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## FEATURE ARTICLES

### [Our 14th annual celebration of people who are driving the next generation of technological breakthroughs.](#)

[MIT Technology Review, 19AUG2014](#)

All 35 of these people are doing exciting work that could shape their fields for decades. But they're solving problems in remarkably different ways. They are driving the next generation of technological breakthroughs.

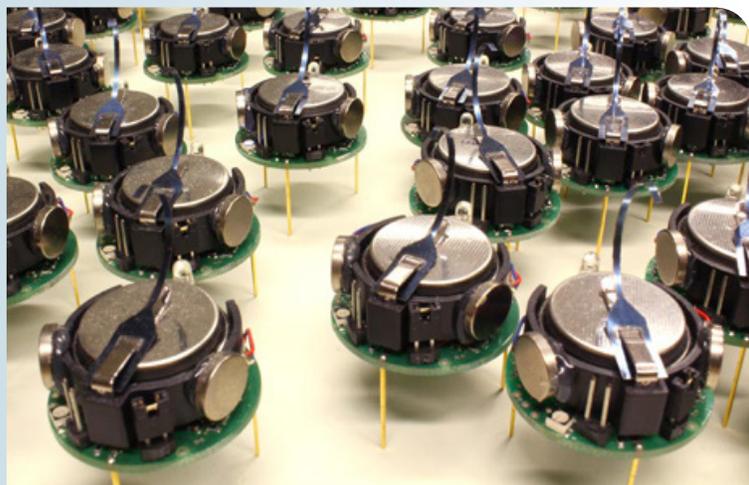
*Tags: Science without borders, Featured Article*

### [A self-organizing thousand-robot swarm](#)

[Harvard University, 14AUG2014](#)

The first thousand-robot flash mob has been assembled at Harvard University. Just as trillions of individual cells can assemble into an intelligent organism, or a thousand starlings can form a great flowing murmuration across the sky, the Kilobots demonstrate how complexity can arise from very simple behaviors performed en masse. [VIDEO](#)

*Tags: Autonomous systems & robotics, Featured Article*



*The Kilobots, a swarm of one thousand simple but collaborative robots. (Photo courtesy of Mike Rubenstein and Science/AAAS.)*

## S&T NEWS ARTICLES

### ADVANCED MATERIALS

#### [Fast synthesis of graphene oxide nanosheets with ultrasonic waves](#)

[Nanowerk, 18AUG2014](#)

Researchers in Iran produced graphene oxide nanosheets through a chemical process (Hummer's method) by using ultrasonic waves with low intensity. High quality products are obtained in 20 minutes at ambient temperature.

[TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

#### [Multilayer silicene proves stable in air](#)

[Nanotechweb, 18AUG2014](#)

Researchers in Italy have demonstrated that they can manage multilayer silicene outside an ultrahigh vacuum for at least 24 hours, which is largely long enough to perform any industrial microelectronic process or physical measurements. Silicene has attracted interest both in terms of the fundamental physics behind its properties and new technologies that might exploit them.

[TECHNICAL ARTICLE](#)

*Tags: Advanced materials, S&T Italy*

#### [New material could be used for energy storage](#)

[PhysOrg.com, 14AUG2014](#)

Researchers at Lawrence Livermore National Laboratory developed ultralow-density, ultrahigh surface area bulk material with an interconnected nanotubular makeup.

It could be used in catalysis, energy storage and conversion, thermal insulation, shock energy absorption and high energy density physics. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Government S&T*

#### [Custom-made carbon nanotubes](#)

[Nanowerk, 13AUG2014](#)

An international team of researchers (Germany, Switzerland) has succeeded in growing single-walled carbon nanotubes (CNTs) with only a single, pre-specified structure using custom-made organic precursor molecules. Such CNTs could be used in the future in

*continued...*

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ultra-sensitive light detectors and very tiny transistors.

#### TECHNICAL ARTICLE

*Tags: Advanced materials, CNT*

## AUTONOMOUS SYSTEMS & ROBOTICS

### Air Force tests reconnaissance system to give forces better picture of surroundings

[Fierce Government IT](#), 18AUG2014

The technology called Skate is a portable, adaptable and customizable Small Unmanned Aircraft System, or SUAS. Users send the square black device out like a remote-controlled airplane, which records video that warfighters can watch to understand the vicinity, giving them a clearer picture of where they are, much like police officers who walk their beats.

*Tags: Autonomous systems & robotics, Military technology*

### Video Friday: George Takei Meets Baxter, Jibo Origins, and Underwater Cake

[IEEE Spectrum](#), 15AUG2014

Watching the ESA's Eurobot rover move slowly around indoors isn't inherently that exciting, but in this case, it's being controlled from space by an astronaut aboard the ISS.

*Tags: Autonomous systems & robotics*

### Top 10 Reasons Drones Are Disruptive

[Forbes](#), 11AUG2014

Drones are in their deceptive phase, about to go disruptive. Technical challenges aside, we'll have to address many sociopolitical challenges before drones become disruptive.

