



S&T NEWS BULLETIN

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FEATURE ARTICLES

[IBM Makes Quantum Computing Available on IBM Cloud to Accelerate Innovation](#)

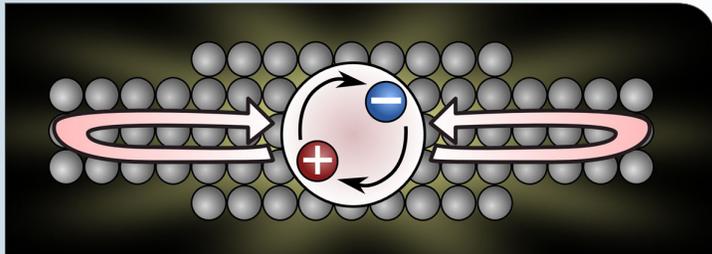
[IBM News](#), 04MAY2016

IBM scientists have built a quantum processor that users can access through a first-of-a-kind quantum computing platform delivered via the IBM Cloud onto any desktop or mobile device. The cloud-enabled quantum computing platform, called [IBM Quantum Experience](#), will allow users to run algorithms and experiments on IBM's quantum processor, work with the individual qubits, and explore tutorials and simulations around what might be possible with quantum computing. The processor is composed of five superconducting qubits.

Tags: Quantum science, Information technology, Featured Article

[Superfast light source made from artificial atom](#)

[PhysOrg.com](#), 26APR2016



In a quantum dot, there are both negatively charged particles and positively charged particles that are missing electrons (also referred to as holes). The attraction between the electron and hole creates a new quantum state with a very strong light-matter interaction and a corresponding quick release of light.

An international team of researchers (Denmark, UK) has developed a quantum dot so that it behaves as if it was comprised of five quantum dots, which means that the light is five times stronger. This is due to the attraction between the electron and the hole. But what is special is that the quantum dot still only emits a single photon at a time. [TECHNICAL ARTICLE](#)

Tags: Photonics, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Robot Spiders Weave Products from Plastic in a New Spin on 3-D Printing](#)

[MIT Technology Review](#), 29APR2016

Unlike a conventional robotic production line, which has to be carefully reconfigured for each new product, a team of mobile manufacturing bots would simply be given the latest design and left to go to work. Siemens is testing teams of creepy-crawly 3-D-printing robots which currently produce only very simple objects, like cubes, but the idea is that they would eventually clamber around a larger, more complex object, building it as they go.

Tags: Advanced manufacturing

ADVANCED MATERIALS

[Exploring phosphorene, a promising new material](#)

[Nanowerk](#), 29APR2016

Two-dimensional phosphane, a material known as phosphorene, has potential application as a material for semiconducting transistors. To overcome its anisotropic properties, an international team of researchers (USA - MIT, Rensselaer Polytechnic Institute, Oak Ridge National Laboratory, University of Pennsylvania, Japan) has developed a new method to quickly and accurately determine the orientation required to conduct electrons using the interactions between light and electrons within phosphorene and other atoms-thick crystals of black phosphorus. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

["Teslaphoresis" assembles nanostructures](#)

[Nanotechweb](#), 28APR2016

Dielectrophoretic systems can assemble quite small scale volumes of nanoscale material (between μL and mL). A team of researchers in the US (Rice University, University of Tennessee, Texas A&M University, Second Baptist School) has developed a new technique to self-assemble nanoscale structures on a large scale from the

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bottom up. Dubbed “teslaphoresis”, the technique can not only be used to fabricate carbon nanotube wires as long as 15 cm, but can also wirelessly power LED circuits made from the nanotubes. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Advanced manufacturing

[Graphene doped with hydrogen reveals its magnetism](#)

[Nanotechweb, 26APR2016](#)

An international team of researchers (Spain, France, Egypt) has demonstrated that hydrogen atoms can induce magnetism in graphene and they can be used to create a uniform magnetic order across the material. They also demonstrated that it is possible to atomically manipulate hydrogen atoms on graphene to control the local magnetic state. The use of spin as an additional degree of freedom would represent a tremendous boost to the versatility of graphene-based devices. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

[EMTech Digital, May 23-24, 2016, San Francisco, CA](#)

[MIT Technology Review, 27APR2016](#)

The EmTech Digital program will feature talks from many of the people and organizations that are defining this new digital era. These innovators will paint a clear picture of the implications to us all as the connected environments around us gain intelligence in the years to come.

