

# Matériaux

Bulletin de Veille - 06 décembre 2018

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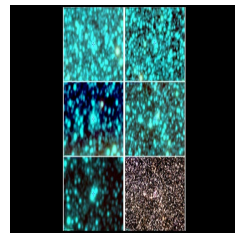
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## A LA UNE

### Globular clusters could offer clues on formation and evolution of inner Milky Way

26/11/2018 - [phys.org](#)



The newly identified clusters, which are old and metal-poor, have also the potential to improve our understanding of the structure as well as kinematics of the galactic bulge. The newly detected GCs, designated Camargo 1102 to 1106, were found by analyzing images collected by NASA's Wide-field Infrared Survey Explorer (WISE) spacecraft. The cluster nature of the objects was confirmed by photometric data from the 2MASS survey and ESA's Gaia satellite (second data release or DR2).

## GÉNÉRALITÉS - MATÉRIAUX

### Crystal clear: Understanding magnetism changes caused by crystal lattice expansion

04/12/2018 - [www.sciencedaily.com](#)

An international research collaboration, including researchers from Osaka University, has reported the induction of an interesting type of magnetic order, called helimagnetism, in a cobalt oxide material by expanding its lattice structure. "We have shown emergent helical spin order in a cubic perovskite-type material, which we achieved simply by expanding the lattice size," study first author Hideaki Sakai says.

### Novel Ways to Make Phase-Change Memory Material More Rapid than Existing Flash Computer Memory

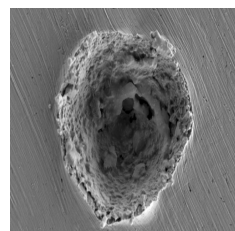
03/12/2018 - [www.azom.com](#)

PCMs are a type of computer random-access memory (RAM) that store data by modifying the state of the matter of the "bits" (millions of which form the device) between glass, liquid, and crystal states. Another is water which is famous for its anomalies, and a third is germanium, a second of the three elements of the GST type of PCM.

## AÉROSPATIAL

### Micrometeorite Damage Under the Microscope

03/12/2018 - [www.universetoday.com](#)



Given the growing problem of space debris – and the number of satellites, spacecraft and space habitats that are expected to be launched in the coming years – this information could play a key role in the development of impact mitigation strategies. These range from space-based lasers that could burn up debris and magnetic space tugs that would capture it to small satellites that could harpoon and deorbit it or push it into our atmosphere (where it would burn up) using plasma beams. .

### ESA team blasts Intel's new AI chip with radiation at CERN

29/11/2018 - [www.esa.int](#)

An ESA-led team subjected Intel's new Myriad 2 artificial intelligence chip to one of the most energetic radiation beams available on Earth. ESA is studying various space uses for

detect how its shape changes

## REVÊTEMENTS

- Reproducing paintings that make an impression
- MIT's New Device Could Provide Refrigeration for Off-Grid Locations

## SEMI-CONDUCTEURS

- Sandwiching Materials in Nanoelectronics
- A new light on significantly faster computer memory devices

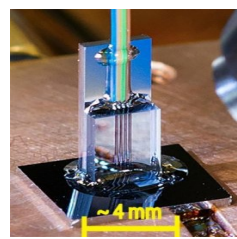
## TERRES RARES

- Ames Laboratory

the Myriad 2 chip, including a flight on Italy's Tyvak Mark-I CubeSat, which will carry the HyperScout hyperspectral imager – an enhanced version of the autonomous instrument developed by cosine Research in the Netherlands, already flown aboard the GomX-4B CubeSat – as well as internal and external environmental monitoring of the International Space Station.

## Photonic radiation sensors survive huge doses undamaged

27/11/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)



To determine the effects of radiation, the NIST researchers exposed two kinds of silicon photonic sensors to hours of gamma radiation from cobalt-60, a radioactive isotope.

## MATÉRIAUX POUR L'ÉNERGIE

### Shape Memory Alloy Rock Splitters

01/12/2018 - [www.techbriefs.com](http://www.techbriefs.com)

- SMA material as the actuating member - a casing heater placed around the SMA member - a DC or AC power source to provide current through the heater - pointed tips for acute penetration into rock formations - a hand press to reset the SMA element after each use. When the current is removed and the heater cools, the SMA material returns to its pre-compressed state. Glenn's SMARS device provides high-powered rock fracturing that is controllable, reliable, and comparatively simple without the use of explosives, hydraulics, or chemicals.

