



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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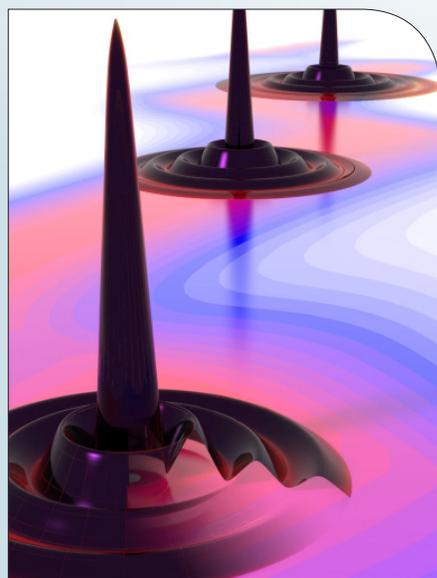
[Quantum science \(2\)](#)

FEATURE ARTICLES

[Physicists discover 'quantum droplet' in semiconductor](#)

[Science Daily, 26MAR2014](#)

The new quasiparticle discovered by an international team of researchers (USA, Germany) is a microscopic complex of electrons and holes in a new, unpaired



Artist's conception of microscopic "quantum droplet" discovered by JILA physicists in a gallium-arsenide semiconductor excited by an ultrafast red laser pulse. Credit: Baxley/JILA

arrangement. The "quantum droplet" has quantum characteristics such as well-ordered energy levels, but also has some of the characteristics of a liquid. Although its lifetime is only a fleeting 25 picoseconds, the quantum droplet is stable enough for research on how light interacts with specialized forms of matter.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, Featured Article

[Autonomous drones flock like birds](#)

[Nature News, 26FEB2014](#)

A Hungarian team has created drones that can fly as a coordinated flock. The aircraft, called quadcopters, navigate using signals from GPS receivers, communicate their positions to one another via radio and compute their own flight plans. [VIDEO](#)

Tags: Autonomous systems & robotics, Featured Article

ADVANCED MATERIALS

[Physics in 3-D? That's nothing. Try 0-D](#)

[Nanowerk, 04MAR2014](#)

Researchers at the University of Cincinnati have reached zero-dimension in semiconductor nanowires. They have observed unique optical signatures indicating that electronic excitations within these nanowires can be confined to a zero-dimensional state. The discovery could lead to better ways of harnessing solar energy, stronger lasers or more sensitive medical diagnostic devices.

Tags: Advanced materials

[Atomic chisel chips away at graphene](#)

[Nanotechweb, 28FEB2014](#)

An international team of researchers (USA, Spain) have invented an atomic "chisel" made from a single silicon atom that can be used to sculpt and create ultraclean nanostructures in graphene. It could be used to fashion clean edges in carbon material, fabricate a host of nanostructures for use in future molecular electronics devices and make nanopores for DNA sequencing applications. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Government S&T

[Creating complex nanoparticles in one easy step](#)

[Science Daily, 26FEB2014](#)

Without using chemicals, researchers in Japan have created biocompatible ternary nanoparticles that consist of three parts each of which exhibits a useful property. The new method allows for easy manipulation of the size of the particles to tailor-make them for a variety of uses all in one step, and provides better stability for longer storage. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T Japan

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Graphene found to efficiently absorb radio waves

KurzweilAI, 25FEB2014

Researchers in England demonstrated that stacked graphene layers increased the absorption of millimeter waves by 90 per cent over a wide bandwidth (125 - 165 GHz, which could be extended down to microwave frequencies) without blocking visibility. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials, Materials science, S&T UK*

AUTONOMOUS SYSTEMS & ROBOTICS**Video Friday: Flocking Quadcopters, Hip Hop NAO, and Watson Gets Cooking**

IEEE Spectrum, 28FEB2014

Animals have somehow figured out how to navigate and avoid collisions even when there's a whole bunch of them trying to occupy the same small space. Swarming and flocking behaviors are just as important for fleets of quadrotors.

Tags: *Autonomous systems & robotics*

COMMUNICATIONS TECHNOLOGY**Emergency services benefit from a high-speed wireless technology**

PhysOrg.com, 03MAR2014

Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) announced a licensing deal with a company to commercialise Ngara, a wireless technology, so it can be used to allow massive amounts of information to be passed between control centres and emergency services in the field.

Tags: *Communications Technology, S&T Australia, S&T Policy*

Mathematical Proof Reveals How To Make The Internet More Earthquake-Proof

MIT Technology Review, 03MAR2014

Researchers in Japan use integral geometry to prove a number of handy rules of thumb that network scientists can easily exploit to design robust networks against earthquakes. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology*

Can Quantum Communication Work For Underwater Vehicles and Sensors?

MIT Technology Review, 26FEB2014

Chinese physicists say quantum key distribution is possible through clear ocean water at distances of up to 125 metres and at data rates capable of sending a secure video feed.

