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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

New half-light half-matter quantum particles created

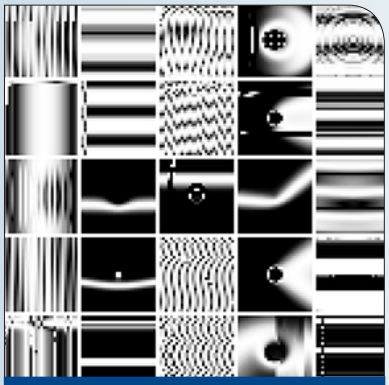
Science Daily, 29DEC2014

An international team of researchers (USA, Taiwan, Canada) has discovered half-light, half-matter particles in atomically thin semiconductors (thickness ~ a millionth of a single sheet of paper) consisting of a two-dimensional layer of molybdenum and sulfur atoms arranged similar to graphene. They sandwiched this 2D material in a light trapping structure to realize these composite quantum particles. Besides being a fundamental breakthrough, this opens up the possibility of making devices which take the benefits of both light and matter. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

"Smart" Software Can Be Tricked into Seeing What Isn't There

MIT Technology Review, 24DEC2014



Images like these were created to trick machine learning algorithms. The software sees each pattern as one of the digits 1 to 5.

A team of US researchers (Cornell University, University of Wyoming) can create images that appear to a human as scrambled nonsense or simple geometric patterns, but are identified by the software as an everyday object such as a school bus. The trick images offer new insight into the differences between how real brains and the simple simulated neurons used in deep learning process images.

Tags: Neuroscience, Information technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

Researchers discover new method to convert CO2 to a valuable organic compound

PhysOrg.com, 22DEC2014

Researches at Louisiana State University have developed a three-step reaction sequence in which a copper complex converts carbon dioxide to oxalate under mild conditions. A key component to this discovery was the development of a compound that would react with carbon dioxide. TECHNICAL ARTICLE

Tags: Advanced materials

Ultrasounds dance the 'moonwalk' in new metamaterial

Science Daily, 22DEC2014

Researchers in France have developed a new type of metamaterial, in the fluid phase, formed of porous silicone microbeads embedded in a water-based gel. This metafluid is the first three-dimensional metamaterial to work at ultrasonic frequencies. It can be made using physico-chemical processes and microfluidics technologies, which are much easier to implement than micromechanical methods. TECHNICAL ARTICLE

Tags: Advanced materials, S&T France

AUTONOMOUS SYSTEMS & ROBOTICS

New-generation 'thinking' biomimetic robots developed as ocean engineering solutions

Science Daily, 23DEC2014

Researchers in Singapore are currently putting final touches to a robotic sea turtle which could move about underwater including diving to deeper depths vertically like a real turtle. The robot does not use a ballast system making it smaller, lighter, and enabling it to carry bigger payloads. They envision a swarm of tiny turtles which communicate with each other and act collaboratively.

Tags: Autonomous systems & robotics

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BACK TO TOP

Zoom in, Zoom out: Speedy, Agile UAVs Envisioned for Troops in Urban Missions

DARPA News, 22DEC2014

DARPA has issued a Broad Agency Announcement solicitation for the Fast Lightweight Autonomy (FLA) program. FLA focuses on creating a new class of algorithms to enable small, unmanned aerial vehicles to quickly navigate a labyrinth of rooms, stairways and corridors or other obstacle-filled environments without a remote pilot. SOLICITATION

Tags: Autonomous systems & robotics, Government S&T

BIG DATA

Decision cascades in social networks

PhysOrg.com, 22DEC2014

With the right timing strategy, the cascade can have a good likelihood of spreading very widely, while with the wrong strategy, it can have very little chance of going far. The mathematical and computational challenge is to characterize the kinds of timing strategies that are most effective. An international team of researchers (USA, Italy) provides an algorithm for this timing or scheduling problem in cascades, adapted from a widely used framework in economic theory. TECHNICAL ARTICLE

Tags: Big data, Information technology

CYBER SECURITY

Hacker replicate politician's fingerprint to warn of biometric security dangers

Digital Trends, 29DEC2014

A researcher in Germany used several photos, taken three meters away from a politician during a public press conference, and software called VeriFinger to recreate her fingerprint. Other image-processing software can also be used. A camera with a sharp lens may not be necessary, if your phone has a good enough camera. While the print may not be 100 percent accurate it can be used to fool Touch ID on any iPhone as well as other devices with fingerprint sensors.