## Clemson researchers develop ceramic laser 3D printing technique for energy storage

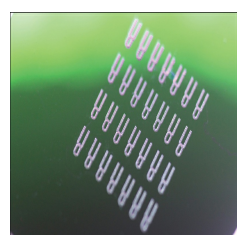
30/11/2018 - [www.3ders.org](http://www.3ders.org)

Researchers at Clemson University are working on a new 3D printing technique involving rapid laser processing to create "protonic ceramic electrolyzer stacks" that convert electricity to hydrogen as a way of storing energy. The new laser 3D printing technique would reduce the cost and time of manufacturing highly compacted electrolyzers. The technique could be applied to 3D printing other types of ceramic products, including batteries and solar cells, or high-density batteries that allow smartphones to maintain a charge for days at a time.

## MATÉRIAUX POUR L'OPTIQUE

### Using Sound Waves to Produce Optical Isolators

01/12/2018 - [www.techbriefs.com](http://www.techbriefs.com)



In addition, the necessary materials are not yet available in photonics foundries, creating the need for a better approach that uses only conventional materials and avoids magnetic fields. An array of 100 × 200-micron optical isolators uses sound to produce one-way light propagation. The new device is only 100 × 200 microns in size – about 10,000 times smaller than a square centimeter – and made of aluminum nitride, a transparent material that transmits light and is compatible with photonics foundries.

## BIOMIMÉTIQUE

### Biomimetic coagulant makes water safe to drink - Physics World

01/12/2018 - [physicsworld.com](http://physicsworld.com)

Stable core-shell structure "We made our nanocoagulant by first hydrolysing the organic component, 3-(trimethoxysilyl)propyl-n-octadecyldimethylammonium chloride (TPODAC), into a charged quaternary ammonium compound with a hydrophobic long carbon chain and silanol head group," explains Zhao. The researchers tested their nanocoagulant on secondary wastewater effluent from a municipal sewage treatment plant.

## A water treatment breakthrough, inspired by a sea creature

26/11/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)

The research, a collaboration of the labs of Yale's Menachem Elimelech and Huazhang Zhao of Peking University, used a material known as a nanocoagulant to rid water of contaminants. When added to water, conventional coagulants such as aluminum sulfate and other metallic salts remove larger particles from water by causing them to group together into larger formations and settle. "It also opens doors for fabricating 'smart' materials that can transform configuration and function in response to its environment," he said.

## MÉTAUX

### Extremely strong and yet incredibly ductile multicomponent alloys developed

27/11/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)

Multiple-principal element alloys, generally referred as high-entropy alloys (HEAs), is a new type of materials constructed with equal or nearly equal quantities of five or more metals.

## NANOMATÉRIAUX

### How microscopic machines can fail in the blink of an eye

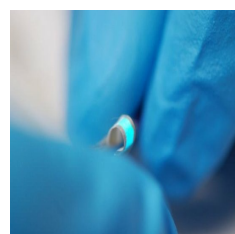
04/12/2018 - [www.nanodaily.com](http://www.nanodaily.com)



As in their previous work, the team labeled the MEMS components with fluorescent particles to track their motion. A faster imaging system and larger fluorescent particles, which emit more light, provided the scientists with the tools to perform their particle-tracking measurements a hundred times more rapidly than before. The team found that the jostling of contacting parts in the system, whether contact between the parts occurred at only one point or shifted between several points, and wear of the contacting surfaces, could all play a key role in the durability of MEMS.

### Graphene unlocks new potential for 'smart textiles'

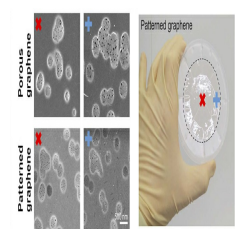
03/12/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)



The new research instead integrates the electronic devices into the fabric of the material, by coating electronic fibres with light-weight, durable components that will allow images to be shown directly on the fabric. This new research used existing polypropylene fibres -- typically used in a host of commercial applications in the textile industry -- to attach the new, graphene-based electronic fibres to create touch-sensor and light-emitting devices.

