



LETI & STARTUPS

A winning combination



© Aledia

ALEDIA

HIGH-POWER LEDs



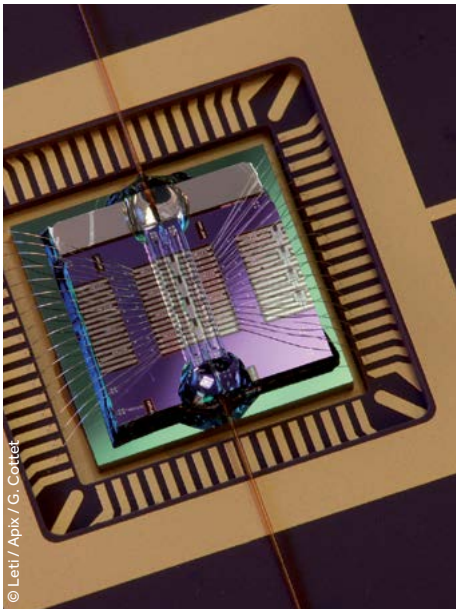
Aledia, founded in 2011, makes high-power LEDs that provide enhanced luminous efficacy while cutting the cost per lumen by a factor of ten. This is made possible thanks to technology developed from five years of research at Leti.

Aledia's high-power LEDs boast two innovations. First, they are designed to use 8- or 12-inch silicon substrates, whereas most LED manufacturers employ 6-inch sapphire substrates. This significantly reduces Aledia's production costs, especially for large batches. Second, instead of an emission plane they contain a "forest" of gallium nitride wires that are grown on the substrate. The resulting 3D surface configuration increases the light-

emitting area by a factor of three to five. Aledia's technology, called WireLED, draws on eight Leti patents and represents a major breakthrough in efforts to improve luminous efficacy and lower costs. The WireLED equivalent of a 100 W bulb costs €10–€12, versus €40–€45 for a 100 W bulb using conventional LED technology. Aledia is targeting the residential market where price is often the primary purchasing decision criteria. The company is based on the MINATEC campus and works with Leti through a joint research laboratory.

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APIX ANALYTICS

MULTIGAS ANALYSIS



Apix Technology is helping make multigas analysis easier and more affordable with silicon-based labs-on-chip that are five to ten times more compact than the systems currently available. Ultimately, Apix Technology's labs-on-chip will cost 10 to 100 times less than competing products.

A Leti-Caltech spinoff founded in 2011, Apix Technology has offices in Grenoble, France and Dayton, Ohio. In early 2012 the company created a joint lab with Leti and holds exclusive licenses to around fifteen patents.

Apix Technology analyzers use silicon miniaturization techniques as well as advanced machining, detection, preparation, and gas species separation methods. A chip measuring

just a few square centimeters can carry out gas-phase chromatography, for example. The analyzers can be used for periodic and semi-continuous analyses.

The company is targeting applications like industrial process monitoring, indoor air quality monitoring, and healthcare, where breath analysis could help diagnose serious illnesses like cancer.

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ARNANO

MICRO-ETCHING ON SYNTHETIC SAPPHIRE



Arnano has developed a unique technology with applications in archiving. The company engraves digital documents in analog format on a sapphire wafer that offers a lifetime of more than 2,000 years. The company also produces decorative engraved-sapphire parts for luxury timepieces.

Arnano's products leverage several advanced processes, including microscopic engraving on precious (artificial sapphire) transparent substrates, thermosensitive lithography, direct laser writing, molecular bonding, and synthetic holography. The company formed a joint lab with Leti in 2010 and holds licenses to around ten Leti patents. Arnano's secure data archiving system entails micro-etching on a nanoform—a 200 mm

sapphire wafer that can store the equivalent of 10,000 A4 pages, or a stack of paper 1.5 meters high! The stable, forgery-proof storage medium is waterproof and flame-resistant up to 1,200°C. The stored data is engraved in analog format at a reduced scale, making it directly readable.

The company's decorative engraved-sapphire parts for luxury timepieces include watch faces, movements, crystals, and watch case backs. Arnano can engrave lines just one micron thick—competitors currently offer only 20-micron engraving—ideal for hiding information that can be used to identify fakes.

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© Aryballe technologies

ARYBALLE TECHNOLOGIES

USING BIOCHEMICAL SENSORS TO DETECT TASTES AND SMELLS



Aryballe Technologies uses a combination of biosensors, databases, and signal processing to develop multi-purpose electronic noses for both commercial and consumer applications.

