZO, makes it easier and cheaper to build displays with extra-dense pixels.

Tags: Information technology, Imaging technology

Featured Resource

Nature Video

For selected articles and letters Nature presents streaming videos featuring interviews with scientists behind the research and analysis from Nature editors.

NSF's Most Powerful Computing Resource Has Opened Its Doors to Six Science Teams

NSF News, 21MAR2012

Six research teams have started to use the first phase of the Blue Waters sustained-petascale supercomputer to study some vexing problems in science and engineering from climate change to the HIV infection. It's the first use of Blue Waters, which is on its way to becoming one of the most powerful supercomputers in the world.

Tags: Information technology, Supercomputer

World's first flying file-sharing drones in action

KurzweilAI, 21MAR2012

Project "Electronic Counter Measures" has built a swarm of five fully operational drones that prove that an "aerial Napster" or an "airborne Pirate Bay" is not as futuristic as it sounds. "Part nomadic infrastructure and part robotic swarm, we have rebuilt and programmed the drones to broadcast their own local Wi-Fi network as a form of aerial Napster. They swarm into formation, broadcasting their pirate network, and then disperse, escaping detection, only to reform elsewhere," says the group, describing their creation.

Tags: Information technology, Autonomous systems & robotics

MATERIALS SCIENCE

Buckle in

MIT News, 26MAR2012

A toy inspired the engineers at MIT to create the "buckliball," a hollow, spherical object made of soft rubber containing no moving parts, but fashioned with 24 carefully spaced dimples. When the air is sucked out of a buckliball with a syringe, the thin ligaments forming columns between lateral dimples collapse. This is the engineering equivalent of applying equal load on all beams in a structure simultaneously to induce buckling.

Tags: Materials science

New nano-measurements add spark to centuries-old theory of friction

Nanowerk, 26MAR2012

The phenomenon of friction, when studied on a nanoscale, is more complex than previously thought. When friction occurs, an object does not simply slide its surface over that of another, it also makes a slight up-and-down movement. This finding completes a centuries-old theory of friction dating to 1699 and uncovers a gap in contemporary thinking on friction.

Tags: Materials science

'Antimagnet' renders magnets invisible

Nature News, 22MAR2012

Magnetic cloak could bring medical benefits—and security risks. Superconductors repel magnetic fields, so any magnetic field enclosed within a superconductor would be undetectable from outside. But the superconductor itself would still perturb an external magnetic field, so the researchers coated its external side with an ordinary ferromagnet. The superconductor tries to repel external field lines, whereas the ferromagnet tries to draw them in—together, the two layers cancel each other out. The research was done by a team of Spanish and Slovakian scientists.

Tags: Materials science

Liquid-like Materials May Pave Way for New Thermoelectric Devices

Science Newsline, 22MAR2012

Researchers at CalTech studied a material made from copper and selenium. Although it is physically a solid, it exhibits liquid-like behaviors due to the way its copper atoms flow through the selenium's crystal lattice. They found that because heat-carrying vibrations in a liquid can travel only via longitudinal waves, a material with liquid-like properties is less thermally conductive. Therefore, a liquid-like material that's also good at conducting electrically should be more thermoelectrically efficient than traditional amorphous materials.

Tags: Materials science

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New technique lets scientists peer within nanoparticles, see atomic structure in 3-D

EurekAlert, 22MAR2012

UCLA researchers used a scanning transmission electron microscope to sweep a narrow beam of high-energy electrons over a tiny gold particle only 10 nanometers in diameter. The nanoparticle contained tens of thousands of individual gold atoms. These atoms interact with the electrons passing through the sample, casting shadows that hold information about the nanoparticle's interior structure onto a detector below the microscope.

Tags: Materials science, Nanomaterials

NEUROSCIENCE

Highly flexible despite hard-wiring: Even slight stimuli change the information flow in the brain

Science Daily, 23MAR2012

When looking at an optical illusion that can appear as either one cup or two faces, which do you see first? In a new theoretical study, scientists of the Max Planck Institute show how this is possible without changing the cellular links of the network. The direction of information flow changes, depending on the time pattern of communication between brain areas. This reorganisation can be triggered even by a slight stimulus, such as a scent or sound, at the right time.

Tags: Neuroscience

Neuroscience, ethics, and national security: the state of the art

KurzweilAI, 21MAR2012

Neuroscience offers possibilities for cutting edge, deployable solutions for the needs of national security and defence, but are, or at least should be, tempered by questions of scientific validity, consequential ethical considerations, and concern for the relationship between science and security, according to the researchers from Wake Forest University and the University of Pennsylvania.

