

Top news

A connected armband for construction workers

In early February, Ideas Laboratory® will supply Air Liquide, Bouygues Construction, and Suez with fifteen connected armband prototypes for factory and construction workers.

With a display that lets workers pinpoint their location on a map, look at task lists and technical drawings, and send and receive safety alerts, the connected armband developed by Ideas Laboratory® is unique on the market. Today, factory and construction workers must rely on smartphone apps that rapidly reveal their limitations on the job.

A pre-prototype version of the connected armband was field tested at Air Liquide plants, on Bouygues construction sites, and on Suez waste-collection rounds, where it was exposed to harsh weather, impacts, dirt, and debris and subjected to inadvertent activation due to wearer error.

Pushbuttons instead of a touch screen

The tests gave wearers an opportunity to identify their needs more clearly: The display had to be easy to read, even in direct sunlight; it had to be usable with gloves (which was why the idea of a touch screen was abandoned in favor of pushbuttons); and it had to be able to operate for an entire workday between charges. It was also determined that the armband should have a limited number of functions to ensure ease of use and avoid distracting the wearer.

This user-centered approach to innovation resulted in a prototype that was very well accepted by the project partners. Manufacturers have also stated that they would be willing to produce the final product. The expected price would be €200. However, before volume manufacturing can begin, additional prototyping and user testing will be completed in 2018.

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Learn more: <https://www.youtube.com/watch?v=2UZx8YUvBY>

Innovation

More compact H-bridges for home appliances

An H-bridge is a type of electronic circuit—commonly used to control motors in home appliances—in which each of the four branches of the “H” is home to a power transistor. A team of researchers and engineers from Leti, AMS, and Infineon successfully packaged an H-bridge on silicon. Compared to a conventional H-bridge, which is on a circuit board, the silicon H-bridge is five times more compact, faster, and less expensive to manufacture. In addition, silicon offers thermal conductivity 200 times higher than that of the polycarbonate used to make circuit boards—a crucial factor when you consider that power transistors reach temperatures of 180°C.

Several technical hurdles—including vertical TSVs 40 nm in diameter and 200 nm deep—had to be overcome to make the circuit on silicon. Several modules are currently undergoing functional electrical testing.

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Researchers invent a skyrmion switch

Skyrmions—magnetic bubbles that can be nanometer-sized and that are insensitive to faults—are garnering attention in the spintronics community. They could one day be used as bits in memory or in logic operations. To dig deeper into the issue, researchers from Spintec and Institut Néel recently created the first-ever “skyrmion switch.” The device is made up of triple-layers of platinum, cobalt, and aluminum oxide. A gate voltage alters the size and density of the skyrmions, making them appear or disappear.

Measurements were taken on micrometer-scale skyrmions. To move to the nanometer scale, the researchers are currently working on coupling an optical microscope with transportation measurement to characterize skyrmions’ unique electrical signature.

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Stimulating the visual cortex to restore sight

Leti recently announced that it is working on the ambitious CorticalSight project alongside a consortium of five other partners led by the Institut De la Vision in Paris. The project is funded by the United States Department of Defense DARPA agency.

The goal of the CorticalSight project is to restore sight in patients not eligible for retinal implant surgery. In work spearheaded by Cinatec, Leti has been tasked with creating an implantable interface compatible with optogenetic treatment techniques. Leti will be working on miniaturization, biocompatibility, wireless communications, and miniaturized optical light stimulation sources. The first project milestone is proof-of-concept testing, slated for completion in June 2018.

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Innovation

Peptide targets could help determine uranium toxicity

It is not very well known exactly why uranium is toxic to or how it interacts with living organisms. A team of researchers at INAC used a biomimetic approach to tackle the issue. The researchers created small peptide sequences that model the protein-metal bonds, and then placed them in contact with uranyl, the uranium ion that is the most stable in living organisms.

The approach confirmed phosphorus amino acids' strong affinity for uranyl. A protein like osteopontin, present in bones and highly phosphorylated, is thus considered a potential *in vivo* target for uranyl. In the long term, the results of the research could aid in the development of decorporants to treat uranium poisoning.