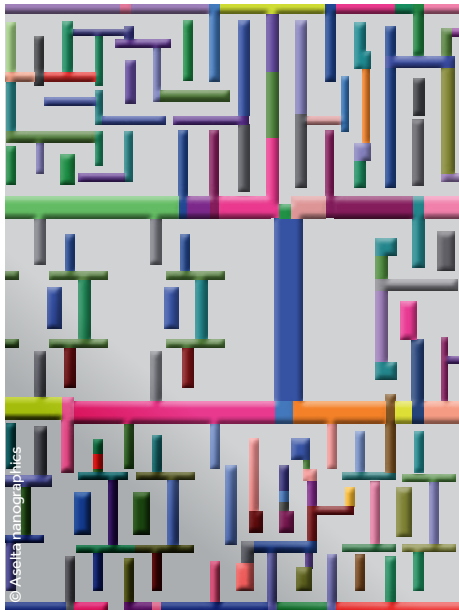
Aryballe Technologies leverages the exceptional versatility of its biochemical sensors to deliver a universal detector that, in the near future, will be able to detect thousands of different scents stored in a database. The sensors use a typical lab testing technique—surface plasmon resonance imaging (SPRi)—but are ten times smaller and ten times less expensive than laboratory-grade devices. Launched in 2014, the startup has established R&D contracts with Leti and INAC and uses three of Leti's patent

families in the development of its technology. Its first product, Neosmia, is a portable device that detects smells for people suffering from olfactory disorders.

The startup has identified more than 50 applications for its technology, including medical diagnostics, olfactory tests in the food and cosmetics industries, environmental monitoring, and the detection of undesirable or dangerous household smells. Aryballe Technologies has already signed partnership agreements with a pharmaceutical company and a household appliance manufacturer.

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ASELTA NANOGRAPHICS

SOFTWARE FOR SUB-32 NM LITHOGRAPHY



Asetla Nanographics' powerful software slashes lithography costs for sub-32 nm integrated circuits—while improving their performance—by shortening mask write times and pushing the limits of machine resolution.

Lithography accounts for 40% of the cost of fabricating sub-32 nm integrated circuits (ICs) and requires special equipment with a price tag of tens of millions of euros.

Asetla Nanographics decided to tackle this key step and deliver two major benefits to IC manufacturers: better process design and mask quality, since Asetla's software lets engineers assess lithography process performance in advance; and the ability to

use existing machines for future technology nodes—thereby eliminating the need for further investments—since Asetla's software pushes the limits of machine resolution by providing unparalleled performance in terms of proximity effect correction.

Through its joint lab with Leti, Asetla is developing software for the next technology nodes and laying the groundwork for future technological advancements like direct e-beam etching. The company has exclusive licenses to several Leti patents.

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ASYGN

DESIGN AND TESTING OF ANALOG AND MIXED INTEGRATED CIRCUITS



Asygn's software can drastically cut the design and testing time for analog and mixed integrated circuits, with applications in imaging systems, radiofrequency communication systems, sensors, and high-speed I/O.

Founded in 2008 as a spinoff of STMicroelectronics and Leti, Asygn draws from a decade of experience in industrial-scale circuit design and testing. Asygn helps semiconductor foundries, designers, and fabless manufacturers get their products to market faster with software that integrates seamlessly into existing workflows.

With Asygn software, simulations can be carried out between 100 and 1,000 times faster

than with conventional tools. And Asygn's testing functions are especially powerful for circuits requiring a high figure of merit, like sensor circuits. Asygn also opens the door to software-based testing that was previously inconceivable, like for imagers.

The company is based near Grenoble and targets the European and US markets, performing advanced R&D in association with Leti.

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AVALUN

BLOOD TESTS IN THE PALM OF YOUR HAND



Avalun's LabPad® mobile point-of-care device can perform a broad range of tests using a simple drop of blood from the patient's finger.

Not only is Avalun, developer of the LabPad® mobile point-of-care device, a Leti spin-off—the company is also continuing to work with Leti researchers via a joint R&D lab. Avalun's LabPad® system, which is capable of performing multiple tests like cell dynamics, colorimetry, and microscopy to full-sized-lab standards, hinges on a miniature, automated microscope that includes a CMOS sensor. The innovative system also features custom-developed reagents integrated into disposable micro-cuvettes. The device can be used to measure blood coagulation times for patients

on anticoagulants; the same device can then be used for additional tests like blood glucose, cholesterol, and triglycerides, for example.

Whether it is used in hospital or outpatient settings or at a doctor's office or patient's home, the LabPad® provides rapid results sent directly to a smartphone or tablet via Bluetooth, ensuring better communication and faster caregiver response to patient needs.