Tags: Autonomous systems & robotics, Artificial intelligence

[Will Artificial Intelligence Win the Caption Contest?](#)

[MIT Technology Review, 27APR2016](#)

A team of researchers in the US (Carnegie Mellon University, Johns Hopkins University, University of Rochester, Virginia Tech, industry partner) describes an image captioning system that mimics humans’ unique style of visual storytelling. The team is teaching a neural-network-based system to infer a story from several images. Someday it could be used to automatically generate descriptions for sets of images, or to bring humanlike language to other applications for artificial intelligence. [TECHNICAL ARTICLE](#)

Tags: Autonomous systems & robotics, Artificial intelligence

BIG DATA

[Challenges in Data Science International Conference July 8-11, 2016, Matera, Italy](#)

[Physics World, 26APR2016](#)

The main objective of the meeting is the exploration of the multiple methodological intersections that have been devised in diverse areas to provide insights regarding e.g. acquisition and analysis of complex networks, resilience and vulnerability, cybersecurity and privacy. Data Science & Complex Systems Science can borrow new ideas and

techniques from each other contributing to the synergetic comprehension of both disciplines.

Tags: Big data

BIOTECHNOLOGY

[Microsoft Buys Into DNA Data Storage](#)

[IEEE Spectrum, 27APR2016](#)

Microsoft has taken a chunk of data that would normally be stored in a file on a hard drive, and has translated it into the genetic code of As, Cs, Gs, and Ts that represent the chemical building blocks of DNA. Then it asked synthetic biology startup Twist Bioscience to manufacture 10 million DNA strands with those sequences of letters. Once the data has been transformed into invisible molecules at the bottom of a test tube, the company will send it back to Microsoft for testing. The decoder required to read the data is held by Microsoft.

Tags: Biotechnology, Information technology

CYBER SECURITY

[New version of malware uses ‘God Mode’ to hide from Windows users](#)

[Digital Trends, 03MAY2016](#)

Dynamer is a piece of malware that’s been around for several years, but a new version riffs on “God Mode” to hide away on your system. A few devious tricks have been used in an attempt to prevent users from getting rid of the problem. The malware installs itself in the AppData directory, creating a registry run key value so that it can survive a reboot. However, when users click on the folder created by Dynamer during this process, they’ll simply be redirected to an unrelated area of the control panel.

Tags: Cyber security

[Cybersecurity report imagines threat scenarios](#)

[PhysOrg.com, 02MAY2016](#)

Researchers at UC Berkeley lay out five cybersecurity threat scenarios in a new report, [Cybersecurity Futures 2020](#). The report explores how emerging and as-yet-unknown forces could shape technology and security in the years ahead.

Tags: Cyber security

[Alarming Security Defects in SS7, the Global Cellular Network—and How to Fix Them](#)

[IEEE Spectrum, 27APR2016](#)

The network, called Signaling System 7, or SS7, is a digital signaling protocol that mobile phone carriers use to send messages to each other about who is a subscriber, where subscribers are located, and how calls should be routed to reach them. It has security defects that permit hackers and governments to monitor users’ locations and eavesdrop on conversations. Carriers have begun to install protections. In some countries, regulators have compelled companies to install certain protections.

Tags: Cyber security, Communications technology

continued...

“Science is the highest personification of the nation because that nation will remain the first which carries the furthest the works of thought and intelligence.” LOUIS PASTEUR

DARPA seeks to boost cyber attribution

Federal Computer Week, 26APR2016

DARPA is looking for technologies that create operationally and tactically relevant information about multiple concurrent cyber campaigns. The program also looks for a means of sharing information gleaned from attribution tools with any number of parties without exposing sources and methods. It is seeking technologies to extract biometrics from devices and algorithms for developing behavior profiles related to cyber campaigns, for example.

BAA

Tags: Cyber security, S&T Policy

ENERGY

Toward artificial photosynthesis: Mimicking the ingenuity of nature

Science Daily, 03MAY2016

The rare noble metal ruthenium is frequently used as a catalyst for artificial photosynthesis. Basically, the artificial system works with similar efficiency as its natural counterpart. However, the catalyst tends to decompose itself relatively quickly. Researchers in Germany incorporated the ruthenium atoms into special supramolecular structures which slow down the destruction and enable a kind of 'self-healing process.' They got one step closer to reaching the goal of artificial photosynthesis, a virtually inexhaustible source of a clean, climate-friendly energy.

TECHNICAL ARTICLE

Tags: Energy, Biomimetics, S&T Germany

ENVIRONMENTAL SCIENCE

Researchers list 'seven chemical separations to change the world'

Nature News, 26APR2016

Methods to purify chemicals that are more energy efficient could, if applied to the US petroleum, chemical and paper manufacturing sectors alone, save 100 million tonnes of carbon dioxide emissions and US\$4 billion in energy costs annually. The article highlights seven chemical separation processes that, if improved, would reap great global benefits.