[TECHNICAL ARTICLE](#)

Tags: *Communications Technology*

New record set for data-transfer speeds: Existing technology for short-range data transmission may be fast enough for years to come

Science Daily, 25FEB2014

Sending data at a rate of 64 gigabits per second (Gb/s) over a cable 57 meters long using a type of laser called a vertical-cavity surface-emitting laser (VCSEL), researchers at IBM achieved a rate that was about 14 percent faster than the previous record and about 2.5 times faster than the capabilities of today's typical commercial technology.

Tags: *Communications Technology*

Novel optical fibers transmit high-quality images

Science Daily, 25FEB2014

After having recently discovered a new way to propagate multiple beams of light through a single strand of optical fiber, engineers at the University of Wisconsin-Milwaukee have found that their novel fiber architecture can transmit images with a quality that is comparable or better than the current commercial endoscopy imaging fibers. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology*

CYBER SECURITY**New technique targets C code to spot, contain malware attacks**

EurekAlert, 04MAR2014

Researchers from North Carolina State University have developed a new tool to detect and contain malware that attempts root exploits in Android devices. The tool improves on previous techniques by targeting code written in the C programming language—which is often used to create root exploit malware, whereas the bulk of Android applications are written in Java.

Tags: *Cyber security*

First contagious airborne WiFi virus discovered

Science Daily, 25FEB2014

Researchers in the UK designed and simulated an attack by a virus, called "Chameleon," and found that not only could it spread quickly between homes and businesses, but it was able to avoid detection and identify the points at which WiFi access is least protected by encryption and passwords. [TECHNICAL ARTICLE](#)

Tags: *Cyber security, S&T UK*

“It is the facts that matter, not the proofs. Physics can progress without the proofs, but we can't go on without the facts” RICHARD FEYNMAN

ENERGY

[Infrared: A new renewable energy source?](#)

Harvard University, 03MAR2014

Researchers at Harvard University envision a device that would harvest energy from Earth's infrared emissions into outer space. They are proposing something akin to a photovoltaic solar panel, but instead of capturing incoming visible light, the device would generate electric power by releasing infrared light. [TECHNICAL ARTICLE](#)

Tags: Energy, Solar energy

[Two New Ideas in Wave and Tidal Power](#)

IEEE Spectrum, 03MAR2014

A couple of interesting ideas—one wave, one tidal—were on display this week at the ARPA-E Innovation Summit in Washington, D.C. They offer some clear advantages over many of the other attempts at drawing energy from the oceans.

Tags: Energy

[Going beyond the traditional electromagnetic generator](#)

Nanotechweb, 27FEB2014

Discovering a complementary relationship between a triboelectric generator and an electromagnetic generator, a team of researchers (USA, China) integrated them on a single device to harvest the mechanical energy from an automobile tyre. [TECHNICAL ARTICLE](#)

Tags: Energy

FORECASTING

[Predictive fitness model for influenza: Physics, computer science help find clues on flu evolution](#)

Science Daily, 26FEB2014

By studying the genomes of the virus, an international team of researchers (USA, Germany) devised a way to predict which viral strains have the optimal combination of innovation and conservation. While focused on influenza, the approach highlights a general link between evolution and its consequences for epidemiology that is relevant for many fast-evolving pathogens. [TECHNICAL ARTICLE](#)

Tags: Forecasting, Biology

INFORMATION TECHNOLOGY

[Magnet for fast and cheap data storage invented](#)

Science Daily, 03MAR2014

A team of researchers (UK, Germany, the Netherlands) reports on atomistic spin simulations of the laser-induced

magnetization dynamics on synthetic ferrimagnets. They demonstrate that the application of ultrashort laser pulses leads to sub-picosecond magnetization dynamics and all-optical switching in a similar manner as in ferrimagnetic alloys. [TECHNICAL ARTICLE](#)

Tags: Information Technology

[Data stored in magnetic holograms](#)

Physics World, 27FEB2014

A team of researchers (USA, Russia) has unveiled a new type of memory device based on the interference of spin waves. Data are stored in the form of magnetic bits and read out simultaneously as holographic images. Because the wavelengths of the spin waves are much shorter than those of light, the storage density of the memory has the potential to be much greater than systems based on optical holograms. [TECHNICAL ARTICLE](#)

Tags: Information Technology

MATERIALS SCIENCE

[Newly discovered catalyst could lead to the low-cost production of clean methanol from carbon dioxide](#)

Science Daily, 02MAR2014

Researchers at Stanford University combined theory and experimentation to identify a new nickel-gallium catalyst that converts hydrogen and carbon dioxide into methanol with fewer by-products than the conventional catalyst.

