

micro & nano Mag



The Magazine of the micro-nanotech Cluster of Western Switzerland



SENSORS & MEASURING DEVICES
AERONAUTICS & SPACE
MACHINES, INDUSTRIAL EQUIPMENT
& AUTOMATION
AUTOMOBILE
ELECTRONICS, MICRO-ELECTRONICS
MEDICAL
ENERGY
WATCHMAKING
TELECOMMUNICATIONS
MATERIALS
R & D + SERVICES
SUB-CONTRACTING
SECURITY



II - 2016



Robotics and IT



Innovative photopolymerization



Rubidium atomic clock

Western Switzerland

Sensors
Time
MEMS
Watchmaking
Nanomaterials
Micro-electronics
Precision
Innovation
Reliability

The future of microtech

Integrated magnetization



Embeddable microsystems



Endodontics Training



Ultra-low-power chips



The Amadeo
Fleurier BraveHeart





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IMPRESSUM

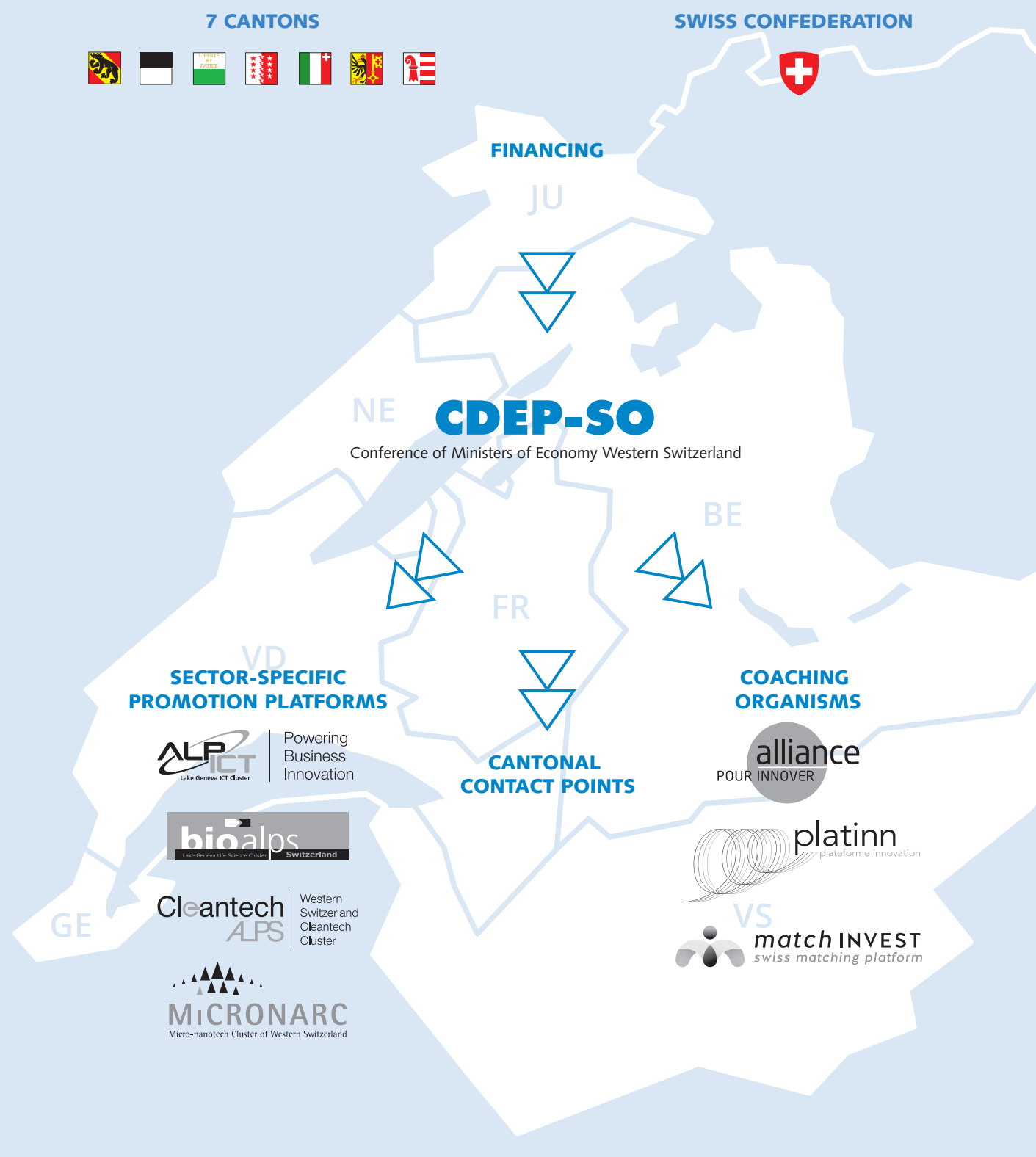
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Cover: sugar cube delta robot (size: 31 x 31 x 31 mm³) with miniature piezo linear micro-motors (CSEM).