Tags: Neuroscience, Military technology

Rapid Response: Navy's Mad Scientists Seek 'Sixth Sense'

Wired, 21MAR2012

Promising "new insights into intuitive decisionmaking," the futuristic Office of Naval Research is putting together a new program to turn what it actually calls a "sixth sense" into a military advantage. "Evidence is accumulating that this capability, known as intuition or intuitive decision making," the scientists say in a new proposal, "enables the rapid detection of patterns in ambiguous, uncertain and time restricted information contexts." Mastering with intuition, the Navy says, should help troops with "Cyberwarfare, Unmanned System Operators, Information Analysts, Small Unit Leaders and other domains."

Tags: Neuroscience, Military technology

QUANTUM SCIENCE

Single molecules in a quantum movie

Nanowerk, 25MAR2012

The quantum physics of massive particles has intrigued physicists for more than 80 years, since it predicts that even complex particles can exhibit wave-like behaviour - in conflict with our everyday ideas of what is real or local. An international team of scientists in Austria now succeeded in shooting a movie which shows the build-up of a matter-wave interference pattern from single dye molecules which is so large (up to 0.1 mm) that you can easily see it with a camera. VIDEO

Tags: Quantum science

A one-way street for light

Nanowerk, 22MAR2012

Electrons carry information over tiny distances in computer circuitry. Photons are commonly used to carry information over kilometer distances. Scientists are currently developing micron-scale optical devices to either replace or be compatible with their electronic counterparts. An optical diode made with silicon technology can be used for quantum information.

Tags: Quantum science

How the alphabet of data processing is growing: Flying 'qubits' generated

Science Daily, 21MAR2012

The alphabet of data processing could include more elements than the "0" and "1" in future. Scientists have achieved a new kind of bit with single electrons, called quantum bits, or qubits. With them, considerably more than two states can be defined. So far, quantum bits have only existed in relatively large vacuum chambers. The team has now generated them in semiconductors. This represents another step along the path to quantum computing.

Tags: Quantum science

Quantum plasmons demonstrated in atomic-scale nanoparticles

Science Daily, 21MAR2012

Addressing a half-century-old question, engineers have conclusively determined how collective electron oscillations, called plasmons, behave in individual metal particles as small as just a few nanometers in diameter. This knowledge may open up new avenues in nanotechnology ranging from solar catalysis to biomedical therapeutics.

Tags: Quantum science

S&T POLICY

Reforming Science: Methodological and Cultural Reforms

American Society for Microbiology, 19DEC2011

The question is not whether science is failing, but rather, whether the current scientific enterprise is as healthy as it

continued...

should be. Our answer is that, in many respects, it is not, and we point to the growing problem of retractions as a symptom. What we propose is nothing less than a comprehensive reform of scientific methodology and culture. More editorials

Tags: S&T policy, S&T Policy

SCIENCE WITHOUT BORDERS

Can a machine tell when you're lying? Research suggests the answer is 'yes'

EurekAlert, 26MAR2012

University of Buffalo computer scientists are exploring whether machines can read the visual cues that give away deceit. Results so far are promising: In a study of 40 videotaped conversations, an automated system that analyzed eye movements correctly identified whether interview subjects were lying or telling the truth 82.5 percent of the time. They suggest that computers may be able to learn enough about a person's behavior in a short time to assist with a task that challenges even experienced interrogators.

Tags: Science without borders, Biometrics

New York to Beijing in two hours without leaving the ground?

KurzweilAI, 26MAR2012

How it would work: put a superconducting maglev train in evacuated tubes, then accelerate using linear electric motors until the desired velocity is attained. Passive superconductors allow the capsules to float in the tube, while eddy currents induced in conducting materials drive the capsules. Efficiency of such a system would be high, as the electric energy required to accelerate a capsule could largely be recaptured as it slows.

Tags: Science without borders

Solar storm dumps gigawatts into Earth's upper atmosphere (w/video)

PhysOrg.com, 23MAR2012

During the heating impulse, the thermosphere puffed up like a marshmallow held over a campfire, temporarily increasing the drag on low-orbiting satellites. This is both good and bad. On the one hand, extra drag helps clear space junk out of Earth orbit. On the other hand, it decreases the lifetime of useful satellites by bringing them closer to the day of re-entry.

Tags: Science without borders ■

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