

Top news

First-ever analysis of neutral particles by mass spectrometry

Researchers from INAC, Leti, and IRTSV recently completed the first-ever successful analysis of neutral particles by mass spectrometry. The scientific achievement, which took place right here in Grenoble, was praised by an article in *Nature Communications*.

The researchers chose to bypass traditional spectrometry methods, preferring to use nano-electromechanical systems (NEMS), whose resonance frequency varies depending on the mass being supported. In this particular case, the mass was made up of nanometric copper and tantalum aggregates.

Biology a top-priority application

NEMS mass spectrometry has the advantage of being fully operational for non-ionized particles and/or very heavy particles—for which traditional spectrometry is not ideal. These advantages make the technique particularly attractive for biological research and clinical applications, where it can be used to detect things like viruses and protein complexes.

The method also marks a leap forward in the analysis of certain objects, previously hindered by the fact that particles were ionized prior to analysis—with NEMS the particles are not ionized.

The ten scientists who worked on this project filed for four patents and are pursuing their work on two NEMS spectrometers, one at INAC and one at Nanobio. They have also started work on a new system dedicated to neutral spaces and to NEMS for specific applications, with the goal of ultimately transferring the system to a spectrometry equipment manufacturer.

The next step will be to carry out an initial demonstration of the method on a biological species never before measured. The demonstration—slated for 2017—will validate the effectiveness of the technology.

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Innovation

LINC, the Esperanto of smart buildings

How do you get smart-building systems and sensors working together if they all use different communication protocols? Leti has come up with an ingenious solution to this problem: it uses a middleware, LINC, to share important information—temperature, hygrometry, and presence, for instance—regardless of the technology used. In this way, information can be shared across multiple systems to complete processes, like using the input from a sensor to start a fan, for example. The development was part of the EU-funded Scuba project.

LINC revealed some truly impressive capabilities during a test rollout at five sites. The middleware can rapidly reconfigure modular office spaces, generate energy savings of around 20%, and adjust lighting in real time according to energy costs. Negotiations with several manufacturers are underway. The possibility of launching a startup is also being considered.

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Lensless imaging: Cytonote off to a good start

France-based startup Iprasense (www.iprasense.com) unveiled its Cytonote digital microscope in late 2014 in London. Today, the company is pleased to announce its first sales of the very-large-field (30 mm²) microscope. The Cytonote microscope was developed by an Iprasense-Leti joint lab and uses lensless imaging technology patented by the CEA. The microscope is used to monitor and inspect cellular cultures in real time for bioproduction in the pharmaceutical, food, and other industries. It can observe thousands of cells at a time.

Cytonote is much more compact and easier to use than today's most highly-regarded solution, video microscopy inside an incubator. Iprasense and Leti are already working together on a second product, this time for routine use in industrial vats.

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Non-destructive testing gains strength thanks to TMR

TMR (tunnel magnetoresistance) sensors promise greater sensitivity to probe for hidden defects and higher spatial resolution to pick up even the most minute defects. The technology is a product of the EU-backed project Imagic, in which Leti participated. The sensors will end up in in Eddy current NDT equipment used to inspect metal parts.

The sensor is made up of a network of 576 magnetic tunnel junctions (50 μm x 50 μm), each made of a stack of fifteen-or-so magnetic thin layers. The processes developed to make the sensors leverages some of the same fabrication methods used in MRAM production. The sensors' extreme sensitivity could position them as a promising technology for various applications, such as in the automotive industry, where they could compete with giant magnetoresistance technology.

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MINATEC NEWS

No. 35
June '15

Innovation

Supercapacitor power unsheathed

Researchers at INAC used a plasma growth technique to produce sheaths of graphene perpendicular to the electrode of a supercapacitor. These sheaths, just nanometers thick, are used to build a layer of graphene that is several microns high, which is deposited on a silicon substrate—a geometry that makes it easier for the ions in the electrolyte to access the interfaces.