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Dear reader,
Welcome to the second edition of your Micro&Nano Mag! It is proudly published by Micronarc, the micro-nanotech cluster of Western Switzerland, and its eminent partners.



Danick Bionda,
Secretary General
of Micronarc

Our goal is to present you with some of the most innovative products and technologies from our region and to introduce you to the mystery of its prosperity and longevity. Indeed, how can such a small country and region remain, over centuries, the reference for accuracy, reliability and of course legendary - SwissMade - quality? Not only of its products and services, but also quality of life... How is it possible that, in a radius of 10 miles, you can still drive by all the most prestigious leading names of the watchmaking industry? And did you know that they produce, in quantity, only 2% of the watches worldwide? But... they succeed in owning, every year, 54% of the total turnover of this industry!

Nevertheless, as you'll discover in this magazine, this is not a renewed overnight miracle! It comes with hard work and strong synergies, between several entities, sharing best practices on a daily basis: top universities, outstanding research institutes, highly qualified facilitators and of course, companies daring to innovate, targeting the world as their first market – because we are only 8.2 million people in Switzerland (source: Swiss Federal Statistical Office in Neuchâtel, for 2015), with a rich percentage of 25% of foreigners (you can move the adjective «rich» wherever you want)!

Are you ready to see:

- A micro sensor, detecting forces of 0.01 N, with an accuracy of up to +/- 0.1% combined error (linearity + hysteresis)?
- The first 3D Cell Explorer, fitting on your desktop, to observe living cells, without any preparation or invasive process?
- Cutting-edge technologies for low power components and optimized protocols?
- New generations of original biometrics smartwatches?
- Specialized universities, institutes and facilitators supporting the Swiss industry, including the 4.0?
- 3D printers of «Digital Materials» formulated during the building process, with multiple colors.
- SwissMade machines and processes to help the world to master precision and reliability but also, for our own watchmaking industry?
- The best clocks for satellites? Our Atomic clocks!
- How Swiss quality is a key asset for medtech innovations?
- Nanoplastics with megaproperties? Etc.

And of course several masterpieces celebrating their own artistic vision of time with brands like Vacheron Constantin, Jaquet Droz, Rolex, Bovet and Richard Mille...

And a special tribute from Micronarc to Caran d'Ache for their 100th Anniversary: one century of exceptional writing instruments, crafting beauty and emotion, to constantly inspire generations of passionate fans, fathers, mothers and children, drawing together unforgettable pages of their lives.

So, are you ready to explore Western Switzerland and would you like to join us on our booths to exhibit your activities locally and abroad? Please, check our program of events at the end of this Micro&Nano Mag!

We wish you a happy reading!

MICRONARC
Micro-nanotech Cluster of Western Switzerland

«Ready, Steady, Go!»



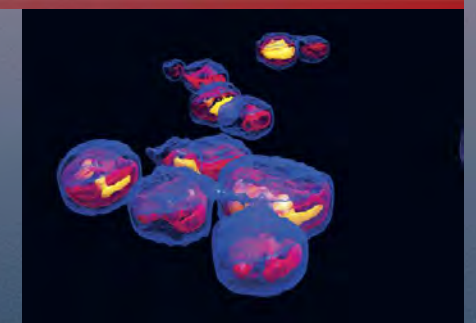
Life is much about sensing. Living creatures need to perceive what is pertinent, useful and vital to them. Human societies too. Today, technology is producing small sensors and smart sensing systems in quantities measured by billions. These devices can assess in finite detail the quality of our environment, our health, while ensuring the quality of our products as well as the accuracy of other devices...