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Nanowires could compensate for 6% lattice constant deviation

Growing indium arsenide (InAs) and gallium arsenide (GaAs) heterostructures is theoretically impossible due to a lattice constant deviation of 6%. However, a team of researchers from INAC and Institut Néel has overcome this hurdle by using the vapor-liquid-solid method to grow nanowires. The vaporized indium and arsenic atoms migrate in a liquid gold nanodroplet located at the extremity of a GaAs nanowire, exiting in the form of a crystal of the same diameter on the GaAs.

The resulting structure is free from dislocations at the interfaces as long as the liquid gold nanodroplet measures less than 40 nm. The researchers are now working on growing GaAs on InAs. They plan to use the technique to grow nanowires with integrated quantum dots that can be positioned at will for new photonic transmitters.

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Fingerprint recognition: Leti exceeds FBI requirements

The eight partners of the EU PiezoMAT project, coordinated by Leti, achieved resolutions twice as high as what the FBI requires for fingerprint recognition. The project resulted in a prototype fingerprint recognition sensor with 250 pixels 4 microns in diameter; each pixel is made up of a bunch of piezoelectric nanowires on silicon. When a finger is placed on the sensor, local deformation of the nanowire network generates an electric potential.

Leti fabricated the sensor in a cleanroom leveraging developments on the nanowire growth layer and the contact lines. The technology can achieve resolutions in excess of 1,000 dpi, distinguishing a fingerprint's tiniest details like pores.

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 Learn more: <http://www.piezomat.eu/Home>

Leti launches hardware emulation services using Veloce

Startups, SMBs, and large companies that would like to verify the designs of their future single- or multi-processor circuits can now benefit from the support of a new emulation service at Leti offering record-breaking performance.

For the past four years Leti and Mentor® (a Siemens company) have been working together to use and improve Mentor's Veloce emulator, which is around a thousand times faster than conventional simulation tools. For the same time it takes conventional tools to complete validation, Veloce can complete a much more thorough verification of the future circuit and, in particular, OS boot.

For companies using the service, which is available remotely, Leti will ensure that their designs are implemented optimally on the emulator, troubleshoot, and analyze the results. Leti is currently signing contracts with its first customers for this new service.

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Skin DNA: Sunscreens do provide protection

Sunscreens protect the skin from sunburn, of course. But can they effectively prevent skin DNA damage due to exposure to UV rays, a phenomenon that starts to occur before sunburn appears? Pharmaceutical company Laboratoires Pierre-Fabre turned to a team of INAC researchers specialized in the field to find answers. The researchers developed very sensitive analysis tools capable of detecting 20 femtomoles in a sample.

In work conducted with King's College London, around 20 sunscreens were tested on skin biopsies, reconstituted skin, and suction blisters. The results? Sunscreens do have a measurable protective effect proportionate to their SPF. Therefore, they do prevent the physical and chemical mechanisms that cause skin cancer. One more reason to use sunscreen on the ski slopes this winter!

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Secure circuits inspected down to the transistor

It is now possible to analyze secure-circuit failures at the individual transistor—the ultimate degree of precision. However, to do so requires access to one of the world's four nanofocused X-ray beams. A team of researchers from CESTI*-Leti used the beamline at Grenoble's Synchrotron to obtain some original results.

The nanofocused beam can put and keep a single transistor in the open or closed position to determine its role in the failure being analyzed. Simply annealing the transistor for one hour at 150°C restores normal conditions. The testing method also offers the major advantage of being 100% non-invasive for the circuit and its enclosure. CESTI's research won the Best Paper award at the recent CHES conference in Taiwan.

*Information technology security evaluation center

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Day by day

Bruno Paing succeeds Hughes Metras as head of CEA Tech US

Bruno Paing has succeeded Hughes Metras as head of CEA Tech US. Metras had held the position since 2011. Paing recently spent four years in Japan and is now at Caltech, a Leti partner since 2006.

Paing will focus on strengthening the strategic partnerships between the three CEA Tech institutes and US universities and manufacturers (Caltech, Stanford, MIT, Intel, GlobalFoundries, etc.) and building new relationships.

For CEA Tech, an outpost in the US is crucial to rounding out existing partnerships in France with partnerships in fields not covered by potential partners in France and other European countries.

Paing will attend CES 2018 with the CEA Tech delegation and his two San Francisco-based coworkers and an International Volunteer based in Washington, D.C.