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BESPOON

PRECISION LOCATION TECHNOLOGY



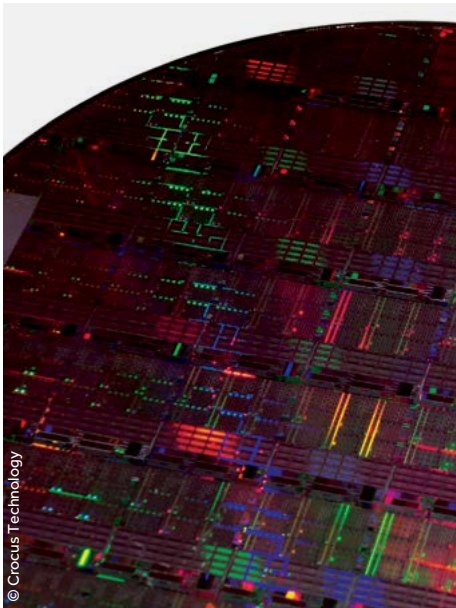
BeSpoon is one of the only companies in the world to offer indoor precision location technology for consumer applications. The key to the company's time saving devices? Transmitter-receiver chips installed directly on the items users wish to locate.

BeSpoon, founded in 2010 by two entrepreneurs with extensive track records in the mobile phone industry, has formed a joint lab with Leti. BeSpoon's objective? To benefit from Leti's location-system know-how and develop an ultra-wideband (500 MHz to 1 GHz) transmitter-receiver chip compatible with smartphone electronics. The joint lab has filed several patents to protect its innovations. In BeSpoon's devices, a chip integrated into a smartphone

communicates with chips on objects to be located, like a laptop computer, handbag, car keys, or a child's favorite stuffed toy. The system uses travelling time to determine the location of the object to within a few centimeters' accuracy, both indoors and out, within a range of up to several hundred meters. The fact that location capabilities have been successfully integrated onto just a few millimeters of silicon will open the door to a broad range of consumer applications. Smartphone and internet box manufacturers—always on the lookout for ways to provide new services—have already expressed interest.

www.bespoon.com

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© Crocus Technology

CROCUS TECHNOLOGY

MAGNETORESISTANT SEMICONDUCTORS



Crocus Technology's Magnetic Logic Unit™ (MLU™) architecture offers exceptional stability and speed, making it ideal for a wide range of applications including secure microcontrollers for communicating devices. This groundbreaking architecture can be used for technology nodes as advanced as 22 nm.

Crocus Technology, founded in 2004, boasts a portfolio of leading-edge technology and holds over 100 patents. Its MLU™ architecture has transformed the smart card industry by providing low power, high read/write speed, high endurance, and non-volatile memory that can operate at high temperatures. Industry giant IBM has recently formed a technology

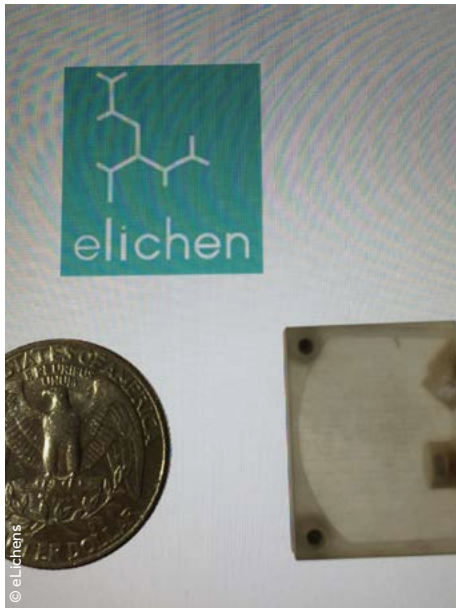
development partnership with Crocus to leverage the French company's extensive know-how in magnetic technology.

Crocus is based in Grenoble with a branch office in the US, and carries out R&D in association with Leti and two other Grenoble research centers: the Microelectronic Technology Laboratory (LTM) and Spintec. Crocus has also formed a joint venture in Russia to build a 300 mm wafer manufacturing facility.

Its MLU™ architecture can also be used instead of flash memory in microcontrollers to perform extremely secure authentication functions.

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eLICHENS

MINIATURE CONNECTED SENSORS FOR AIR QUALITY SERVICES



Launched in late 2014, eLichens develops miniature air quality sensors and services for the consumer and commercial markets.

eLichens' products are based on nondispersive infrared detector (NDIR)-type gas sensors. Although industrial-grade sensors of this type do exist on the market, they are often bulky and expensive. By reducing product size and gradually bringing the cost-per-sensor down to just a few dollars, eLichens is making inroads into new segments of the commercial market and has set its sights on the vast consumer market. eLichens' sensors perform continuous measurement of gases like CO, CO₂, and CH₄, enabling users to detect, monitor, and predict overall air quality. Using specialized software

and connected devices and equipment—from smartphones and smart home automation systems to infrastructure and manufacturing equipment—and leveraging data from public air monitoring networks and user communities, the sensors are driving the emergence of new personalized services.