Western Switzerland is a preeminent place in this new stage of global evolution.

Photo: Castle of Chillon, Vevytau. Vaud



Sensor covering a range of 0.01 N to 3500 kN



New holographic tomographic microscope



Electronics - sensor networks

Based in Rossens/Fribourg (Switzerland) Magtrol is recognized worldwide as a designer and supplier of Force/Torque/Position sensors as well as Motor Testing Systems and Test Benches.

A 0.01 N mini-sensor for force measurement



1

Magtrol provides sensors for force measurement ranging from 0.01 N (corresponding to a mass of 1 gr) to 3500 kN. These are fitting applications from medical and watchmaking to containers crane or tunnel drilling. Born as the spin-off of instrumentation division of Vibro-Meter in May 2000, Magtrol SA employs now 70 qualified collaborators. It is part of the Magtrol group of companies with headquarters in Buffalo, USA, and subsidiaries in Germany, France, China and India for a total of 140 employees.



«More than ever, we need to be innovative with high-end and unique product offering!»

Jocelyn Cattin,
CEO/General Manager

With the **MBB-02** force transducer, Magtrol supplies a sensor dedicated to micro-measurement, used for example, by many high-end watch-manufactures for measuring the friction in the movement of mechanical watches.



2



1. MBB-02, semiconductor strain gauge transducer for measuring very small forces (0.01 N to 5 N).
2. Its compact dimensions allow the use of MBB-02 sensor in many small and precision applications.
3. Thanks to its high expertise and know-how, Magtrol SA guarantee high reliable and accurate products.

The MBB-02 is entirely made of aluminium to combine lightness and stability of measurement. It covers a range of 0.01 N to 5N and uses semi-conductors strain gauges. Having a larger gauge factor than foil types, semiconductor strain gauges allow measurements of very small strain. It is however more sensitive to temperature changes and are more fragile than foil gauges, which then requires specific knowledge and expertise for the application. The sensor integrates a built-in overload protection offering up to 25 times security. Dedicated to laboratory application, it is suitable for the temperature range of +15°C