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Day by day

NeOse Pro artificial nose can detect 500 different scents

In January 2018 startup Aryballe Technologies will release NeOse Pro, a new version of the company's artificial nose based on a technology developed at INAC that combines biochemical and optical techniques to reproducibly detect 500 different scents—MEMS-based electronic noses max out at less than ten. Aryballe Technologies is also gradually adding to an olfactory database that will further increase its product's capacities.

NeOse Pro will address the agriculture, food, and cosmetics industries, where it will be used to control the quality of both raw materials and finished products, with higher reliability and reproducibility than a human nose. The product is not intended to replace human experts in the fragrance and other luxury industries, however.

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Leti PhD candidate wins L'Oréal Foundation grant

Éloïse Pariset, a PhD candidate conducting research at Leti, is one of 30 winners of the L'Oréal-UNESCO "For Women in Science" award. Since 2015 she has been working to develop a cancer diagnostic system for which several patents are currently being filed. The miniaturized system isolates and characterizes (mass, size, density, and deformability) the extracellular vesicles found in all biological fluids. This structural analysis rapidly and reliably determines whether or not the emitting cell is malignant.

The award, which comes with a grant of €15,000, will enable Pariset to acquire high-resolution microscopy equipment and go to Boston's MIT with her dissertation supervisor to combine her vesicle isolation technology with the MEMS sensors used to characterize the vesicles.

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FRM medical research foundation awards funding to LMGP lab

France's Fondation pour la Recherche Médicale (FRM) recently approved an LMGP lab specializing in the interfaces between biological and other materials for a project on bone regeneration. Catherine Picart and her team of biomaterials engineers are investigating BMP*-mediated cotransduction to better understand how the bioactive proteins initiate the differentiation between stem cells to regenerate bone and how they behave with other cell receptors. For the researchers, the approval is recognition that their basic research has viable biomedical applications and, ultimately, that it will help develop new treatments. The €400,000 in funding, which will be disbursed over the next three years, will enable the team to hire a postdoc and purchase an optical microscope.

*bone morphogenetic proteins

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Smart Force Technologies boosts micron-scale rapid prototyping

Rapid prototyping has become very popular in the manufacturing industries. However, until now, it has not been possible to prototype micron-scale patterns using the technique. Startup Smart Force Technologies, founded in 2015 by two former LTM-CNRS PhD candidates, is responding to this need and has already sold several units of its Smart Print optical photolithography machine.

Smart Print eliminates the need for physical masks, saving on both time and costs and giving designers the freedom to make multiple prototypes. The product targets research laboratories and industrial R&D departments in the watchmaking and microfluidics industries. Smart Force Technologies also sells SF-Research, a machine used to position nanoparticles.

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Learn more: www.smartforcetechnologies.com

Horizons

CEA Tech Village at CES 2018

Until now, Leti had exhibited solo at CES, the world's largest consumer electronics event. This January all three CEA Tech institutes—Leti, Liten, and List—will be in Las Vegas. CEA Tech Village will showcase five demonstrator systems in the fields of connected healthcare, flexible electronics, virtual reality, artificial intelligence, and sensors for tomorrow's urban mobility solutions. In addition, four CEA Tech startups—Motion Recall, Moovlab, PowerUp, and Sport Quantum—will also be exhibiting.

The expanded presence at CES will help CEA Tech raise its profile among consumer electronics professionals from around the world.

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Moovlab, still in its incubation phase, wins first customer

It is pretty uncommon to see a startup make its first sale while still in the incubation phase. Moovlab, which specializes in interactive training circuits for fitness clubs, has done just that! The company has just delivered its game (developed with game designer Urban Expé) "Escape to Mars" to Keep Cool, France's third-largest chain of fitness clubs.

Here's how the game works: four to twelve players have to try to get to Mars on board a hybrid spaceship whose navigation system has failed. The game lasts for 45 minutes and players wear sensors that display their level of physical activity in real time on a screen. Players encounter different situations (low fuel, an imminent collision...) where they must bike, row, box, or do other physical activity—which makes for a fun and entertaining workout.

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Interview

Aurélie di Nola,
Director, Corporate Relations,
Grenoble Institute of Technology-Phelma

A core of strong corporate partners is crucial to our school

Engineering and services firm ONET and Grenoble Institute of Technology-Phelma recently signed a partnership agreement. How many corporate partners does the school currently have?

We signed the agreement with ONET on October 12. The company offers a wide range of services that align with our programs (electronics, embedded systems, nuclear engineering). With ONET we now have ten partners.