### Graphene filters go large

26/11/2018 - [physicsworld.com](http://physicsworld.com)



We have spent many years trying to obtain a large-scale uniform pore pattern using self-assembled block-copolymers made from polystyrene (PS) and polymethylmethacrylate (PMMA) by allowing few-tens-of-nanometre-wide PMMA spheres to form within a PS matrix. The two techniques, which are described in Science Advances DOI: 10.1126/sciadv.aau0476, produce samples up to 25 cm<sup>2</sup> in size in which the pore size is uniform and controllable in the sub-20 nm to 50 nm range on average.

## POLYMÈRES - ÉLASTOMÈRES

### Elastic foam uses machine learning to detect how its shape changes

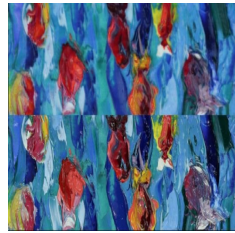
29/11/2018 - [physicsworld.com](http://physicsworld.com)

Disoriented movement A robot operating autonomously could easily injure itself without realising, says Robert Shepherd , who heads the Organic Robotics Lab at Cornell University in New York. Most previous attempts to build self-sensing systems have involved surface mounting or embedding sensors that each detect something specific, such as a change in pressure or the curve of a robot limb. "The optical fibres transmit light into the foam, that light gets scattered in the foam, and some of that light re-enters the fibres," Cornell's Ilse Van Meerbeek told Physics World.

## REVÊTEMENTS

### Reproducing paintings that make an impression

29/11/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)



"RePaint" uses a combination of 3-D printing and deep learning to authentically recreate your favorite paintings -- regardless of different lighting conditions or placement. To test RePaint, the team reproduced a number of oil paintings created by their artist collaborator. Instead of using more laborious physical approaches, the team trained a deep learning model to predict the optimal stack of different inks.

### MIT's New Device Could Provide Refrigeration for Off-Grid Locations

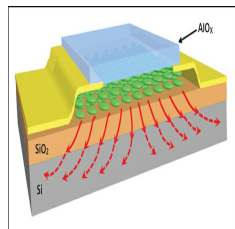
29/11/2018 - [www.azom.com](http://www.azom.com)

Then, a simple device developed from a combination of cheap plastic film, white paint, polished aluminum, and insulation can allow for the required emission of heat through mid-infrared radiation, which is the way most natural objects cool off, while stopping the device from being heated by the direct sunlight. "It was done using very simple materials" and vividly showed the system's effectiveness.

## SEMI-CONDUCTEURS

### Sandwiching Materials in Nanoelectronics

01/12/2018 - [www.techbriefs.com](http://www.techbriefs.com)



The experimental transistor using silicon oxide for the base, carbide for the 2D material, and aluminum oxide for the encapsulating material. In order to enhance the connection between the 2D material and the silicon base to improve heat conductance away from the 2D material into the silicon, engineers have experimented with adding an additional ultra-thin layer of material on top of the 2D layer -- in effect, creating a "nano-sandwich" with the silicon base and ultrathin material as the "bread."

### A new light on significantly faster computer memory devices

30/11/2018 - [www.sciencedaily.com](http://www.sciencedaily.com)

The simple equation:  $D\eta/T$  where  $T$  is the temperature,  $\eta$  is the viscosity and  $r$  is the particle radius, implies that the product  $D\eta/T$  should be constant as  $T$  changes, and the surprising thing is that this seems to be true not only for Brownian motion, but also for simple molecular liquids whose molecular motion is known to be anything but that of a ball falling through honey. Another is water which is famous for its anomalies, and a third is germanium, a second of the three elements of the GST type of PCM.

## TERRES RARES

### Ames Laboratory

01/12/2018 - [www.techbriefs.com](http://www.techbriefs.com)

Key areas of expertise are materials design, synthesis, and processing; analytical instrumentation design and development; materials characterization; catalysis; computational chemistry; condensed matter theory; and computational materials science and materials theory. Critical Materials Institute – The Critical Materials Institute brings together leading researchers from other DOE national laboratories, academia, and industry

to develop solutions to domestic shortages of rare earth materials and other materials critical to U.S.

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