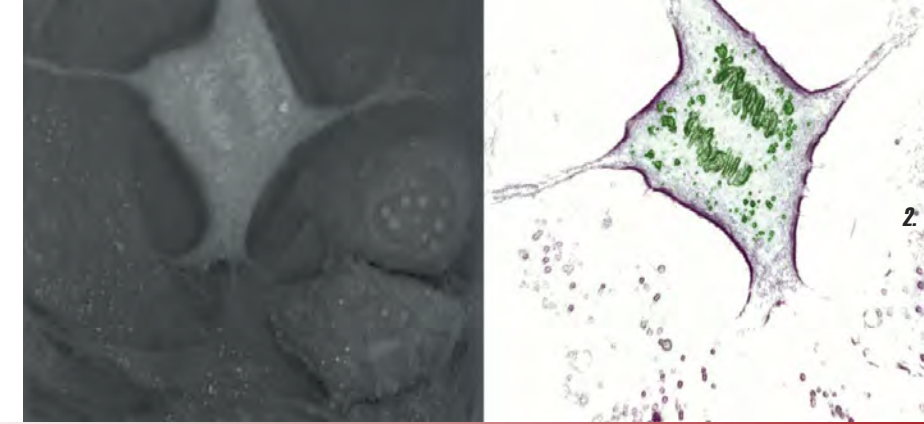
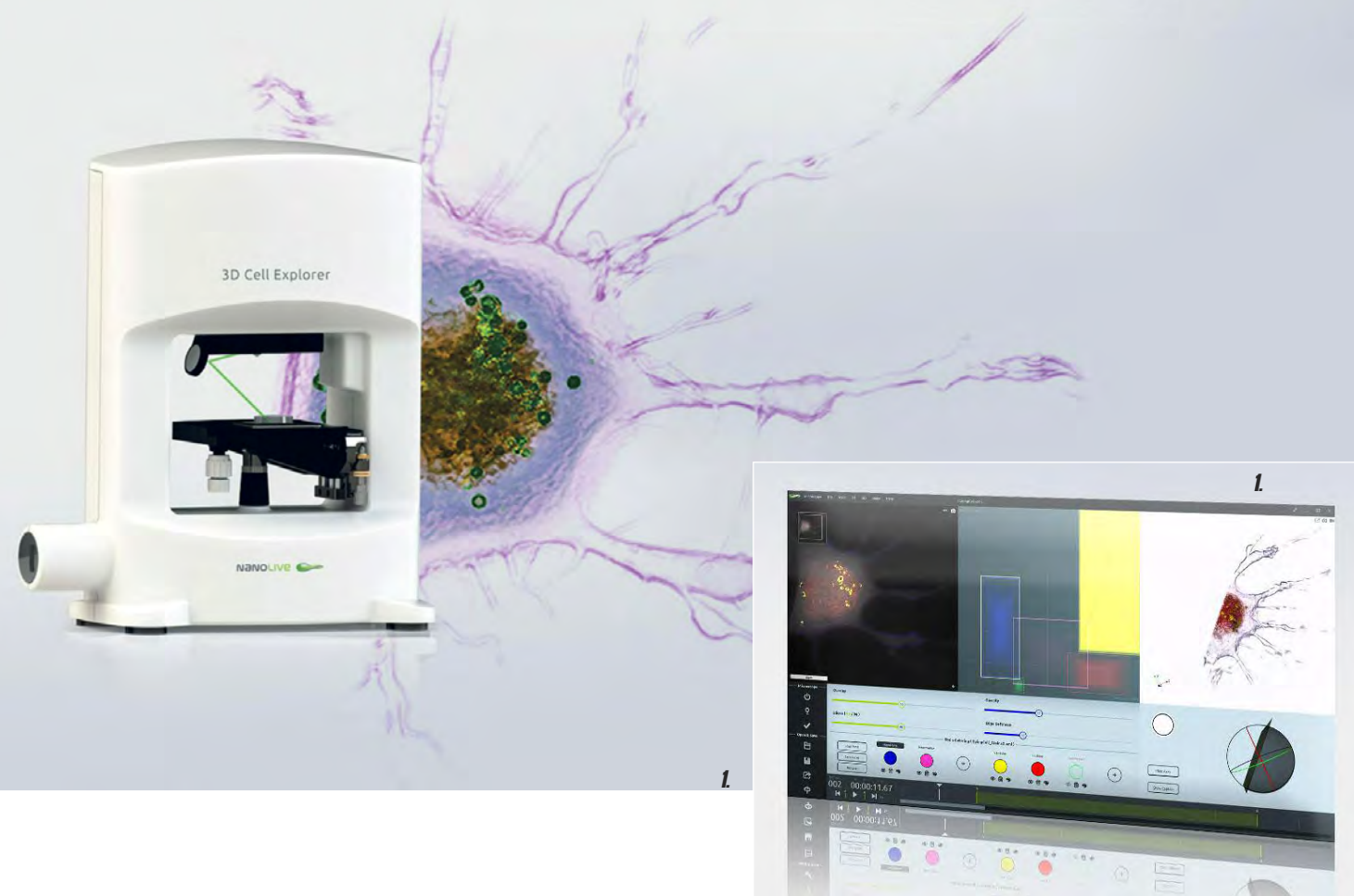
to +25 °C and offers an accuracy of up to +/- 0.1% combined error (linearity + hysteresis). It can be easily connected to PC or display unit through an external Wheatstone bridge amplifier. A version for Air Humidity compensation in range of 30% to 60% HR is also available. Applied force radially acts on sensor's pin which can be independently positioned in 2 different locations, thus offering more operating flexibility. Special versions with various cable length and connector outputs are also available.

www.magtrol.com

Have you ever dreamed to be able to explore living cells, in 3D, without neither any preparation nor owning any expensive lab or equipment, but with a clever desktop tool?