Tags: Environmental science

IMAGING TECHNOLOGY

SMU engineering team leads DARPA research into holographic imaging of hidden objects

EurekaAlert, 28APR2016

A team of researchers in the US (Southern Methodist University, Rice University, Northwestern University, Harvard University) is working under a DARPA sponsored

project called REVEAL to build a theoretical framework for creating a computer-generated image of an object hidden from sight around a corner or behind a wall. The core of the proposal is to develop a computer algorithm to unscramble the light that bounces off irregular surfaces to create a holographic image of hidden objects.

Tags: Imaging technology, Government S&T

MATERIALS SCIENCE

Theory establishes a path to high-performance 2-D semiconductor devices

Science Daily, 26APR2016

A large and tunable Schottky barrier between the semiconductor and a metal contact acts as a barrier and creates an obstacle for the flow of electrons or holes through the 2D semiconductor such as molybdenum disulfide. An international team of researchers (USA - National Renewable Energy Laboratory, CalTech, China) discovered that the height of the Schottky barrier can be adjusted-or even made to vanish-by using certain 2D metals as electrodes.

TECHNICAL ARTICLE

Tags: Materials science, Government S&T

MEDICAL SCIENCES

New drug against nerve agents in sight

Science Daily, 03MAY2016

The nerve agent sarin causes a deadly overstimulation of the nervous system that can be stopped if treated with an antidote within minutes of poisoning. An international team of researchers (Sweden, Germany) describes in detail how such a drug works. The research opens up new opportunities in finding antidotes to sarin and other nerve agents by structure-based molecular design.

TECHNICAL ARTICLE

Tags: Medical Sciences

Danish researchers behind vaccine breakthrough

Medical Express, 26APR2016

The idea behind the new technique developed by researchers in Denmark is to mimic the structure of a virus. When you have made the virus structure, it is used as a platform onto which are glued harmless parts of the disease which you want to vaccinate against. This creates an overall virus-like structure, which constitutes an important danger signal for the body. The immune system will therefore produce antibodies against the disease—a mechanism which has been difficult to activate by traditional vaccines.

Tags: Medical Sciences

continued...

NEUROSCIENCE

Novel electrode systems unveil the mechanisms behind human movement**Medical Express, 02MAY2016**

Moving our arm and hand to seize an object is the result of complex events taking place in our brain, spinal cord, nerves and muscles. The events include ion exchanges across membranes, electrochemical mechanisms, and active ion pumping through energy expenditure. Researchers in Germany working under the EU sponsored project DEMOVE (Decoding the Neural Code of Human Movements for a New Generation of Man-Machine Interfaces) have developed electrode systems that are able to replicate the subtle combination of mechanisms underlying human movements. The research has applications in the fields of robotics and prosthetics.

Tags: Neuroscience, S&T Germany

FEATURED RESOURCE

Academia.edu

Academia.edu is a platform for academics to share their research, monitor deep analytics around the impact of their research, and track the research of academics they follow. Free sign up required.

PHOTONICS

New fabrication and thermo-optical tuning of whispering gallery microlasers**Nanowerk, 03MAY2016**

Taking advantage of the different melting temperatures of silica and Er or Yb doped phosphate glass, an international team of researchers (Japan, China) has devised a new way to produce microlasers via glass wetting, or glass-on-glass fabrication and tune them using compressed air. The new technique could pave the way for the simple serial production of glass microlasers and could be used in a wide range of applications, such as optical communications, chemical or biosensing.

TECHNICAL ARTICLE*Tags: Photonics***A tiny switch for a few particles of light****PhysOrg.com, 29APR2016**

Until now, for a light beam to perceive another one, it has required a large chunk of material as intermediary, and very intense light. A team of researchers in Germany has demonstrated for the first time a mediation process with only a single organic molecule and just a handful of photons. The researchers influence and switch another light beam with these particles of light. This basic experiment may help in the development of nano-optical transistors for a photonic computer. **TECHNICAL ARTICLE**

*Tags: Photonics***Superfluid Increases Force of Laser Light****American Physical Society Focus, 29APR2016**

Lasers can generate forces in microscopic systems, such as for mechanical control of nanodevices or manipulation of bits of quantum information. A team of researchers in Australia has demonstrated a new technique for creating a mechanical force using a laser, through the evaporation of superfluid helium. The force is 10 times greater than other methods can achieve in the cryogenic regime and could be used to cool tiny mechanical oscillators that act as detectors of minute forces or as experimental systems for studying their quantum states of motion. **TECHNICAL ARTICLE**