Are all of your partnership agreements the same, or are there different kinds of partnerships?

All of our partnerships have one thing in common: supporting our students' transition to the career world. Our partners can teach, give talks about their businesses, and conduct mock job interviews with students. They also participate actively in Partners Day.

Our partners can also support us in a number of other ways. They can allocate their apprenticeship tax to the school, make a financial donation, or donate supplies and equipment, for example.

Outside of these partnerships, what role do corporate relations play at the school?

At Phelma we have close relationships with nearly 50 companies, from startups to large corporations. Having a core of strong corporate partners is crucial to our school, especially in terms of career placement. Half of our students are hired by the company where they do their Graduation Project, which shows just how important it is to choose the right company.

The better we know our partner companies, the better we can understand their needs and the more prepared they are to help us. It is a win for everybody.

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Horizons

FED4SAE explores cyber-physical systems

Leti is coordinating the EU FED4SAE program, which will receive €6.7 million in funding over three years. The project recently kicked off with thirteen partners including Intel and STMicroelectronics. The purpose of the project is to help startups and small- to mid-sized businesses develop their existing products into cyber-physical systems. These physical objects with connected intelligence capabilities can include things like garments with integrated sensors, agricultural machines with connected technologies and services, or data management systems for smart buildings and smart cities.

Participating companies will receive support selecting the best available technology, finding the best manufacturing platform for their product, and managing the innovation process. The first call for projects will end in early February.

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Grenoble and Vienna join forces on ALD

LMGP and Austria's Vienna University of Technology could join forces to work on ALD. Vienna University of Technology Professor Dominik Eder will soon come to Grenoble to explore the issue. The two organizations are working on new materials made using ALD, or atomic layer deposition. However, in Vienna they use the conventional process, while LMGP in Grenoble has been using an advanced process, spatial ALD, which deposits atomic layers up to a hundred times faster, for a year now.

The research could focus on comparing the two processes on the same material, cross-assessing materials, and similar topics. The two organizations could create synergies on catalysis and hybrid materials, especially for renewable energy. The outlook for future cooperation certainly looks bright!

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New phase in Building 10.05 rehabilitation project begins

Demolition on the Vercors Wing of Building 10.05 started in mid-October; rehabilitation work will begin as soon as the demolition is complete. The Vercors Wing was originally set up to house thermohydraulics lab facilities. A total of 3,000 sq. m is being rehabilitated to house around 100 INAC researchers starting in the fall of 2018. Some 200 researchers from INAC have already moved to the building's Chartreuse Wing.

The €8.5 million project (which includes €2 million for new equipment) is being financed by the French and regional governments and the CEA. The labs in Building 10.05—to be called MINATEC Labs—will house all INAC researchers investigating and modelling the phenomena (electron spin, photons-on-chip, and quantum electrons) that will underpin tomorrow's electronics.

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Live from MINATEC

Emmanuel Sabonnadière brings industrial and international experience to Leti

Emmanuel Sabonnadière was appointed Director of Leti on November 20. He plans to support the institute's science and technology activities and bolster its ties to industry through partnership and innovation-transfer activities. Sabonnadière earned an engineering degree from Compiègne University and completed his PhD in Physics at Ecole Centrale de Lyon. He brings 25 years of management experience at Schneider Electric, Alstom, General Cable Europe, and Philips Lighting.

A Grenoble native, Sabonnadière spent much of his career in international settings, including in Germany, Spain, and the Netherlands. He will address CEA Tech employees for the first time on February 1 at the General Meeting.

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Live from MINATEC

MIT to send five teaching assistants to GIANT

GIANT, a partner of MIT's Global Teaching Labs program, will host five MIT students for four weeks in January. The MIT undergrads in the program must complete teaching assignments abroad.

They will teach—in French—the high school students participating in the Nano@School program and will help to develop and facilitate new workshops on low-tech solutions and microfluidics for the program.

They will also participate in test classes for a new program on innovation for junior high school students that GIANT is currently developing. They will give lectures on science topics and will facilitate discussions with the participating students and their teachers.

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First-ever Phelma open house to be held in March

Phelma will hold an open house for high school, preparatory, tech college, and university students and their families on Saturday, March 3. One of the goals of the open house is to promote the Electronics, Microelectronics, and Telecommunications program, which combines classroom learning with in-company experience.