[TECHNICAL ARTICLE](#)

Tags: Materials science, Energy

[Physicists solve 20-year-old debate surrounding glassy surfaces](#)

Science Daily, 28FEB2014

Researchers in the UK have succeeded in measuring how the surfaces of glassy materials flow like a liquid, even when they should be solid. Understanding the mobility of glassy surfaces has implications for the design and manufacture of thin-film coatings and also sets practical limits on how small we can make nanoscale devices and circuitry. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T UK

[Squeezing out the hidden lives of electrons](#)

PhysOrg.com, 28FEB2014

The key to understanding what causes changes in material conductivity lies in teasing out contributions from structural atomic arrangements and electron interactions. An international team of researchers (USA, North Korea, China) has managed to disentangle these components

continued...

in vanadium sesquioxide. The interplay between crystal structure and electronic properties underlies almost every modern device, from pressure sensors to superconducting high speed trains. [TECHNICAL ARTICLE](#)

Tags: Materials science

FEATURED RESOURCE

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MICROELECTRONICS

[Electronics based on a 2-D electron gas](#)

[EurekaAlert](#), 03MAR2014

Researchers in Austria have created a stable two-dimensional electron gas in strontium titanate. In a thin layer just below the surface electrons can move freely and occupy different quantum states. This new material is a remarkable new instrument for designing electronics and possibly using exotic material effects such as superconductivity. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Materials science

[Relativity shakes a magnet](#)

[Nanowerk](#), 03MAR2014

An international team of researchers (UK, Japan, Germany, USA) created an internal magnetic cloud by applying an electric current inside a permanent magnet. The magnetic cloud was able to manipulate the surrounding permanent magnet. The observed phenomenon is closely related to the relativistic intrinsic spin Hall effect. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

PHOTONICS

[Novel Quantum dot laser paves the way for lower-cost photonics](#)

[Nanowerk](#), 04MAR2014

Researchers at the University of California, Santa Barbara, have demonstrated a novel quantum dot laser that is grown on silicon that performs as well as similar lasers grown on their native substrates. It requires less power to operate than quantum well lasers while outputting more light, so they would enable low-cost silicon photonics.

Tags: Photonics, Quantum science

[Optical nano-tweezers take over the control of nano-objects](#)

[Nanowerk](#), 02MAR2014

An international team of researchers (Australia, Spain) has demonstrated the ability to use near-field optical

tweezers to trap a nano-size object and manipulate it in all three dimensions of space. It is possible to manipulate and release a single nano-object without exerting any mechanical contact or other invasive action. [TECHNICAL ARTICLE](#)

Tags: Photonics

[Optical ‘nanocavity’ to boost light absorption in semiconductors; improve solar cells, cameras and more](#)

[Science Daily](#), 26FEB2014

An international team of researchers (USA, China) have developed an optical “nanocavity” that boosts the amount of light that ultrathin semiconductors absorb. The advancement could lead to more powerful photovoltaic cells and faster video cameras; it could be useful for splitting water using energy from light. [TECHNICAL ARTICLE](#)

Tags: Photonics, Advanced materials

QUANTUM SCIENCE

[‘Photon glue’ enables a new quantum mechanical state](#)

[PhysOrg.com](#), 03MAR2014

A team of researchers in the US and UK used light to create links between organic and inorganic semiconductors in an optical cavity—a mirror-lined nanoscale filament. The effect could harness the most useful characteristics from each material for hybrid solar cells and high efficiency lighting, among other applications. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[Report: China Working on New Intermediate-Range Missile](#)

[Global Security Newswire](#), 04MAR2014

The new ballistic missile, dubbed the Dongfeng-26C, is projected to be able to travel a minimum of 2,200 miles. “China is developing and will soon deploy new longer-range theater missiles as part of its anti-access, area denial strategies.”

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

[U.S. government releases 2014 National Nanotechnology Strategic Plan](#)

[Nanowerk](#), 28FEB2014

The 2014 National Nanotechnology Initiative Strategic Plan updates and replaces the prior NNI Strategic Plan released in February of 2011. The Plan describes the NNI vision and goals, specific objectives within each of the goals, and investment strategy and categories.

Tags: S&T policy, Government S&T

SENSORS

Pencil drawing of a sensor actually is a sensor

PhysOrg.com, 28FEB2014

Although graphite piezoresistive (PZR) sensors are much easier to fabricate than silicon ones, they generally are not as sensitive because graphite's electrical properties are not as good as those of silicon. Researchers in Taiwan have further investigated the underlying mechanisms of graphite's PZR properties and improved the sensitivity of graphite-based PZR sensors. TECHNICAL ARTICLE

Tags: *Sensors*

Quicker anthrax detection could save millions of dollars, speed bioterror response

University of Missouri, 07FEB2014

Researchers at the University of Missouri discovered that when the "bioluminescent reporter phage," an engineered virus, infects anthrax bacteria, it takes on a sci-fi-movie-type glow. This light, or the absence of it, could save millions of dollars for governments and save the lives of anthrax victims.

Tags: *Sensors, Biotechnology* ■

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