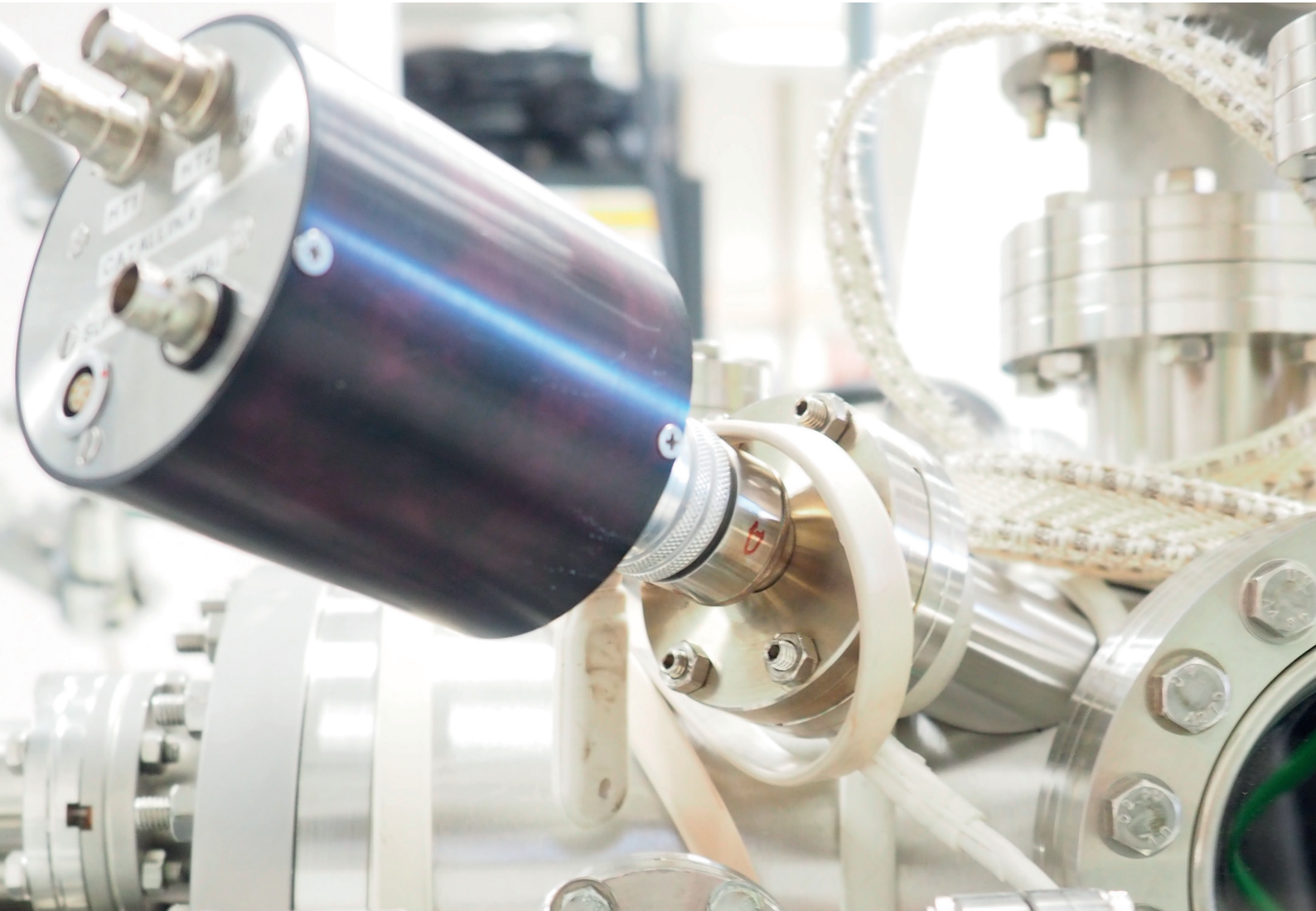# TECHNOLOGY TEASERS 2019
__ SMART INDUSTRIES

SEEING MORE THAN EVER BEFORE WITH MASS SPEC

At LIST, we developed VECTOR500 SIMS: an instrument allowing chemical microscopy at a world record resolution. Nano-analytical techniques and instruments providing both excellent spatial resolution and high-sensitivity chemical information are of extreme importance.