Based in Ecublens/Lausanne, in the EPFL Innovation Park, Nanolive has patented a disruptive solution which, for the first time, allows any user to explore instantly the inside of a living cell in 3D, without the need for any labeling or other invasive methods. The multi-awarded microscope, the 3D Cell Explorer, is a tool for discovery that comes at an affordable price: 19'900 Euros.

The 3D Cell Explorer



What are the principles behind Nanolive?

The combination of holography and rotational scanning allows the reconstruction of the internal three-dimensional structure of the cell in a non-invasive fashion. Furthermore, this technique allows quantitative measurements with a resolution much below the diffractive limit of light proposed by the Rayleigh criterion.

The sample is positioned between a high-numerical-aperture air objective beneath the sample and a rotational illumination arm above. Green light (520 nm) from a laser diode is split into sample and reference beams. The sample is illuminated with a laser beam inclined at 45° which rotates around the sample 360°. A series of holograms is recorded on a digital camera by combining the beam that has passed through the sample with the reference beam. The holograms are raw data which are incomprehensible for the user. Nanolive's processing technique, based on complex deconvolution, treats these data and displays a comprehensible 96 z-stacks cell image in grey scale every two seconds. Furthermore, it corrects for many imaging errors that otherwise would require extremely expensive optical components and ultra-precise alignment.

Unprecedented observing potential without sample invasion or preparation. Use the dedicated software STEVE to digitally color your cells' images.

The Nanolive's 3D Cell Explorer offers earlier unmet insights into the living cell: no need for any special procedures, which require intensive and long preparation. The observation is completely non-invasive to the cell, and allows resolving the cell's parts in 3D down to 200 nm.

For visualization purposes, it is possible, thanks to a dedicated software, to segment the 3D refractive index matrix to identify a particular organelle, and assign to it a numerical but not chemical marker.

This unique software called STEVE allows the user to mark and label certain parts of the cells in 3D based on their refractive index. STEVE automatically detects all regions with same refractive index characteristics (different organelles have different optical properties) and digitally stain them with the same color. This process is quantitative and can be applied for a limitless amount of colors. Changes to digital stains are shown in real time in both 2D slices and 3D view.

Revisiting old worlds!

The 3D Cell Explorer is a tool for discovery and we are just at the beginning of

1. The new holographic tomographic microscope for quantitative and non-invasive 3D live cell imaging and its software STEVE.
2. Mitosis of a mouse fibroblastic reticular cell, time-lapse.
3. Pap test: a method of cervical screening used to detect potentially pre-cancerous and cancerous processes in the cervix.



«The 3D Cell Explorer has the great potential to revolutionize all the rules in the fields of education, biology, pharmaceuticals and cosmetics in universities, hospitals and industries.»

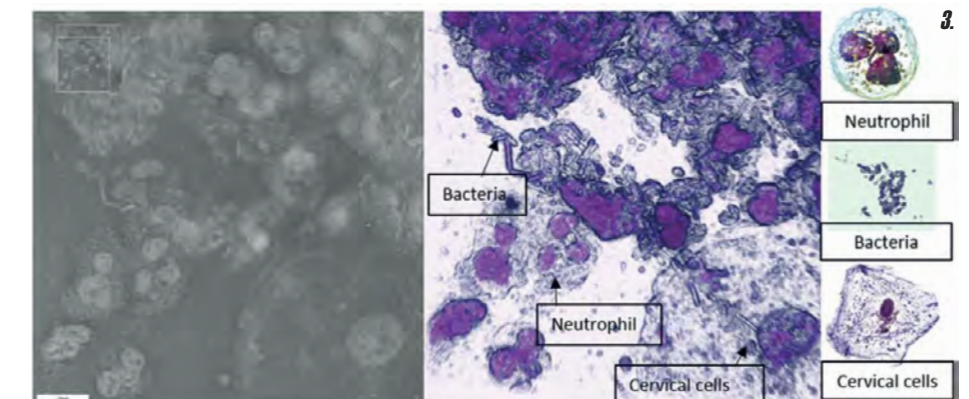
*Yann Cotte, PhD in Physics
CEO and Co-Founder*

exploring all its potential. It allows the measurement of cellular processes and kinetics in real-time enabling multi parameter analysis at single-cell and sub-cellular scale.