The resulting improvement in surface capacity is very promising for use in applications like energy storage for wireless sensors. The energy density is practically double that of state-of-the-art supercapacitors made of semiconductor nanomaterials or carbons. Cycling performance is also good, at 20% loss after 150,000 cycles. The scientists behind this technology, ever-cautious in their claims, remind us that this proof of concept is only the first step in perfecting the development.

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Datacom-dedicated optical multiplexer achieves record stability

Leti researchers teamed up with two manufacturers to produce an optical multiplexer for datacoms (links from 1 meter up to 10 km) as reliable as its current competitors. This in itself is a great achievement. Even more impressive, however, is that the researchers actually improved reproducibility for each batch of wafers. The research, which leveraged the resources of IRT Nanoelec, resulted in prototypes that boast losses of 3 dB, insertion error rates of 35 dB, and a transmission dispersion comb of only 0.8 nm.

The researchers are now readying the component for industrial-scale manufacturing, fine-tuning things like improvements to the materials and ways to reduce losses and energy consumption of the optical connection. The multiplexer will be integrated into a datacom transmitter card that will include a III-V laser source/modulator.

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A close-up look at how materials behave between -80°C and 600°C

The Nanocharacterization Platform's heating cell can be used to measure the properties of materials between -80°C and 600°C under controlled atmospheres. And, when coupled with ellipsometers, the thickness and the optical index of thin films can also be measured. Alternatively, Raman spectrometers can be added to study materials' crystalline properties.

Temperature measurements are particularly useful when they can be taken in situations that replicate the fluctuations characteristic of industrial processes or operating conditions without having to run multiple tests. The scientists monitored, for example, the recrystallization of a thin film of amorphous silicon at 550°C to determine the optimal length of time for the procedure. They are now investigating polymers and phase-change materials for memory.

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3D grain imaging now even more precise

A team of researchers from Leti, INAC, and ESRF combined X-ray tomography and Laue microdiffraction to determine the crystallographic orientation of micrometric grains. The technique, used in this case on 80-micron-thick copper vias, also indicates the area of deformation in the silicon matrix that surrounds the vias.

Laue microdiffraction is very effective on thin films, where each grain is the thickness of the film. But because the technique is not as effective for 3D structures, the researchers combined it with X-ray tomography to get similar measurements indicating the precise location of each grain. These results, of an unparalleled precision, will be used to improve microelectronic production processes.

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Photovoltaics: the sensitized p-type cell takes off

Until now, the only photovoltaic cell with an inorganic p-type absorber tapped out at 0.1% conversion efficiency. Researchers from INAC recently broke this record, reaching yields of 1.25% with a prototype developed under a French National Research Agency-funded project. The cell uses a new pair of materials (quantum copper-indium-sulfur dots and nickel oxide) and perfects the separation of charges at their interface. The goal for this type of energy conversion is to eventually reach 4% to 5% efficiency.

Beyond its contribution to basic science, the research opens a field of new possibilities. The researchers are now working on pairing a p-type cell with the already-prevalent and less technologically-challenging n-type cell. Complete with two absorbers, this paired cell's yields could surpass the 7% typical of n-type cells, all while maintaining the low cost of cells with inorganic absorber layers.

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Field gradient NMR to examine vegetable oils

Researchers at INAC are investigating a novel use of field gradient NMR: the *in vivo* study of the lipid vesicles of vegetable oils like sunflower, canola, and linseed. These micrometric vesicles are of particular interest to biologists and varietal selection experts, who currently use electron microscopy—which requires tedious, time-consuming sample preparation.

In the research, field gradient NMR not only saved time, but it also delivered a reliable distribution of vesicle sizes. The technique also revealed that lipids could circulate from one vesicle to another, a result that garnered interest from the French National Institute for Agricultural Research, INRA, for its potential impact on seed germination and preservation. INAC and INRA are currently preparing several joint research projects for submission to the EU.