A PLASMA ROBOT FOR ALL SITUATIONS

Plasma is one of the four fundamental states of matter. It is electrically conductive, produces magnetic fields and electric currents, and responds strongly to electromagnetic forces. Although not freely existing under normal conditions on Earth, it is quite commonly generated by either lightning, electric sparks, fluorescent lights, neon lights or in plasma televisions. LIST researchers use the plasma technology and its deposition at industrial scale to treat material, on 3D dimensional shapes, in order to give new properties to the surface of this material (for example corrosion resistant, antibacterial, self-cleaning, etc.).

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STOP ANIMAL TESTING (THROUGH NEW TECHNOLOGY) WITH LUNG CELL CULTURES

Respiratory sensitizing chemicals are of high societal concern. Early detection of such hazards during product development of new chemicals can contribute to safer products. LIST has developed the first 3D-in vitro assay that can identify sensitizers and differentiate them from respiratory irritants, thus avoiding animal experiments in the future.

FEEL AS IF IT WAS REAL WITH NEW HAPTICS!

Piezo actuators are a special type of ceramic that expands or contracts when an electrical charge is applied, generating motion and force. They generate ultrasonic vibrations on a glass screen and modify the friction of your finger on it. LIST technology allows for integrating these actuators on glass, with no need for external bulky ceramics. LIST's technology relies on the deposition of state-of-the-art transparent piezoelectric films on glass. They are able to generate local vibrations that you can feel on your fingers. The targeted applications go from mobile phones and tablets to cars interiors but also fridges and ovens in your kitchen.

DIGITAL IMAGE CORRELATION: LOOK, BUT DON'T TOUCH!

This new way to understand the strain mechanisms of materials or complex objects is a major step in R&D testing. Digital Image Correlation (DIC) is an experimental technique, very customizable, that allows measuring strain fields without contact with the specimen or product, by comparing pictures at different deformation steps and relating them with the corresponding applied load.

RAW MATERIALS FOR 3D PRINTING

To support the 3D-printing transition, LIST develops polymer-based blends and composites. We deliver a unique combination of competences in material engineering, polymer compounding, characterization, process simulation and structural analysis solutions. Targeted industries are transportation, aerospace and medical industries, using popular 3D-printing techniques that offer significant part design flexibility: Fused Deposition Modeling (FDM) and Selective Laser Sintering (SLS).

MONITOR YOUR HEALTH WITH CHEMICAL NANO-SENSING

LIST is on its way to contribute to personalised medicine thanks to Bio-field effect transistors (BioFETs). These are sensors enabling reliable chemical sensing. At LIST we aim to use nano-sensors (FinFET) in large numbers, which might be a breakthrough innovation for personalised medicine: for example, in the future we might be able to create fully customized vaccines. Our FinFET pH sensors are extremely sensitive and fully reliable.

DATA SCIENCE FOR THE TIRE OF THE FUTURE

Tires are not only produced with rubber and advanced materials but also increasingly with data. Within the strategic collaboration between LIST and Goodyear, the potential of data science is explored all along the life cycle of a tire. Data can deliver value in complex engineering, in tire testing and in developing new services to customers.

NEED MORE INFORMATION?

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TECHNOLOGY TEASERS 2019
__ SMART ENVIRONMENT

SPRAY LESS WITH PRECISION AGRICULTURE

LIST presents two remote sensing technologies that will allow precision farming: a way to reduce and tailor the application of pesticides or fertilizer to the crop needs. For example, drones take very-high-resolution images, which can help in detecting and monitoring diseases in vineyards. L IST also presents ways to remotely monitor the nutrient status of wheat crops utilizing satellite imagery of Sentinel-2, the Earth observation mission from the EU Copernicus Programme.

SAVING LIVES WITH GLOBAL FLOOD MONITORING

Floods have a huge environmental, social and economic impact, and this will increase in the future with climate change combined with a growing population. To help stakeholders mitigating inundation risk and give them access to a comprehensive, historical and up-to-date record of events, LIST has developed HASARD: a satellite Earth Observation-based flood mapping software using satellite images to automatically produce accurate floodwater maps in near real-time.

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SAVING LIVES WITH GLOBAL FLOOD MONITORING

Floods have a huge environmental, social and economic impact, and this will increase in the future with climate change and a growing population. To help stakeholders such as disaster relief authorities and international organisations mitigate inundation risk and give them access to a comprehensive, historical and up-to-date record of events, LIST has developed HASARD: a satellite Earth Observation-based flood mapping software using satellite images to automatically produce accurate floodwater maps in near real-time.