Applications for the Nanolive technology include: cell cycle monitoring, cell division and cell death analysis, cell-cell interactions, nanoparticles internalization, trafficking, cell motility monitoring, histopathology and many others.

The product was officially launched in the market during ASCB2015 in San Diego in December 2015 after the company started delivering the first microscopes last summer.

www.nanolive.ch



Users nowadays buy reliable solutions, not pure technology. The increasingly high integration found today in mobile phone raises considerably the expectation. Ingecom's strength is its ability to innovate and industrialize complex radio sensor networks to meet users requirements.

The challenge of lowering power & cost in sensor networks



1. RF-Max basestation installed on the main building at Geneva airport.

2. RF-Max basestation. Includes an array of antennas, motherboard, network and power interface (POE).

3. Detail of the RF-Max vibration sensor (proportion with the pen adjacent) used to monitor the movements of a glacier.

4. Ingecom's production automatic assembly line.

Founded in 2005, Ingecom is a private company located close to Neuchâtel, on the lakeshore. The company grew-up quickly and became famous with its Active-RFID system. The CTI Startup label was awarded in 2007, the same year their first Active-Tag design and complete system was sold to Siemens. The everlasting Active-RFID exposure on Ingecom's website hides a significant portion of the activity in specific contracts to specialized companies.

Ingecom genuinely develops all the products they sell, integrates and produces them within its own premises. The highly skilled engineering team's core knowledge goes all the way from antenna design to embedded real-time firmware. The ability to develop specific radiocommunication protocols is always achieved with the key user's requirements in mind: long lasting battery lifetime, reliability, redundancy to outperform the commonly used WiFi, Bluetooth or ZigBee protocols. Therefore a new combination of synchronous or asynchronous mechanisms must be fitted to achieve the best tradeoff. Most importantly, the number one key word in the user's requirement is the overall cost of usage. It's a combination of infrastructure cost (APEX) and oper-

ating cost (OPEX). Once the cost factor is settled, the next key word is the security of the network.

The optimization of the infrastructure cost technically converts to the largest area of coverage for one unit of land installation. Any installation of a piece of land equipment is expensive, whatever it is and even unit cost. Call it a gateway, a hub, a radio-modem, a wireless node or any other fancy name, it's still a piece of hardware to be installed somewhere. Moreover, somewhere is certainly not anywhere in the radiofrequency world.



«Ingecom, committed to build strong and efficient wireless sensor networks.»