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LEDs shed their converters

A LED can potentially run for 50,000 hours. Unfortunately, the necessary AC/DC convertor limits LED lifespans to 5,000 hours, due to the convertor's trouble withstanding high temperatures. Plus, the converters are bulky and expensive. Leti has now developed an electronic control block without inductance or capacitance, dedicated to lamps made up of at least 100 elementary LEDs.

Controlled in groups of four, the LEDs are connected in parallel at low voltage. As the voltage increases, the system connects them one after another in series to make sure that the main current remains at a predetermined value.

This dynamic adjustment also improves lighting quality, minimizing the flickering effect for which LEDs are known, all while maintaining a good power factor, crucial to avoiding disruptions on the grid. A patent has been filed.

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Day by day

INAC PhD candidates learn about public speaking

“What is understood completely can be expressed clearly, and the words to express it come easily.”* Easier said than done! INAC organized a public speaking workshop on May 19 that was attended by ten PhD candidates. Trainer Ludovic Lecordier gave the participants the skills they need to express themselves clearly and to feel more comfortable when giving presentations.

The workshop covered how to tailor delivery to your audience, prioritize your messages, and express yourself authoritatively—but without taking yourself too seriously! The trainer used theater techniques to let the participants flex their voices and hone their body language.

*Boileau, *L'Art poétique*, (*The Art of Poetry*), 1674
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American students say “Yes!” to GIANT’s summer program

The fifth annual GIANT International Internship Program (GIIP), which kicked off at the end of May and will continue for 10 weeks, saw record enrollment. GIANT laboratories are hosting 27 international interns, from undergrad through to post-doc, almost all from the United States. In contrast, in 2011, GIIP’s first year, there were only seven interns. Also encouraging is that MIT is sending more and more students to Grenoble. There were five MIT students in last year’s cohort, up this year to ten. The pool of applicants was even larger than in previous years.

And, for the first time ever, Grenoble Ecole de Management is also taking part in GIIP, with three students working on a serious game dedicated to the management of nanotechnologies. All of the other student interns will be dispatched to the various nanotechnologies, materials, life sciences, and microbiology laboratories and startups on the GIANT campus.

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Learn more: www.internship.giant-grenoble.org

Phelma revises curriculum for first-year students

The 2015–16 school year will mark the rollout of a new first-year curriculum at Grenoble Institute of Technology-Phelma. The scope of the PMP (physics, materials, processes) and PET (physics, electronics, telecoms) core curricula will be broadened to six 32-hour science courses. The new curriculum will minimize dispersing core content across too many courses and sharpen the focus on the school’s standout disciplines: physics, electronics, and materials. The school also hopes that the transformation will allow students to choose their second-year major more easily.

Incidentally, the new curriculum will allow the school to reduce the number of groups (ten groups of 36 students going ahead, compared to twelve groups of 32 students in the past) and to use resources more efficiently.

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Ense³ moves to 1:1 demo building

On September 7 Grenoble Institute of Technology-Ense³ (the Institute’s school of energy, water, and environmental engineering), will begin the school year at GreEn-ER, the Presqu’île’s new innovation center for energy and renewable resources, located at 21 avenue de Martyrs.

Exemplary in its energy usage, the school’s new building is a living lab for energy management technology. The building is entirely outfitted with specialized instruments, and all water and energy consumption will be tracked. The data will be used to generate a real-time visualization model on display at the Agora.

Perhaps more importantly, the school’s new home will have spaces that are better suited to both academics and campus life. The building will also house the G2ELab, a proximity that will encourage synergies between energy researchers and teaching faculty.

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Grenoble off to Korea for Nano-KISS

Sorin Cristoloveanu, a research scientist at IMEP-LAHC, is organizing the sixth annual Nano-KISS* summer school from July 13–15 in Daejeon, Korea. The program will host 120 participants and leading speakers from around the world, for a full program of talks on microelectronics, nanoelectronics, and sensors.