Tags: Cyber security

Computer programs 'mutate' to outlast viruses

Futurity, 26DEC2014

Researchers at Michigan State University pitted self-replicating computer programs against computer viruses in the domain of the Avida platform for digital evolution. The co-evolution of host and virus ultimately led to organisms with capabilities superior to those of organisms that evolved without battling the viruses.

Tags: Cyber security

ENERGY

Intelligent façades generating electricity, heat and algae biomass

PhysOrg.com, 22DEC2014

An international team of researchers (led by Germany) intends to develop functional façades and window modules, together with an integrated production process to achieve an as to yet unmatched readiness to market. The structured glass contains microfluidic channels through which a functional fluid circulates. As an example, this liquid will make it possible to automatically adjust the incidence of light or to harvest exterior heat which will then be transported to a heat pump.

Tags: Energy

FORECASTING

Mostly Right! Updates on Our 2014 Predictions

IEEE Spectrum, 25DEC2014

It's that time of year when we look back and take stock of what we've accomplished. At IEEE Spectrum that means seeing how well our predictions from last January's tech forecast turned out. In our humble opinion, we did pretty well.

Tags: Forecasting, Emerging technology

GOVERNMENT S&T

NASA launches next-generation scientific balloon

Nature News, 29DEC2014

On 28 December at 21:16 London time, technicians inflated and released a 532,000-cubic-metre aerostatic balloon from near McMurdo Station in Antarctica. The new super-pressure balloon is carrying a γ-ray telescope to hunt for high-energy photons streaming from the cosmos. Known as the Compton Spectrometer and Imager (COSI), it can detect where in the sky these γ rays are coming from, and thus begin to unravel various astronomical mysteries.

Tags: Government S&T, NASA

INFORMATION TECHNOLOGY

2014 in Computing: Breakthroughs in Artificial Intelligence

MIT Technology Review, 29DEC2014

The most striking research results in AI came from the field of deep learning, which involves using crude simulated neurons to process data. Machine learning was also a source of new products this year from computing giants, small startups, and companies outside the computer industry.

Tags: Information Technology, Artificial intelligence

continued...

"It's really clear that the most precious resource we all have is time."

STEVE JOBS

Evolvable internet architecture

PhysOrg.com, 29DEC2014

An international team of researchers (China, UK) has developed a novel evolvable Internet architecture framework under the evolvability constraint, the economic adaptability constraint and the manageability constraint. They consider that the evolvable architecture can be developed from the network layer under these design constraints. TECHNICAL ARTICLE

Tags: Information Technology

Taking the grunt work out of Web development

MIT News, 23DEC2014

Researchers at MIT describe a new programming language, called Ur/Web, that lets developers write Web applications as self-contained programs. The language's compiler then automatically generates the corresponding XML code and style-sheet specifications and embeds the JavaScript and database code in the right places. In addition to making Web applications easier to write, Ur/Web also makes them more secure.

Tags: Information Technology

Baidu Deep Speech system 81% accurate in noisy environments compared to 65% for best commercial systems

Next Big Future, 21DEC2014

Baidu researchers' approach is a well-optimized RNN training system that uses multiple GPUs, as well as a set of novel data synthesis techniques that allow them to efficiently obtain a large amount of varied data for training. Their system, called DeepSpeech, outperforms previously published results on the widely studied Switchboard Hub5'00, achieving 16.5% error on the full test set. TECHNICAL ARTICLE

Tags: Information Technology

MATERIALS SCIENCE

Ionic liquids open door to better rare-earth materials processing

PhysOrg.com, 24DEC2014

Researchers at DOE's Ames Laboratory are tuning the ionic liquids in such a way that they dissolve rare-earth oxides and then they are using electrodeposition, where electricity is run through a liquid to create a chemical change to get the rare earth in metal form.