Visitors will get to meet with students and faculty, tour the lab classrooms (the printed circuit workshop and the physics lab, for example) and visit the showroom of student demonstrators, where they will have a chance to discover a miniature driverless vehicle, a system that weighs luggage for airports, and more. The program also includes presentations of the academic programs available at Phelma and career placement opportunities. The Grenoble Institute of Technology Information Day will be held the same day, as well as open houses for the Institute of Technology preparatory program, Pagora, Ense3, and Esisar.

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Pascale Bayle-Guillemaud appointed to INAC

Pascale Bayle-Guillemaud was appointed Interim Director of INAC (the Institute for Nanosciences and Cryogenics) on October 1. Bayle-Guillemaud is a research engineer specializing in materials physics and had been the Deputy Director under Yves Samson since September 2014.

After serving for four years as Director of INAC, Samson is now with the Basic Research Division of the CEA, where he has been appointed Associate Director for Physics and Director of External and Industrial Partnerships.

The Basic Research Division recently began exploring the feasibility of merging its three departments—the Institute for Structural Biology (IBS), the Grenoble Institute for Bioscience and Biotechnology (BIG), and INAC—and Bayle-Guillemaud will head INAC in the interim.

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Innov@School gets high-schoolers working on low-tech solutions

The next session of the Innov@School high school outreach program will get students* to explore how to meet basic needs like lighting and cooking in a city ravaged by a natural disaster. Students will discover how to innovate and use low-tech solutions to effectively reuse items that no longer work and how to produce energy with recovered equipment.

The three participating classes will each be split into two groups for their day at MINATEC. They will tour the CEA Tech showroom and take part in a creativity workshop at the Ideas Laboratory®. Then, working in pairs, the students will come up with a basic prototype using recovered objects, Legos, and modelling clay. They will then shoot a video presenting their prototype and showing how it is used.

*Grenoble-area high school juniors in the Engineering Sciences and Industrial Technology and Sustainable Development tracks

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Experimenta, now held every two years, to take place in February

The Experimenta Art, Science, and Technology Fair will now take place every two years during the Biennale Arts Sciences. The next edition of the event will be held on February 8–10 at Maison MINATEC.

Experimenta is open to the general public. Visitors will have a chance to discover 25 projects created by artists and scientists. Several international artists will participate, including new Atelier Arts Sciences partners from Germany, Japan, and Estonia. For example, Antoni Rayzhkov will make bacteria sing using a system that transforms the movements of microorganisms into music!

The February 9 Midi MINATEC brown-bag lunch talk will explore the Artefact* vision system, which creates the illusion that represented objects are actually physically present. The day before Experimenta, February 7, is for professionals only and will address the role of humans in a context where artificial intelligence is rapidly taking hold.

*A joint initiative of Leti/DOPT/SNAP, Théâtre Nouvelle Génération, and Centre dramatique national de Lyon

<https://www.experimenta.fr/>

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Giant International Internship Programme fall session

The fall session of the Giant International Internship Programme—similar to the summer session, which hosts mainly American students—will welcome students from other countries whose academic calendars are more compatible with the September–December schedule. This year's participants will include a student from Japan, one from Vietnam, one from Peru, and five from Argentina affiliated with the Franco-Argentinian Arfitec program.

The students, all enrolled at GIANT partner universities, will conduct research for ten to twelve weeks at Grenoble Institute of Technology, Leti, and Institut Néel labs. In addition, five Chinese medical professionals (doctors, nurses, and pharmacists) will complete internships at Grenoble University Medical Center.

Since the program was created in 2011 more than 200 students have participated.

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Agenda

December 13, Atelier Arts Sciences Experimenta press conference

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January 8–19, les Houches Winter School: Physics with Trapped Charged Particles

<https://indico.cern.ch/event/596966/>

January 9–12, Las Vegas Consumer Electronics Show

CEA Tech and four CEA Tech startups to exhibit

<http://www.ces.tech/>

February 8–10, Maison MINATEC Arts, Science, and Technology Fair

<https://www.experimenta.fr>

March 3, Grenoble Institute of Technology-Phelma

Phelma Open House

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March 15, Maison MINATEC Innovation Marketing Conference

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March 16, Maison MINATEC Tenth annual JSIam

(Junior Scientist and Industry annual meeting)

<http://www.jsiam-giant-grenoble.org/>

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MINA-NEWS >

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