Based in Grenoble, eLichens currently licenses about 20 of Leti's patents and, through a joint laboratory set up between the two organizations, has also applied for several new patents. eLichens plans to release its first products in 2016.

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ENERBEE

ENERGY-HARVESTING MICROGENERATORS FOR SELF-POWERING DEVICES



What if it was possible to harvest energy from any type of movement, fast or slow, regular or irregular? Enerbee has answered the challenge with a new breed of innovative microgenerators.

Each year, 30 billion button batteries are sold worldwide. Many could soon be replaced by self-powering wireless microgenerators that require no maintenance or replacement.

Founded in 2014, Enerbee has introduced a disruptive technology for harvesting energy from movement, even slow or irregular. The energy harvested is greater than that of conventional induction generators for movements of up to 10,000 rotations per minute (RPM). At 100 RPM, the energy is

an impressive 100 times greater. Enerbee's microgenerators, which combine piezoelectric and magnetic materials, were developed over three years with Leti and Grenoble Institute of Technology and are protected by five patents. Enerbee is housed at MINATEC and is supported by scientific advisors from Leti and the CNRS.

The company is targeting the home automation, access control, and connected objects markets. It is currently offering evaluation kits and plans to release its first products in 2016.

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ETHERA

INDOOR AIR PURIFICATION AND MONITORING SYSTEMS



Ethera provides in situ indoor air purification and monitoring systems that offer greater sensitivity and selectivity at costs lower than competing systems.

Ethera, founded in March 2010, has developed an air purification and monitoring system that uses nanoporous materials whose pores have been functionalized to react with common indoor air pollutants like formaldehyde, trichloramine, and benzene derivatives. The concentration of a given pollutant is indicated by the color of the nanoporous materials; these materials are also capable of filtering the air to remove certain pollutants.

Because the concentration measurements are made in situ rather than at a laboratory,

Ethera's system can cut costs considerably while offering the same level of sensitivity. Its system can detect pollutants at a $\mu\text{g}/\text{m}^3$ level in line with the latest indoor air quality monitoring standards for chronic exposure.

With operations at Grenoble and Saclay, Ethera holds licenses to patents owned by the CEA and CNRS—with which it has set up a joint laboratory. Ethera is currently working with Leti to improve its reading systems and develop methods for measuring new gases. The company's main market is France, where the government has passed strict indoor air quality regulations.

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EXAGAN

INTEGRATING GALLIUM NITRIDE (GAN)-ON-SILICON POWER COMPONENTS INTO CONVERTERS



With Exagan's GaN-on-silicon technology, tomorrow's electric power converters will be smaller, more efficient, and less expensive.

In the race towards increasingly smaller product form factors, power converter manufacturers are forced to increase their products' frequencies by several hundred kHz and, sometimes, MHz. Exagan plans to take full advantage of this trend with its GaN-on-silicon power components.

Exagan's promise: converters that are three times smaller, 25% less expensive, and capable of reaching 99% efficiency. The technology will address the hybrid vehicle, solar energy, radar, mobile phone network, and other markets.

Launched in 2014, Exagan is the product

of technology developed over a decade-long collaboration between Leti and Soitec and is protected by dozens of patents. The startup's success is based on gallium nitride-on-silicon deposition using MOCVD paired with a manufacturing process compatible with silicon foundries.

An R&D contract with Leti has given Exagan the opportunity to produce its prototypes on Leti's Grenoble-based 200 mm pilot line. It also uses equipment from the CEA Tech Midi-Pyrénées' regional technology transfer platform located in Toulouse.

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FLUOPTICS

FLUORESCENCE IMAGING FOR ASSISTED SURGERY



Fluoptics' fluorescent tracers are used with the Fluobeam® imaging system to highlight details like tissue vascularization, blocked veins, and tumor edges to within 300 microns' accuracy—a boon to surgeons.

Fluoptics, founded in 2009, works with Leti through annual research contracts. The company uses the lab's physics, optics, and chemistry equipment and leverages its in-depth knowledge of medical instrumentation. Fluoptics combines fluorescence imaging with a variety of tracers capable of following the vessels of the lymphatic circulation system and targeting tumor cells, for instance. Surgeons can now see the edges of a tumor with unparalleled precision and observe biological

events previously invisible to the naked eye. Fluoptics has integrated this technology into portable, cost-effective systems that are easy to use in actual operating room conditions. Fluoptics' imaging systems are designed for use in cancer, cardiovascular, liver, and reconstructive surgery. The Grenoble-based company has also opened an office in Boston, MA to serve the US market.

