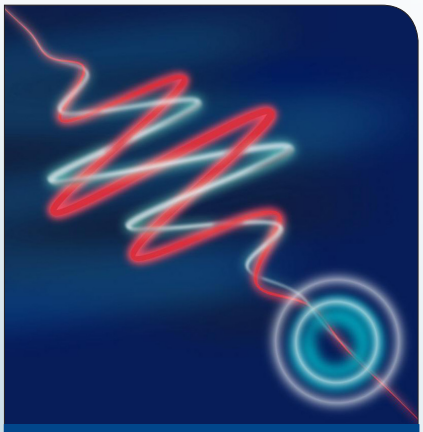
Volume 4, Issue 52 ■ 24DEC2014

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES



Quantum physics says that particles can behave like waves, and vice versa. Researchers have now shown that this 'wave-particle duality' is simply the quantum uncertainty principle in disguise. Credit: Timothy Yeo / CQT, National University of Singapore

Quantum physics just got less complicated

PhysOrg.com, 19DEC2014

An international team of researchers (Singapore, Canada, the Netherlands) found that 'wave-particle duality' is simply the quantum 'uncertainty principle' in disguise, reducing two mysteries to one. The discovery deepens our understanding of quantum physics and could prompt ideas for new applications of wave-particle duality. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

Scientists reveal breakthrough in optical fibre communications

PhysOrg.com, 19DEC2014

An international team of researchers (England, Ireland) explores a radically new approach to the generation of spectrally-efficient advanced modulation format signals as required in modern optical communication systems. This new technology avoids the need for costly and power-inefficient external modulator schemes that are currently used to generate such signals. TECHNICAL ARTICLE

Tags: Communications Technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

New horizons for self-assembling materials

MIT News, 18DEC2014

Many researchers believe that they will realize the full potential of 3D printers only when they can generate sheets of patterned materials that will automatically warp themselves into larger, more complex shapes. A team of researchers at MIT and their collaborators describe a new process for designing and manufacturing "programmable matter" that could make it more versatile. The new procedure yields materials that also self-stretch.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Graphene "cut and paste" with microwaves

Asia Research News, 21DEC2014

Researchers in Russia carried out graphene "cut and paste" with metal nanoparticles under microwave irradiation. Their study revealed unique processes occurring on the carbon layers under the influence of metal nanoparticles heated by microwave irradiation. Understanding the processes taking place in Metal/Carbon systems is crucial for development of a new generation of highly efficient catalysts for organic synthesis and chemical industry. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Russia

Shapeshifting metal nanoparticles eating tracks in graphene

Nanowerk, 19DEC2014

In a recent paper an international team of researchers (USA, Japan, China) helped to explain the mysterious behavior of nanoparticles reported by researchers in Denmark: that the particles can change shape as if they were liquid, while they are in fact crystalline. This happens even at room temperature. Patterned graphene is relevant for particle filters, plasmonics, transistors, and ultrasensitive sensors. TECHNICAL ARTICLE

Tags: Advanced materials

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Scientists open new frontier of vast chemical 'space': As proof-of-principle, team makes dozens of new chemical entities

Science Daily, 17DEC2014

Researchers at the Scripps Research Institute have invented a powerful method for joining olefins to create a new bond between their carbon-atom backbones. It doesn't require the use of extreme temperatures or pressures, nor harsh chemicals. The technique can be used to make pharmaceuticals, fabrics, dyes, plastics and other materials previously inaccessible to chemists. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Humanoid Waltz, Robot Sumo, and Happy Holidays!

IEEE Spectrum, 19DEC2014

We've always liked robots that are able to physically express themselves with minimal degrees of freedom. Here's some of the thinking that went into making Jibo good at it.

Tags: Autonomous systems & robotics

Army developing robotic insects?

US Army, 16DEC2014

Researchers at the Army Research Laboratory have been pushing innovation in the area of tiny actuators and developed a pair of tiny robotic wings measuring only 3 to 5 centimeters in length. The wings bend and flap when voltage is applied to the PZT material. They demonstrated that the wings can actually create lift.

Tags: Autonomous systems & robotics, Government S&T

CYBER SECURITY

IARPA seeks 'unconventional' methods to detect cyber attacks

Fierce Government IT, 18DEC2014

The Intelligence Advanced Research Projects Activity will host a one-day conference on Jan. 21 to provide information about an upcoming solicitation to develop the Cyber-attack Automated Unconventional Sensor Environment, or CAUSE, program.