Cristoloveanu, who spearheaded the Migas summer school, took the helm of Nano-KISS in 2010 at the behest of his Korean counterparts, who wanted to shift away from their habitual focus on the United States and build bridges with other parts of the world—like France! And Grenoble’s scientific community will be well represented at the event. To date, 20 scientists from Leti, Grenoble-Alpes University, and the CNRS are among the confirmed speakers.

Registration is free for Grenoble-based participants.

*Korean International Summer School on Nanoelectronics
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Local science website now has jobs section

This June the website “38 de Sciences” (a joint endeavor of the French Physics Society and the Fondation Nanosciences) is adding a new careers section with job offers.

The goal is to centralize links to available internship, PhD, post-doc, research, and teaching positions on the websites of over 100 organizations (including laboratories, institutes, doctoral schools, and more). The aim is to make it easier for the scientific community—and the international scientific community in particular—to find career opportunities that may interest them in Grenoble, Valence, and Annecy.

The primary mission of “38 de Sciences” still is to maintain an online calendar of local scientific events. With this extraordinary new initiative, the website will also become a go-to source for information for the entire scientific community across the Alpine Arc.

Check it out at <http://sfp.grenoble.cnrs.fr/>
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MultiX raises €3 million in fresh capital

MultiX, a company specializing in X-ray spectrometry-based subsystems for detection applications, has brought in €3 million from a group of investors that includes CEA Investissement. The company raised €3 million in 2011 and €4 million in 2013. MultiX technology is used in airport baggage scanners and food-industry inspection equipment.

MultiX is pursuing its partnership with Leti, and has also initiated strategic alliances with the major X-ray machine manufacturers on its target markets. The influx of funds will pay for manufacturing equipment as well as the commercialization of the company’s new line of X-ray detectors.

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Horizons

Phelma students reach out to young cancer patients

Just one year ago, the students of Phelma created the 17th branch of the French nonprofit “Cheer up!”. The organization helps young adults suffering from cancer to make their dreams come true—like one young man who dreamed of taking part in an off-road automobile race.

The new branch counts around 40 Phelma student members, and is particularly active. Each week, members visit teens and young adults aged 15–25 hospitalized in Grenoble. “Cheer-up!” Phelma also runs a variety of fundraisers, like a campus road race in March that raised around €300.

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CEA Tech Research Directorship applicants unplug in the Vercors

For the third straight year, from July 1–3, about 20 people from CEA Tech (Leti, List, and Liten) will participate in an off-site seminar to prepare for the French-state-sanctioned research directorship accreditation (*habilitation à diriger des recherches*). For applicants, this trip to Lans-en-Vercors represents a break from their everyday routine and an opportunity to make progress on their dissertations, the successful defense of which will earn them France’s highest academic distinction.

Alternating independent and group work time, this workshop will offer talks by diverse speakers (scientific directors from CEA Tech, heads of doctoral schools) who try to answer all the applicants’ questions on what to expect from the jury at their defense. A session of individual coaching for their oral presentation is also an option.

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Minalogic expands scope

Minalogic has merged with the Optique Rhône-Alpes cluster (ORA) in St. Etienne, the logical next step in a multi-year partnership that has resulted in numerous initiatives in support of the region’s photonics industry. Effective April 1, the two clusters now operate under the Minalogic banner. The consolidation of the two has led to the inauguration of a third division dedicated solely to optics and photonics.

The merger has also expanded the new organization’s scientific and technical scope and its geographical footprint. Still based out of Grenoble, the cluster now has a branch in St. Etienne, making it easier to work with partners from the Loire and Rhône regions.

Minalogic will celebrate the merger and its ten-year anniversary in Lyon on June 30. Everyone who has contributed to the cluster over the past ten years will be invited, and the event—shh... the program is still top secret!—is guaranteed to be fun and original.