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ISKN

SIMPLER, RICHER INTERACTION WITH THE DIGITAL WORLD



ISKN's The Slate is revolutionizing the relationship between physical objects and the digital world. This smart tablet digitizes handwritten drawings, notes, and sketches in real time.

ISKN's technology sets itself apart from today's existing devices by its simplicity and variety of potential uses. It's as easy as this: the user writes on a piece of paper with a regular pen that has been outfitted with a small magnetic ring. The pen generates a magnetic field that is measured in real time by The Slate's 32 three-axis magnetometers and a digital version—precise to the millimeter—instantly appears on the user's tablet, PC, or Mac.

The digital file can then be modified, enhanced,

shared with other users, and even played as a video of the drawing's progress. The result of four years of research at Leti, ISKN was launched in February 2014, and raised \$2 million in October 2014. The startup has licensed several patents held by Leti and has signed a multi-year R&D contract with the institute.

Until now, ISKN has mainly addressed the consumer market. However, with the development of targeted applications, its technology could also respond to certain commercial needs from survey-taking to gathering health data and more.

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KALRAY

PROGRAMMABLE MANYCORE PROCESSORS



© Kalray

Kalray has developed a new generation of programmable processors. Thanks to a massively parallel architecture supporting several hundred cores, the processors deliver power, energy efficiency, fast programming, and low cost.

Kalray's MPPA® architecture was developed to overcome the challenges of programming 256, 512, or 1,024 processor cores and getting them to work in parallel. Specific processing tasks are no longer hardware-dependent as they are with ASICs; plus the technology offers better performance than ASICs at a lower cost. The company, founded in 2008, has offices in Orsay and Grenoble and holds around 40 patents for its technology, half of which

originated at List and Leti. Kalray also has a joint lab with the two institutions on programming tools, networks-on-chip, and the porting of applications to MPPA. The company's first commercial product is a 256-core processor made using 28 nm technology.

Kalray will be targeting real-time video encoding, CCTV image analysis, 3D and augmented reality, signal processing for the defense sector, and command and control systems, and hopes that its new manycore processors will become the model for future field-programmable gate arrays (FPGA).

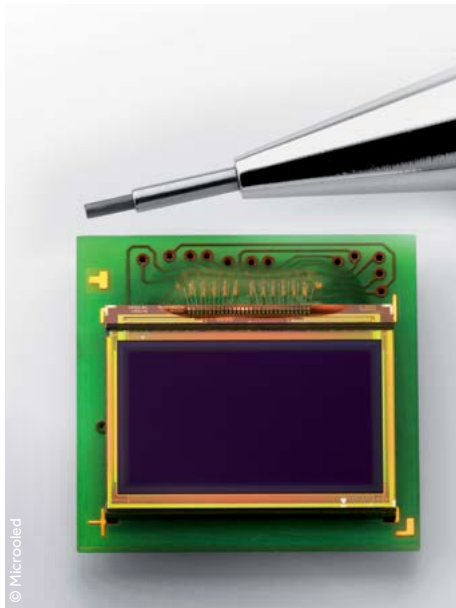
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MICROOLED

MINIATURE OLED DISPLAYS

microoled



MicroOLED's miniature OLED displays offer excellent image quality and low power consumption—all at a competitive price. Used in both consumer and B to B markets, MicroOLED's products are capable of giving industry heavyweights like Sony a run for their money.

Although MicroOLED was founded only in 2007, it has quickly established itself as a viable competitor to its older and bigger rivals. The company's tiny OLED (organic light-emitting diode) displays—less than 2 cm diagonal—are already used in video glasses, cameras, binoculars, and industrial equipment for the healthcare and defense industries. All of the Grenoble-based company's revenue

is generated outside France. MicroOLED's technology allows for unparalleled pixel density, making it ideal for delivering optimal image quality in terms of color, resolution, contrast, and brightness—or for lowering the cost of displays while maintaining current quality levels. At its joint lab with Leti, MicroOLED performs advanced R&D using patented Leti technology for which the company has an exclusive license. STMicroelectronics acquired a minority stake in MicroOLED in 2012 through a joint venture to better integrate controller functions into the microdisplays.

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MOVEA (an Invensense company)

VALUE-ADDED DETECTION SOLUTIONS



Movea, a company specializing in embedded data-fusion software, was acquired by US-based Invensense in 2014 to develop new detection solutions for connected objects, sports and leisure, drones, robotics, and more.

Movea, founded in 2007, boasts a portfolio of more than 600 patents and has established a joint lab with List and Leti. Movea develops embedded software that fuses raw data from multiple sensors (position, acceleration, temperature, and sound) to provide high-added-value information.