Tags: Materials science, Government S&T

Magnetic vortices: Controlling core switching in Pac-man disks

Nanowerk, 24DEC2014

Despite many efforts switching between magnetic vortices, which encode information, is still slow and requires very large currents. Pac-man disks seem to be a promising approach. Through simulations, researchers in Japan found that the notch - Pac-man's mouth - plays the double role of annihilating and nucleating the vortex core. Their results suggest that by utilizing both the core switching at the notch edge and the direction of the core motion, the core polarity can be uniquely controlled by adjusting the direction of the current pulse. Current density could be reduced by 75%. TECHNICAL ARTICLE

Tags: Materials science, Information technology, S&T Japan

World's most complex crystal simulated

PhysOrg.com, 24DEC2014

Researchers at the University of Michigan have produced icosahedral quasicrystals in a computer simulation. Icosahedral quasicrystals are commonly found in metal alloys but engineers are still searching for efficient ways to make them with other materials. Due to their high symmetry under rotation, they can have photonic band gap. The researchers say the most exciting aspect of the findings is the insight they provide into how icosahedral quasicrystals form. TECHNICAL ARTICLE

Tags: Materials science

How electrons split: New evidence of exotic behaviors

Science Daily, 23DEC2014

In certain materials where the electrons are constrained in a quasi one-dimensional world, they appear to split into a magnet and an electrical charge, referred to as "fractional particles," which can move freely and independently of each other. A team of international researchers (Switzerland, France, USA, Denmark) has uncovered new evidence showing that this can happen in quasi two-dimensional magnetic materials. TECHNICAL ARTICLE

Tags: Materials science

Universality of Charge Order in Cuprate Superconductors

Science Newsline, 23DEC2014

An international team of researchers (USA, Poland, China, Germany, Italy, Turkey, Switzerland, France, Austria) identified charge order in HgBa2CuO4, a pristine cuprate material with a rather simple crystal structure that

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superconducts at temperatures as high as minus 175 degrees centigrade. They found a universal connection between the period of quantum oscillations and the spatial period of the charge order which helps distinguish between important and spurious effects. TECHNICAL ARTICLE

Tags: Materials science

First direct evidence that a mysterious phase of matter competes with high-temperature superconductivity

Science Daily, 20DEC2014

A team of US researchers (Stanford University, DOE's SLAC National Accelerator Laboratory) has found the first direct evidence that a mysterious phase of matter known as the "pseudogap" competes with and suppresses superconductivity, robbing it of electrons that otherwise might pair up to carry current through a material with 100 percent efficiency. If we can somehow remove this competition, or handle it better, we may be able to raise the operating temperatures of these superconductors. TECHNICAL ARTICLE

Tags: Materials science, Government S&T

Featured Resource

Data.gov

Data.gov is the home of the US government's open data. You can find Federal, state and local data, tools, and resources to conduct research, build apps, design data visualizations, and more. It is an open source.

MICROELECTRONICS

World's first successful use of an electric circuit to compensate for distortions in electric signals due to heat

PhysOrg.com, 24DEC2014

Researchers in Japan modelled the thermal effects of a heterojunction bipolar transistor in an integrated circuit using thermal resistors and thermal capacitors. The circuit elements were arranged in a 'ladder circuit' comprising repeating units of thermal resistors and thermal capacitors. To compensate the signal distortion on the integrated circuit, an electric 'ladder circuit' was connected. TECHNICAL ARTICLE

Tags: Microelectronics, S&T Japan

NEUROSCIENCE

Neuroscientists have worked out how to "read" and "write" brain signals

Science Alert (Australia), 27DEC2014

Researchers in the UK genetically encoded sensors that allow nerve cells to visibly light up when they're active. They also genetically engineered these same nerve cells to express light-sensitive proteins, which means that they could be activated with flashes of light. The technique allows researchers to both observe and control brain activity in mice. TECHNICAL ARTICLE

Tags: Neuroscience, S&T UK

PHOTONICS

Halting photons could lead to miniature particle accelerators, improved data transmission

PhysOrg.com, 22DEC2014

The new work by researchers at MIT shows that the light-trapping process, which involves twisting the polarization direction of light is based on a kind of vortex. In addition to revealing the mechanism responsible for trapping light, the new analysis shows that this trapped state is much more stable than had been thought, making it easier to produce and harder to disturb.