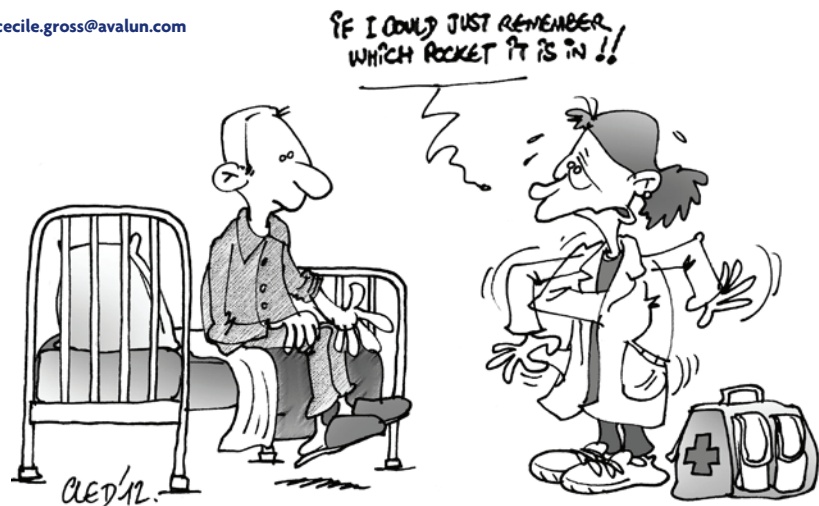
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Local nurses test Avalun’s mobile point-of-care device

A handful of nurses in the Vercors mountains just outside of Grenoble have started testing Avalun’s LabPad® in a two-year pilot program backed by the Rhône-Alpes Regional Board of Health. The program coincides with the commercial launch of the device—a connected, pocket-sized testing lab that can measure blood coagulation from a single drop of blood taken from a finger prick. The device, which leverages Leti technology, sends the results to a local testing lab via Bluetooth.

In the meantime, Avalun is pursuing its joint lab with Leti, with a focus on improving its optoelectronic technology and, ultimately, offering new kinds of analyses, starting with blood sugar, triglyceride, and cholesterol levels.

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Grenoble Institute of Technology Youth Ambassadors

The Grenoble branch of the *Jeunes Ambassadeurs* (Youth Ambassadors) program enjoyed an evening in the spotlight at a gala dinner held on April 9 in St. Etienne. The dinner was attended by some 300 young people, corporate coaches, and program partners.

A team of three Grenoble Institute of Technology students brought home first prize for “Connectome,” a project that aims to build an international network uniting business incubators, startups, and their partners. An Ense³ student won third prize for a proposed solar energy project in Palestine.

Jeunes Ambassadeurs is an international student orientation program designed to give foreign students coming to the Rhône-Alpes region an opportunity to build long-lasting relationships, both personally and between the region and their home country through a project set up with the support of a local business leader.

Learn more: www.jeunesambassadeurs.com
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Tech transfer center to open at Grenoble Institute of Technology

Grenoble Institute of Technology’s center for technology transfer will open in late October. The center, to be located in the new Phelma 2 building at MINATEC, will be dedicated to industrial R&D projects, offering more than a dozen 30-sq.-m workspaces for student groups from Grenoble Institute of Technology schools. The industrial R&D projects, part of the second-year curriculum, also aim to provide small- and mid-sized businesses with access to advanced technology and know-how. Demand from businesses has far outpaced the school’s capacity of just four projects this year.

The new center will help solve the problem by boosting capacity. It will also serve as a home base for student entrepreneurs from Grenoble-Alpes University whose projects fall within Grenoble Institute of Technology’s scope.

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Horizons

Phelma students' crystallography game a hit

The crystallography board game invented in 2013 by a group of first-year students from Grenoble Institute of Technology-Phelma was a hit at the closing festivities of the International Year of Crystallography held in Rabat, Morocco in late April. In fact, the game was so popular that Unesco and Dectris (the world's leading manufacturer of detectors for X-ray diffraction) ordered an additional 100 games.