When combined with Invensense sensors, Movea software powers a vast range of value-added detection solutions, from

instrumentation for Wii-style gaming consoles, GPS assistance, smartphone image stabilizers, computer-assisted athletic training, and attitude control systems for drones.

The Movea-Invensense location in Grenoble counts around 50 employees and is devoted entirely to R&D. The center's current focus is on context-detection applications that adjust a smartphone's settings (ring volume, etc.) to the environment.

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MULTIX

X-RAY SPECTROMETRY FOR LUGGAGE INSPECTION



MultiX X-ray spectrometric detectors are used to inspect luggage and parcels in real time, slashing the number of false positives by a factor of four relative to competing systems. The company's flagship market application is airport security.

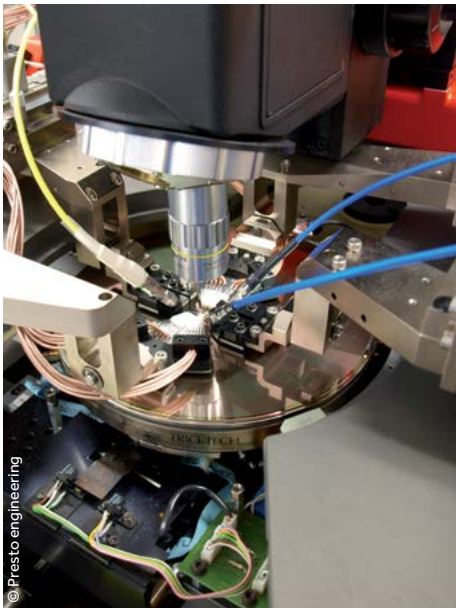
MultiX's transmission X-ray spectroscopy technology can detect explosives (including explosive precursors), acids, inflammable substances, and illegal substances with impressive precision. The technology is also cost-competitive enough to earn it a position in the airport luggage scanner market—worth an estimated \$1 billion.

The company holds exclusive licenses to numerous patents and leverages Leti's fifteen

years of experience in the field of direct-detection for radiological imagers. MultiX and Leti operate a joint lab that focuses primarily on algorithms for interpreting spectrometric data. With headquarters in Neuilly-sur-Seine near Paris, MultiX chose Grenoble as the home for its engineering and manufacturing activities. The company's technology offers unrivalled performance and is the only one of its kind in the world. MultiX currently plans to diversify its market applications with forays into foreign-body detection for the food industry and waste sorting.

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PRESTO ENGINEERING

SEMICONDUCTOR COMPONENT TESTING AND ANALYSIS



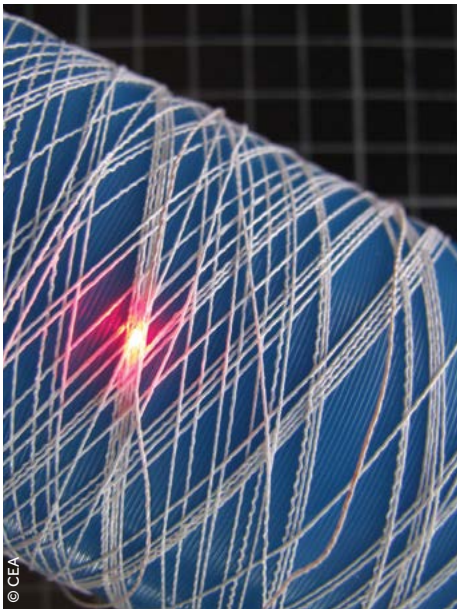
Presto Engineering Europe, the European subsidiary of California-based Presto Engineering, offers high-performance testing and analysis services that help semiconductor component makers get their products to market faster.

The bottleneck for many semiconductor component makers is the crucial testing phase. Electrical, thermal, and functional testing can take anywhere from three to twelve months—with the ever-present risk of falling behind quicker competitors. Presto Engineering has developed testing and analysis methods that can save time while improving product reliability. The company is best known for its radiofrequency know-how, which it is

developing further through a joint lab set up with Leti in 2010. The lab is working on a design-for-test approach that can facilitate later-stage testing. With its European hub in Grenoble, Presto Engineering aims to team up with the area's semiconductor companies to explore new methods like back-end testing for parts just before they reach the industrial-scale production stage.

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© CEA

PRIMO1D

ELECTRONICS SMALL ENOUGH TO FIT INSIDE A THREAD



Primo1D is breaking new ground in integrated electronics, with embedded LEDs, RFID tags, and sensors for woven textile, extruded, or molded plastic applications.