Tags: Cyber security, Government S&T

ENERGY

Improving rechargeable batteries by focusing on graphene oxide paper

Science Daily, 18DEC2014

Researchers at Kansas State University found that sodium storage capacity of paper electrodes depends on the distance between the individual layers that can be tuned by heating it in argon or ammonia gas. They showed that a flexible paper composed entirely of graphene oxide sheets can charge and discharge with sodium-ions for more than 1,000 cycles. TECHNICAL ARTICLE

Tags: Energy, Battery

Future batteries: lithium-sulfur with a graphene wrapper

Nanowerk, 16DEC2014

An international team of researchers (UK, China) describe their design of a multifunctional sulfur cathode at the nanolevel to address performance-related issues such as low efficiency and capacity degradation. The carbon scaffold acts as a physical barrier to confine the active materials within its porous structure which leads to improved cycling stability and high efficiency. TECHNICAL ARTICLE

Tags: Energy, Battery

IMAGING TECHNOLOGY

Atom-thick CCD could capture images

Science Daily, 19DEC2014

Researchers at Rice University synthesized CIS, a single-layer matrix of copper, indium and selenium atoms. They built a prototype a three-pixel CCD to prove the material's ability to capture an image. CIS could also be curved to match the focal surface of an imaging lens system. This would allow for real-time correction of aberrations and significantly simplify the entire optical system. TECHNICAL ARTICLE

Tags: Imaging technology, Materials science

IEDM papers hint at future of imaging

Optics.org, 18DEC2014

Leading research teams have presented a raft of innovations in the field of imaging sensor chips at the IEEE-organized 2014 International Electron Devices Meeting (IEDM). Among them was a silicon detector capable of operating in the increasingly important far-infrared range—a part of the spectrum usually regarded as being well beyond the range of any conventional silicon chips. TECHNICAL PROGRAM

Tags: Imaging technology

INFORMATION TECHNOLOGY

When Will We Have an Exascale Supercomputer?

IEEE Spectrum, 19DEC2014

China and Japan each seem focused on building an exascale supercomputer by 2020. But the United States probably won't build its first practical exascale supercomputer until 2023 at the earliest. To hit that target, engineers will need to do three things: 1.) they'll need new computer architectures capable of combining tens of thousands of CPUs and graphics-processor-based accelerators, 2.) deal with

continued...

"I want to put a ding in the universe."

STEVE JOBS

the growing energy costs and 3.) software developers will have to learn how to build programs that can make use of the new architecture.

Tags: Information Technology

MATERIALS SCIENCE

Building a new nanowire for solar cells (w/video)

Nanowerk, 19DEC2014

Researchers in Switzerland have made the first ever nanowires from a perovskite material using a simple, new method that they call "slip-coating". By pressing the liquid material between the coverslips and then sliding them apart, they were able to observe needle-like structures growing within a few seconds. TECHNICAL ARTICLE

Tags: Materials science, S&T Switzerland

Computational clues into the structure of a promising energy conversion catalyst

Science Daily, 18DEC2014

Researchers at Princeton University have reported new insights into the structure of an active component of the nickel oxide catalyst, a promising catalyst for water splitting to produce hydrogen fuel. TECHNICAL ARTICLE

Tags: Materials science

Engineers use liquid drops to make solids stiffer

PhysOrg.com, 18DEC2014

Researchers at Yale University have discovered that while large drops of liquids are softer than the solid that surrounds them, extremely tiny drops of liquid can actually be stiffer than certain solids. But when they're "just right," the liquid drops have the exact same stiffness as the surrounding solid. It turns out that the importance of surface tension is inversely proportional to the size. These results provide engineers with "a new knob to turn" to control the properties of composite materials. TECHNICAL ARTICLE

Tags: Materials science

Glimpsing pathway of sunlight to electricity

Science Daily, 18DEC2014

Researchers at the University of Oregon detected photocurrent from a PbS quantum dot photocell resulting from its interactions with a sequence of four ultrafast laser pulses. In most solar cells, each absorbed photon creates just one potentially free electron. TECHNICAL ARTICLE

Tags: Materials science

Mathematical description of relationship between thickness, temperature, and resistivity could spur advances

PhysOrg.com, 17DEC2014

MIT researchers have discovered a new mathematical relationship—between material thickness, temperature, and electrical resistance. The result could shed light on the nature of superconductivity and could also lead to better-engineered superconducting circuits for applications like quantum computing and ultralow-power computing. TECHNICAL ARTICLE

Tags: Materials science

MEDICAL SCIENCES

'Radiogenetics' Seeks to Remotely Control Cells And Genes

Science Daily, 15DEC2014

According to a team of US researchers (Rockefeller University, Rensselaer Polytechnic Institute) the system they have developed allows one to wirelessly control the expression of genes in a living animal and could potentially be used for conditions like hemophilia to control the production of a missing protein. Two key attributes are that the system is genetically encoded and can activate cells remotely and quickly. TECHNICAL ARTICLE 1, 2