The original board game, called *Reflexion*, encourages players aged 7–77 to explore the crystallographic lattice of elements like diamonds, gold, and arsenic. Players must exercise their creativity to reproduce the crystalline structure represented on a card using the figures and two mirrors included in the game. *Reflexion* will also soon be used with school groups at MINATEC, in particular for the nano@school outreach program.

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Live from MINATEC

The Airboard, for faster proof-of-concept

Leti engineer Olivier Ménard raised \$65,000 from some 1,000 backers in 55 countries during a recent Kickstarter campaign for the Airboard, a personal project of Ménard's. And just what is the Airboard? A miniature, open-source, communicating (by Wi-Fi, Bluetooth, Sigfox, etc.) computer that can be used to quickly program IoT prototypes to confirm proof-of-concept. A startup recently used the technology to create (in just one day!) a sensor that measures snow cover for snowboarders, later tested for two weeks at local ski resort Chamrousse.

The 1,100 cards that have been ordered on Kickstarter will be manufactured in the Rhône-Alpes region. Ménard is also looking into the possibility of a start-up that would utilize CEA know-how. The idea that ultimately spawned the Airboard dates back to 2010, when Ménard led an exploratory study on the subject at the IDEAs Laboratory®.

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Serma Technologies invests €1 million in a TEM

The MINATEC campus got a new Transmission Electron Microscope (TEM) earlier this year. The FEI Tecnai Osiris microscope, offering resolution close to the angstrom, was acquired by Serma Technologies, a services company that has called the BHT home for the past several years.

The equipment rounds out Serma Technologies' own capabilities, of course. But the company also has access to additional equipment, including three other TEMs, at the Nanocharacterization Platform. Serma Technologies serves companies and research labs in industries ranging from microelectronics, automotive, energy, and space to biology. The company has 21 employees in Grenoble and invested €1 million to purchase and install the new microscope.

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Agenda

June 7–10, Maison MINATEC
13th International NEW Circuits
And Systems (NEWCAS)
conference

<http://newcas2015.sciencesconf.org/>

June 9, Maison MINATEC
Post your science!

Middle-school poster competition

<http://www.scienceiscool.fr/evenements/affiche-ta-science/>

June 11, Voiron, Isère
INOSPORT 2015

6th annual INOSPORT DAY, dedicated to sports and innovation

<http://inosport.fr/>

June 15–16, Maison MINATEC
GIIP Franco-American colloquium

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June 24–25,
World Trade Center Grenoble
LetiDays Grenoble 2015

<http://www.letidays.com/2015/>

June 29–30,
Grenoble INP-Phelma
GDRi MECANANO workshop
Mechanical issues for advanced
electron devices

http://www.im2np.fr/GDRI_CNRS_Mecano/Workshop_Grenoble_2015/index.html

June 30, Maison MINATEC
Assistants' Day

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July 1–3, Maison MINATEC
InMram School

<http://www.inmram.com>

July 2, Maison MINATEC
11th International Conference on
“Research in High Magnetic Fields”
- RHMf 2015

<http://rhmf2015.lncmi.cnrs.fr/>

July 8–9, Maison MINATEC
Finals of the National Inno' Cup
Junior Competition

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

July 14, San Francisco
LetiDays USA 2015

<http://www.letidays.com/2015/>

August 23–September 12
ESONN, European School
on nanosciences and
nanotechnologies

<http://www.esonn.fr>

September 7,
Grenoble Institute of
Technology-Phelma
Start of the school year

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September 17, MINATEC Plaza
Sustainable Mobility Day

<http://www.journee-mobilite-durable.fr>

October 8–10, MINATEC
2015 Science Fair

Contact: david.riassetto@grenoble-inp.fr

October 15, Phelma 2 Building
6th Phelma Partners' Day

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MINA-NEWS >

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Editing: Benoît Playoust and Bénédicte Magne; layout: Philippe Tur; printing: Format Éditions

English translation: SFM Traduction