Primo1D's technology, developed at Leti, uses weaving to encapsulate extremely-miniaturized electronic microsystems in textiles and other fiber-based materials. The start-up's first product is an RFID tag for industrial laundering and textile manufacturing applications. The tag, in thread form, is woven right into the fabric, where it provides traceability and anti-theft capabilities—invisibly and cost-effectively.

The company is currently developing new tags to track the lifecycle management

and recycling of consumer textiles. Other applications include integrating LEDs into thread for high-end home furnishing fabrics and integrating sensors into extruded products like flexible hoses and cabling.

Primo1D conducts its research and development work via a joint lab with Leti and won numerous awards for its innovations in the run-up to founding the company in August 2013.

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SOFRADIR

COOLED INFRARED DETECTORS



Sofradir, founded in 1986, is today the world's second-leading vendor of cooled infrared detectors for aerospace, defense, and industrial applications. One thing that hasn't changed is Sofradir's commitment to innovation. The company allocates 12% of its revenue to R&D.

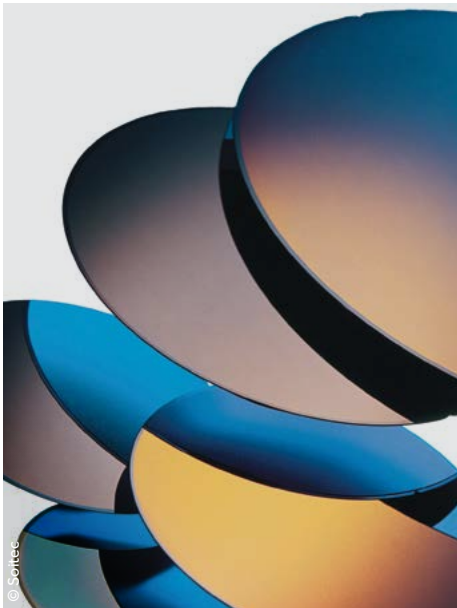
One of the secrets behind Sofradir's success is its HgCdTe technology, which was originally developed at Leti. The company has continued to work with Leti to improve the technology through a joint lab, Defir. The technology, protected by some 55 patents, gives Sofradir's detectors a broad spectrum of wavelengths and the capacity to operate at higher temperatures than competing technologies. Sofradir supplies detectors for military equipment (customers

include the United States Army), satellites, scientific research instruments, and industrial process control equipment. The company handles the entire manufacturing process—from substrate to final testing—in house. Two-thirds of Sofradir's revenue is generated by export sales.

Sofradir is expanding its business to cover all technologies on semiconductor materials for infrared detection. The company is broadening its product lines in order to penetrate new markets. Sofradir will continue to conduct R&D through its joint lab with Leti.

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SOITEC

THE GLOBAL LEADER IN SEMICONDUCTOR MATERIALS



Soitec uses its advanced technologies to design and produce innovative substrates that meet the electronics industry's challenges.

Soitec was founded in 1992 by two Leti researchers. The pair first developed SmartCut™, a process for scaling up Silicon-on-Insulator (SOI) wafer technology for mass production. Leti and Soitec continue to collaborate closely through the joint lab that was founded at the company's inception.

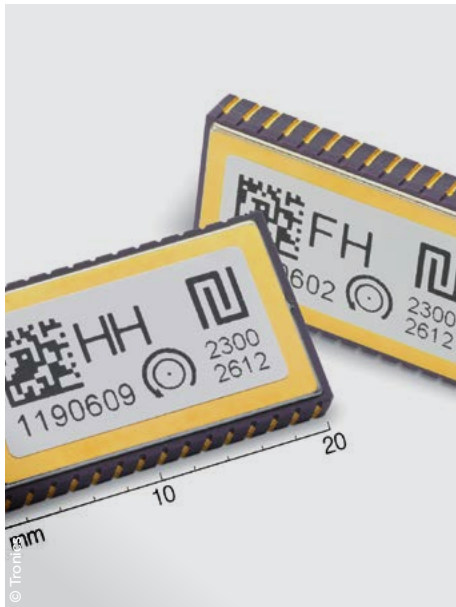
On today's electronic component market, SOI is highly regarded for its superior performance, energy efficiency, and competitive cost. Soitec's materials—particularly well-suited to mobile device manufacturing—are also used

to produce chips for consumer electronics in general, the Internet of Things, cloud computing, and the automotive industry. Soitec's substrates can be found in servers, cars, smartphones, tablets, wearable tech devices, and smart lighting.

Soitec is still based just outside of Grenoble, in Bernin. However 90% of the company's sales are to customers outside France. The company has around 850 employees in France and 1,200 worldwide (January 2015).

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TRONICS

A FULL-SERVICE MEMS MANUFACTURER



Tronics, founded in 1997, designs and manufactures high-performance custom MEMS. The company's products are sold worldwide, with applications spanning the aerospace, defense, energy, healthcare, and transportation industries.