Tags: Medical Sciences, Biotechnology

MICROELECTRONICS

Instant-start computers possible with new breakthrough

Science Daily, 18DEC2014

Researchers at Cornell University made a device equivalent to one computer bit out of bismuth ferrite, a multiferroic material which can be used for nonvolatile memory devices with relatively simple geometries. They found that it exhibits magnetic switchability, in two steps, with nothing but an electric field. TECHNICAL ARTICLE

Tags: Microelectronics

PHOTONICS

Light Microscopy: An ongoing contemporary revolution

arXiv, 10DEC2014

In this article, researchers in Germany present a critical overview of various recent developments in optical microscopy. In addition to the popular super-resolution fluorescence methods, they discuss the prospects

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of various other techniques and imaging contrasts and consider some of the fundamental and practical challenges that lie ahead. TECHNICAL ARTICLE

Tags: Photonics, S&T Germany

Featured Resource

100 Best Science RSS Feeds

Find feeds that touch on everything from space exploration to sustainability to evolution in this awesome list.

QUANTUM SCIENCE

Quantum world without queues could lead to better solar cells

Science Daily, 19DEC2014

Researchers in Sweden studied solar cells containing quantum dots. When sunlight hits the quantum dots, two electrons can be extracted from one photon, which can increase the efficiency of the solar cells. This quantum coherence can lead to a type of energy transfer that produces an almost perfect flow of energy without any obstacles. TECHNICAL ARTICLE

Tags: Quantum science, Energy, S&T Sweden

Switching to spintronics

Nanowerk, 17DEC2014

A team of US researchers (Lawrence Berkeley National Laboratory, Cornell University) successfully used an electric field to reverse the magnetization direction in a multiferroic spintronic device at room temperature. This demonstration, which runs counter to conventional scientific wisdom, points a new way towards spintronics and smaller, faster and cheaper ways of storing and processing data. TECHNICAL ARTICLE

Tags: Quantum science, Microelectronics

S&T POLICY

UK releases world's largest university assessment

Nature, 18DEC2014

Government reveals ratings that will guide spending of £2 billion—and announces overall science strategy. The long-awaited and highly controversial Research Excellence Framework, or REF, the latest iteration of an assessment that rates the quality of academic departments in every UK university every five to six years, is claimed to be the largest assessment exercise of its type in the world.

Tags: S&T policy, S&T UK

SCIENCE WITHOUT BORDERS

The top 10 science news stories of 2014

Science Magazine, 19DEC2014

A list of Science Magazine editors favorite and most popular articles.

Tags: Science without borders

Breakthrough of the Year: The top 10 scientific achievements of 2014

Science Magazine, 18DEC2014

Each year, Science's editors choose a singular scientific achievement as Breakthrough of the Year. They briefly summarize the winner and runners-up and link to the expanded stories, with references, in the magazine, which are freely available.

Tags: Science without borders

Geoscientists aim to magnify specialized Web searching

Science Magazine, 18DEC2014

A group of computer scientists at Woods Hole Oceanographic Institution in Massachusetts officially kicked off their project, called GeoLink, sponsored by NSF, at the American Geophysical Union fall meeting in San Francisco. The project lays the groundwork for a smarter academic search engine that would help geoscientists find the exact data sets and publications they want in the blink of an eye, instead of spending hours scrolling through pages of irrelevant results on Google Scholar.

Tags: Science without borders

The most-read Nature news stories of 2014

Nature News, 17DEC2014

Black holes, stem cells and the changing face of academic publishing were popular topics for our readers in 2014.

Tags: Science without borders

SENSORS

New technique moves researchers closer to new range of GaN biosensors

PhysOrg.com, 18DEC2014

Researchers from North Carolina State University have found a way of binding peptides to the surface of gallium nitride in a way that keeps the peptides stable even when exposed to water and radiation. The discovery moves researchers one step closer to developing a new range of biosensors for use in medical and biological research applications.

Tags: Sensors

continued...

Pyramid nanoscale antennas beam light up and down

Nanowerk, 17DEC2014

Researchers in the Netherlands have designed and fabricated a new type of nanoscale antenna that looks like pyramids. The pyramid shape enhances the interference between the magnetic and electric fields of light. This makes the pyramid-shaped antenna capable of enhancing light emission and beaming different colours of light towards opposite directions. This finding could lead to more efficient light emitting devices (LEDs). TECHNICAL ARTICLE

Tags: Sensors, Imaging Technology ■

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