Tags: Photonics

QUANTUM SCIENCE

A qubit candidate shines brighter

Science Daily, 29DEC2014

A team of US researchers (Harvard University, UC Santa Barbara, University of Chicago) controlled the depth of the diamond defects using a technique called delta doping. The technique confines the possible location of NV centers to a layer approximately 6 nanometers thick sandwiched inside a diamond membrane approximately 200 nanometers thick. The researchers then etched holes into the membrane to create the photonic cavities. Using this method the researchers were able to increase the intensity of the light emitted by the NV centers by a factor of about 30. TECHNICAL ARTICLE

Tags: Quantum science

Atoms queue up for quantum computer networks

PhysOrg.com, 23DEC2014

Researchers in Denmark demonstrate preparation and detection of an atom number distribution in a one-dimensional atomic lattice with the variance −14 dB below the Poissonian noise level. A mesoscopic ensemble containing a few thousand atoms is trapped in the evanescent field of

continued...

a nanofiber. The method is very well suited for generating collective atomic entangled or spin-squeezed states via a quantum non-demolition measurement as well as for tomography of exotic atomic states in a one-dimensional lattice. TECHNICAL ARTICLE

Tags: Quantum science

The importance of three-way atom interactions in maintaining coherence

PhysOrg.com, 22DEC2014

A team of researchers in the US (Washington State University, American University, NIST) argues that scientists should also study 4-atom and higher-order interactions among atoms in order to get a better understanding of what might be called quantum revivalism or de-phasing or de-decoherence. They suggest that using polar molecules, clumps of atoms that have a net electric dipole, would add still more interaction possibilities to this subject. TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

Finding faster-than-light particles by weighing them

PhysOrg.com, 26DEC2014

According to a researcher at George Mason University neutrino is very likely a tachyon or faster-than-light particle with an imaginary mass of 0.33 electronvolts. He deduced this value by showing that six different observations from cosmic rays, cosmology, and particle physics all yield this same value within their margin of error. TECHNICAL ARTICLE

Tags: Science without borders, Particle physics

Predicting the Great Achievements of the 21st Century

IEEE Spectrum, 25DEC2014

Looking at the technologies of 1914 might give a hint to the future. We can group these achievements into three categories: those that had already happened, those that were anticipated, and those that could not possibly have been predicted by anyone in 1915. Applying this reasoning to the current day suggests some possibilities for the year 2100 list of achievements may be Wireless technology (already happened and ongoing), machine intelligence and 3-D printing (anticipated). By definition the technological surprises are beyond imagination.

Tags: Science without borders

Does journal peer review miss best and brightest?

Science Daily, 22DEC2014

Researchers in Canada were able to examine the peer-review history of 1008 articles that were submitted to three elite medical journals. Only 6.2% of the manuscripts were accepted, confirming just how difficult it is to be published in a top-tier journal. The researchers found that, by and large, the gatekeeping system was predictive of a paper's eventual number of citations. Low acceptance rates in journals may foster exclusivity and prestige but if the sample is representative of science as a whole, journals might also be missing important research that is esoteric or unconventional.

Tags: Science without borders, Bibliometrics

Mathematicians Make a Major Discovery About Prime Numbers

Wired, 22DEC2014

This past August, two different groups of mathematicians released papers proving a long-standing conjecture by the mathematician Paul Erdős about how large prime gaps can get. The two teams have joined forces to strengthen their result on the spacing of primes still further, and expect to release a new paper later this month.

Tags: Science without borders ■

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