ANAEROBIC DIGESTION OF BIOWASTE

A renewable and sustainable production of energy, bio-fertilizers and green chemicals, all in a local circular bio-economy concept. Anaerobic digestion of bio-waste is a natural microbe-driven process producing biogas that can be stored and used as energy. Some biogas residues can also be used as fertilizer. How to make it easier for microbes to digest organic matter? What are the best conditions? How to predict/avoid perturbations in the process? Contact us to find out.

ARTIFICIAL INTELLIGENCE FOR AMPHIBIANS!

Amphibians, an important part of biodiversity and ecosystem services, are under high pressures worldwide. The understanding of the drivers of decline is limited by heavy procedures to observe amphibians, which often impact them. LIST's NEWTRAP team developed a newt camera trap using machine learning. The trap automates the production of high-resolution newt observations through Artificial Intelligence, while leaving all living things perfectly unharmed and critically reducing scientific field work.

AIR QUALITY RESEARCH ON WHEELS!

LIST's environmental monitoring vehicle contains a unique combination of bio-meteorological and chemical measurement devices in order to assess local air quality at almost any location, independently from external power supply. Micro- and nanoparticles - that might negatively affect human health - and their chemical composition can be analysed in near real time and in combination with meteorological variables.

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TECHNOLOGY TEASERS 2019
__ SMART CITIES

DIGITAL TWINS FOR BETTER URBAN LIVING

In the future, cities will be managed through digital twins to monitor the performance and environmental impact of buildings, and to provide useful feedback to shape our districts and cities. With this innovative system, citizens can easily interact with their districts or city design: by moving residential, commercial or green areas on the interactive table, they can see the urban design spaces dynamically configured and discuss in real time different options.

DIGITALLY ENHANCED WORK ENVIRONMENTS

Cognitive environments are connected physical spaces that provide digital tools for workers to achieve their tasks while sensing, understanding and ultimately measuring their activity to provide them with feedbacks and feedforwards in a natural and multimodal way. Technologies that equip such spaces consist of a blend of Artificial Intelligence, sensors, data analytics, data visualisation, collaborative devices and connected objects interacting with and adapting to the users.

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CREATING AUTOMATED MAPS WITH ROBOTS

Mapping and digitalizing areas in large buildings is a tedious and time-consuming activity. And what happens when the configuration changes? You need to do it again… With our AIML-TILT system, this can be automatically done by autonomous robots using technologies such as LIDAR and camera, enabling a fast digitalization of large areas at a lower cost. Totally based on open-source software and hardware, this solution avoids proprietary catch.

SO YOU THINK YOU'RE A GREEN TRAVELLER?

Driven by climate change mitigation strategies and reducing urban pollution, electro-mobility is coming. But how efficient are electric cars at reducing our CO_2 emissions? Battery, electricity… what does it depend on? You can test LIST's "CLIMOBIL" online app, available at: https://www.connecting-project.lu/

PLAN CONSTRUCTIONS RELIABLY WITH SMART DATA

The construction sector is facing a new world of opportunities thanks to the huge amount of digital data. Until now this data stays disconnected from the actual decision-making process of the construction site and therefore is useless. LIST's "AndON" Platform aims to be the missing link between planning and reality on a construction site. It manages data in order to support integrated, structured and collaborative decision-making. The Platform will enable users to collect, manage and change data on the go, along with the reality on-site.

PROFESSIONAL TRAINING WITH AUGMENTED REALITY

Radiological incidents, whether caused by acts of terrorism or accidents, pose a significant threat to the public and first responders. As a result, effective training solutions are required. Compared to current approaches, augmented reality can provide a safer, quicker, easier and repeatable method of training at a very low cost. Stimulated items such as sources and equipment can be connected with the augmented reality and therefore exactly adapted to the wishes of the customer.

NO TIME TO WASTE WITH POLYGONE!

Waste management is as a priority industry in Luxembourg and can greatly benefit from new sensing technologies and optimisation techniques. At LIST we developed a digital system through which digitalisation processes, products or services can be improved (in particular via data science, modelling and numerical optimization). This can be applied not only to the waste industry but also to virtually any business (in particular when data is available, or "systematic know-how").

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