*Tags: Autonomous systems & robotics*

## BIG DATA

### The Emerging Pitfalls Of Nowcasting With Big Data

[MIT Technology Review](#), 18AUG2014

Statisticians have boasted of the benefits of big data. Now they're discovering the weaknesses. There's no question that important information relating to economics, health and other things can be extracted from big data given the right tools. But exactly how this should be done accurately and reliably is still the subject of significant debate.

#### TECHNICAL ARTICLE

*Tags: Big data*

### Visual control of big data

[MIT News](#), 15AUG2014

Researchers at MIT have developed a data-visualization tool called DBWipes that lets users highlight aberrations and possible patterns in the graphical display; the tool then automatically determines which data sources are responsible for which. The provenance-tracking system provides a

compact representation of the source of the summarized data so that users can easily trace visualized data back to the source—and conversely, track source data to the pixels that are rendered by it.

*Tags: Big data*

### New tool makes a single picture worth far more than a thousand words

[Science Daily](#), 14AUG2014

The software developed by researchers at UC Berkeley seeks to tame the vast amount of visual data by generating a single photo that can represent massive clusters of images. It works by generating an image that averages the key features of the other photos. Users can also give extra weight to specific features to create subcategories and quickly sort the image results.

*Tags: Big data*

## BIOTECHNOLOGY

### Artificial cells act like the real thing

[Science Daily](#), 18AUG2014

Researchers in Israel have created an artificial, network-like cell system that is capable of reproducing the dynamic behavior of protein synthesis. This achievement may pave the way toward controlling the synthesis of both naturally-occurring and synthetic proteins for a host of uses.

*Tags: Biotechnology*

### Novel lung-on-a-chip developed

[Science Daily](#), 14AUG2014

The microdevice developed by researchers at the University of North Carolina at Chapel Hill includes multiple vertically stacked cellular layers that mimic the structure of the airway tissue. It could provide insight into biological and pathophysiological effects that conventional cell cultures or animal models do not capture, and help lead to the development of new therapeutics.

#### TECHNICAL ARTICLE

*Tags: Biotechnology, Advanced manufacturing*

## CYBER SECURITY

### New hacking scenario emerges: Wi-Fi signal-sniffing drones

[Defense Systems](#), 15AUG2014

According to security experts, the inherent openness of Wi-Fi and other wireless networks, along with the proliferation of mobile devices constantly seeking network connections, provide a tempting target for signal-sniffing drones. The security perimeter of an office building will now have to include the airspace around the structure, because that airspace can be easily surveyed by drones at standoff distances.

*Tags: Cyber security*

“Research is the process of going up alleys to see if they are blind.”

MARSTON BATES

### **Researchers develop defense against cyberattacks**

Science Daily, 15AUG2014

According to a report, five western intelligence agencies are using the Hacienda software to identify vulnerable servers across the world in order to control them and use them for their own purposes. Researchers in Germany have developed free software that can help prevent this kind of identification and thus the subsequent capture of systems.

Tags: Cyber security, S&T Germany

## FORECASTING

### **Long term growth to 2060**

Next Big Future, 18AUG2014

Global GDP is expected to grow at around 3% per year over the next 50 years, but wide variations are forecast between countries and regions. Fast-growing emerging countries will be the principal driver of the long-term outlook. Growth rates of emerging countries will eventually slow, converging towards those projected for the OECD area.

Tags: Forecasting

## IMAGING TECHNOLOGY

### **Microwave multi-tool**

PhysOrg.com, 19AUG2014

An international team of researchers (UK, Spain) has developed a resonator element that can simultaneously act as both a filter and antenna. This is a step towards creating PROMFAs (Programmable Microwave Function Array) the microwave circuit equivalent of an FPGA.

Tags: Imaging technology

### **New 'invisibility cloak': Octopus-inspired camouflage systems automatically read surroundings and mimic them**

Science Daily, 18AUG2014

Researchers at the University of Houston have developed an optoelectronic camouflage system that allows a material to automatically read its environment and adapt to mimic its surroundings. TECHNICAL ARTICLE

Tags: Imaging technology, Military technology

## MATERIALS SCIENCE

### **Promising ferroelectric materials suffer from unexpected electric polarizations**

Nanowerk, 18AUG2014

Researchers at the U.S. Department of Energy's Brookhaven National Laboratory have discovered nanoscale asymmetries and charge preferences hidden within ferroelectrics

that may explain their operational limits. They found that the opposing electronic configurations only allowed for polarization in one direction—a non-starter for reading and writing data.