Tags: Photonics, S&T Australia

QUANTUM SCIENCE

A Laser-Driven Nudge for Spintronics**Optics and Photonics News, 03MAY2016**

An international team of researchers (Germany, Russia, Czech Republic) has used circularly polarized, femtosecond laser pulses to control spin-polarized currents within topological insulators. The combination of these exotic materials and tight, ultrafast control by laser light could open up some intriguing possibilities for low-energy exploitation of spintronics in future IT. **TECHNICAL ARTICLE**

*Tags: Quantum science, Information technology***Quantum logical operations realized with single photons****Science Daily, 03MAY2016**

For the realization of a quantum computer, a quantum logic gate that assigns output signals to input signals in a deterministic way would be an essential building block. Researchers in Germany have demonstrated how an important gate operation can be realized with single photons. A first light pulse containing one photon only is stored as an excitation in an ultracold cloud of about 100,000 rubidium atoms. This gives rise to the effect that a second light pulse that passes through the cloud exhibits a phase shift of 180 degrees. **TECHNICAL ARTICLE**

*Tags: Quantum science, S&T Germany***Could aluminum nitride be engineered to produce quantum bits?****Science Daily, 02MAY2016**

The leading method for creating qubits currently involves exploiting the structural defects in diamonds. A team of researchers in the US (University of Chicago, Argonne National Laboratory) found that by applying strain to aluminum nitride, one could create structural defects that may be harnessed as qubits similar to the one seen in diamond. This could significantly reduce the cost of manufacturing quantum technologies. **TECHNICAL ARTICLE**

*Tags: Quantum science**continued...*

Why quantum cryptography could be a one-way street

PhysOrg.com, 28APR2016

A curious type of non-local phenomenon, known as one-way quantum steering, has been demonstrated experimentally for the first time by two independent groups of researchers (Australia, UK and China, Singapore). This phenomenon is similar to quantum entanglement but applies when one of the two parties sharing a quantum state does not trust the source of quantum particles. The researchers say their work could help to broaden applications of quantum cryptography.

TECHNICAL ARTICLE 1, 2

Tags: Quantum science

Quantum filter integrates 20,000 Josephson junctions

Physics World, 26APR2016

The SQIFs (superconducting quantum interference filters), made by researchers in Australia, comprised 20,000 Josephson junctions with loop areas that have a random size distribution. They were made by creating several "steps" on the surface of a magnesium-oxide substrate. Potential applications for SQIFs include highly sensitive magnetometers for use in geophysical exploration. The devices could also be used as large-bit digital-to-analogue converters; low-noise amplifiers; and sub-wavelength radio-frequency antennas.

TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

Anticipating artificial intelligence

Nature News, 26APR2016

As AI converges with progress in robotics, cloud computing and precision manufacturing, tipping points will arise at which significant technological changes are likely to occur very quickly. It is crucial that progress in technology is matched by solid, well-funded research to anticipate the scenarios it could bring about, and to study possible political and economic reforms that will allow those usurped by machinery to contribute to society.

Tags: Science without borders, Artificial intelligence

Helping engineers refine their negotiation skills

MIT News, 26APR2016

Many engineers can dream up promising inventions; they can even produce a business plan and find interested investors. What they don't know how to do, though, is negotiate on their own behalf. The MIT Professional Education course introduces strategies for entrepreneurial negotiations.

Tags: Science without borders

SENSORS

Compact Radar System Promises to Let Small Drones Cut the Leash

MIT Technology Review, 02MAY2016

A company in the US has developed technology that simplifies and shrinks the complex antenna array needed to make a scanning radar system that operates like those of military and commercial aircraft. They do it using metamaterials capable of manipulating electromagnetic signals in ways impossible for conventional metals and other materials. The scanning radar could let drones far from their pilots detect and avoid other aircraft.

Tags: Sensors

Making invisible physics visible

Science Daily, 02MAY2016

A team of researchers in the US (UC Santa Barbara, UCLA) has created a radically new sensor capable of nanometer-scale spatial resolution and exquisite sensitivity. It operates from room temperature down to low temperatures where thermal energy is low enough, the effects of electron interactions, for instance, become observable, leading to new phases of matter. We can now probe these with unprecedented spatial resolution.

TECHNICAL ARTICLE

Tags: Sensors

Quantum sensors for high-precision magnetometry of superconductors

Science Daily, 02MAY2016

An international team of researchers (Switzerland, Germany) has developed a new method that has enabled them to image magnetic fields on the nanometer scale at temperatures close to absolute zero for the first time. They used spins in special diamonds as quantum sensors in a new kind of microscope to generate images of magnetic fields in superconductors with unrivaled precision. The findings are of relevance for quantum sensor technology and superconductivity, biology and solid state physics.

TECHNICAL ARTICLE

Tags: Sensors, Quantum science ■

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