Tronics was the first foundry to offer MEMS on SOI—a field in which the company has successfully maintained its advantage. Technology—most notably a rich portfolio developed in conjunction with Leti—drives Tronics' business.

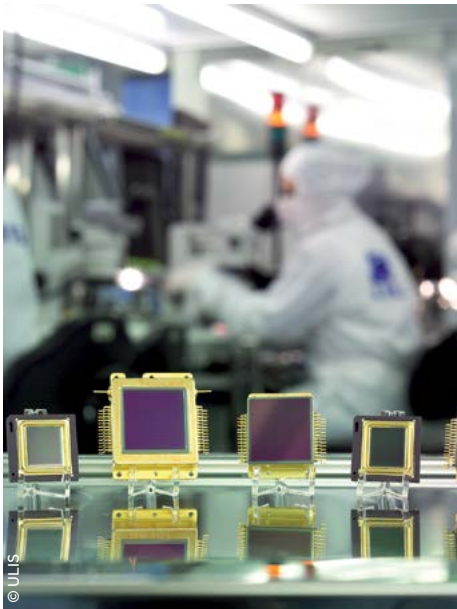
Tronics delivers extensive know-how in high vacuum packaging and is currently developing a silicon nanowire-based detection technology. Tronics manufactures its accelerometers,

gyrometers, RF components, and pressure sensors at plants in Grenoble, France and Dallas, TX. Depending on the application, the company develops custom MEMS or integrates standard functions. Tronics' products are found in aerospace and defense equipment, medical devices, and industrial instrumentation. The company is also the world's leading maker of MEMS seismic sensors for oil and gas exploration.

The company holds licenses to around 20 Leti patents and works with Leti through research agreements and multi-partner projects.

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© ULIS

ULIS

INFRARED DETECTORS



In the ten years since Ulis was founded, the company has become the world's second-leading supplier of uncooled infrared detectors for civil applications. With 96% of its revenue generated outside France, the company has established itself as a global leader in amorphous silicon technology.

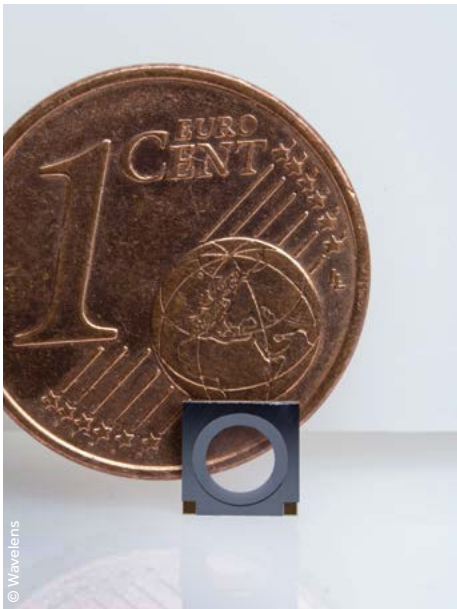
Amorphous silicon offers numerous advantages over the vanadium oxide typically used in infrared detectors, such as high spatial uniformity and predictable temperature behavior. Ulis, which holds an exclusive license based on Leti-patented technology, has leveraged these advantages to develop state-of-the-art systems for industrial thermography, firefighting, healthcare, and airport security

applications. The company has more recently been able to expand into other high-potential markets like surveillance, driver assistance, and low-end thermography systems, thanks largely to sharp reductions in both pixel size (which has shrunk from 45 to 17 microns) and the cost of making uncooled infrared detection systems.

The company is based just outside Grenoble and performs advanced R&D with Leti through research agreements, which result in the filing of some four to six patents every year.

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WAVELENS

MEMS-BASED OPTICS SOLUTIONS



Wavelens, founded in 2012 by three CEA engineers, develops optics solutions designed to enhance smartphone-camera image quality.

The smartphone-camera market is booming, and consumers are becoming increasingly savvy, demanding advanced optical features like autofocus.

Wavelens developed a variable-focal-point lens on silicon—a novel approach that has the advantages of being four times smaller and consuming 1,000 times less power than current autofocus solutions. The lens is particularly well-suited to applications that require a small form factor, high speed, low-power consumption, and affordable cost. And,

because the microsystem is fabricated at wafer scale, it is easy to integrate into smartphone optical systems and/or cameras.

The company is also working on new medium-term applications for the technology, like image stabilization and zoom, as it continues to roll out its current autofocus system. Ultimately, the technology could address higher-added-value markets like manufacturing, healthcare, defense, and automotive.

Wavelens holds exclusive licenses to around ten Leti patents for these technologies.

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