Tags: Materials science, Government S&T

### **To bolster lithium battery life, add a little salt**

PhysOrg.com, 14AUG2014

Researchers at Cornell University report that adding certain halide salts to liquid electrolytes spontaneously creates nanostructured surface coatings on a lithium battery anode that hinder the development of detrimental dendritic structures that grow within the battery cell. The discovery opens the way potentially to extend the daily cycle life of a rechargeable lithium battery by up to a factor of 10. TECHNICAL ARTICLE

Tags: Materials science

### **Pitt engineer turns metal into glass**

PhysOrg.com, 13AUG2014

The novel method of creating metallic glass, developed by researchers at the University of Pittsburgh, involved developing and implementing a new technique that achieved a high cooling rate that allowed for the transformation of liquefied elemental metals tantalum and vanadium into glass. TECHNICAL ARTICLE

Tags: Materials science

## MICROELECTRONICS

### **A New Chip Could Add Motion Sensing to Clothing**

MIT Technology Review, 19AUG2014

A company in the US has made a new kind of accelerometer that senses motion from inside a smartphone or fitness monitor. The component is small and cheap enough to lead to smart electronics in clothing and sports equipment. The new accelerometers are a millimeter across, less than half the size of conventional ones.

Tags: Microelectronics, Flexible electronics

### **Computer scientist reviews frontier technologies to determine fundamental limits of computer scaling**

PhysOrg.com, 13AUG2014

Researchers at the University of Michigan review limiting factors in the development of computing systems to help determine what is achievable, identifying “loose” limits and viable opportunities for advancements through the use of emerging technologies. TECHNICAL ARTICLE

Tags: Microelectronics

continued...

## [Researchers roll out free software to advance computer chip design](#)

PhysOrg.com, 13AUG2014

The FreePDK15, developed by researchers at North Carolina State University, gives chip designers accurate rules and definitions for what optical lithography can (and can't) do on the 15 nm scale. The software allows designers free rein to explore new ideas, while keeping them within the bounds of what is physically possible.

Tags: *Microelectronics*

## PHOTONICS

### [New optical frequency comb has record low laser relative intensity noise](#)

PhysOrg.com, 18AUG2014

Researchers in Switzerland have demonstrated an optical frequency comb that has record low laser relative intensity noise and in which the carrier envelope offset frequency has been stabilised to very low level. The performance of their frequency comb is an order of magnitude better than typical Ti:Sa based systems, and 2–3 orders of magnitude better than systems using lasers with similar pulse duration and repetition rate.

Tags: *Photonics, S&T Switzerland*

## FEATURED RESOURCE

### [Open Quantum Materials Database \(OQMD\)](#)

The OQMD, developed by Northwestern University, is a database DFT calculated thermodynamic and structural properties. Online interface is provided for convenient, small scale access; for more powerful utilization one can download the entire database and the API for interfacing.

### [A mirror with a peephole](#)

PhysOrg.com, 13AUG2014

Researchers at MIT found a way to manipulate the Brewster angle in a specially designed photonic crystal mirror, achieving control over the light by controlling its angle of travel into a material. The principle could be applied to new applications in microwave and optical frequency regimes, including radar tracking and laser scanning. [TECHNICAL ARTICLE](#)

Tags: *Photonics*

## [US Navy to test powerful, mobile laser weapon against drones](#)

Defense Update, 13AUG2014

A compact yet powerful laser weapon, developed by Raytheon, will soon be integrated on a HMMWV to demonstrate its ability to defeat enemy drones as part of the enhancement of current US Marine Corps ground-based air-defense capabilities.

Tags: *Photonics, Military technology*

## QUANTUM SCIENCE

### [‘Cavity protection effect’ helps to conserve quantum information](#)

Science Daily, 17AUG2014

Coupling atomic spins in diamonds to microwave resonators could lead to new quantum technologies. Researchers in Austria have managed to dramatically prolong the time these systems can store information.

[TECHNICAL ARTICLE](#)

Tags: *Quantum science*

### [Molecular engineers record an electron’s quantum behavior](#)

Science Daily, 14AUG2014

Researchers at the University of Chicago have developed a technique to record the quantum mechanical behavior of an individual electron contained within a nanoscale defect in diamond. Their technique uses ultrafast pulses of laser light, both to control the defect’s entire quantum state and observe how that single electron state changes over time. The work could accelerate development of quantum computing devices. [TECHNICAL ARTICLE](#)

Tags: *Quantum science*

## SENSORS

### [Laser makes microscopes way cooler, incredibly sensitive](#)

Science Daily, 15AUG2014

Researchers in Australia used laser beams to cool a nanowire probe to minus 265 degrees Celsius. The level of sensitivity achieved after cooling is accurate enough for us to sense the weight of a large virus that is 100 billion times lighter than a mosquito. The development could be used to improve the resolution of atomic-force microscopes. [TECHNICAL ARTICLE](#)

Tags: *Sensors, S&T Australia*

## Lithium-based neutron detector named among Top 100 technologies of the year

EurekAlert, 13AUG2014

Researchers at Kansas State University created the neutron detector by stacking very thin sheets of lithium foil between multiple electrodes. Lithium-based neutron detectors are more cost-effective than helium-3 based neutron detectors. Applications include stationary detectors that can be used at U.S. ports of entry, mobile backpack neutron detectors, and handheld devices.

*Tags: Sensors*

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