Olivier Desjeux
Director

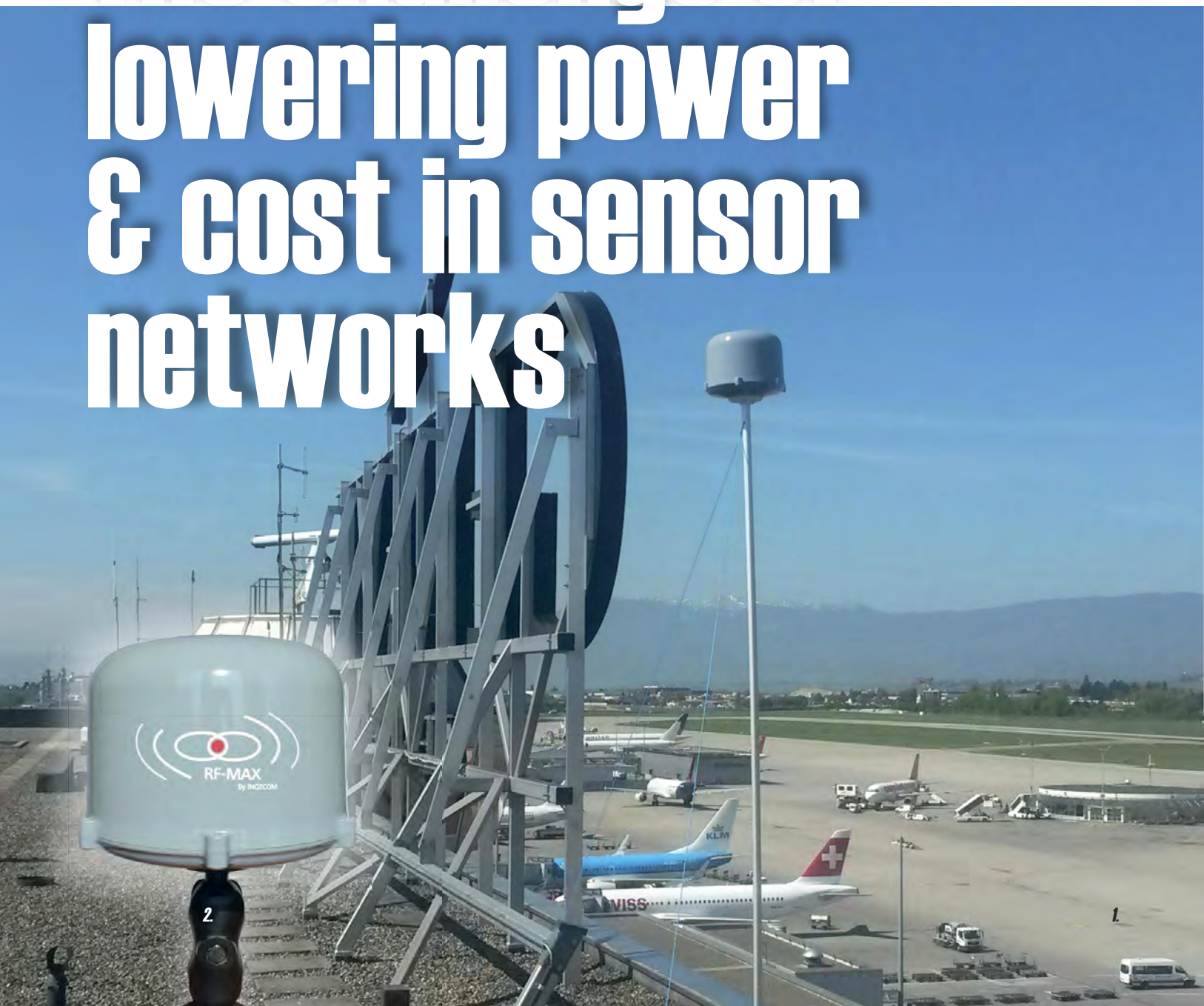
The optimization of the operating cost translates in three parameters. 1) long battery lifetime of the sensors; 2) maintenance cost of the infrastructure; 3) subscription cost to operate the system. The RF-Max system proposed by Ingecom gives a good tradeoff between all the factors. RF-Max includes the wireless sensors, the RF-Max basestations, the Middleware and API, and the optional but highly recommend Network Security Algorithm (NSA). Solving the very large coverage area for the basestations requires not only a clever patent pending antenna design, but also a very large radio-link budget. The 150 dB radio link budget is clearly

not obtained by pumping energy out of the antennas, otherwise the batteries of the sensors would drain out in no time and the regulation compliance would not be met. So the choice is rather to work on increasing the sensitivity of the receivers. By requirement, the sensor network only needs to feed a few bytes per day of data. Think about it for a second, what's the purpose of zooming a few bytes at, say, 1 MBps, when a data rate of 2 Kbps increases de-facto the signal-to-noise margin by 28 dB. RF-Max takes advantage of the main purpose of the network to operate only sensors and actuators to build a very low data-rate system.

The system proves by itself: a downtown coverage is achieved with one basestation per 2 km². The applications derived from the infrastructure are numerous, all starting with «smart» -parking, -metering, -building, -factory, ...

The RF-Max system is easy to operate and maintain with very little maintenance requirement and marginal subscription costs. The typical battery lifetime of an RF-Max smoke-detector is 10+ years. Once more, Ingecom is setting the pace for new performances and capabilities.

www.ingecom.ch



The world is changing fast, very fast. Biowatch brings the vision of a safer and more simplified world. For everyone. All of these PIN codes, passwords, keys, cards and badges are insecure and not convenient anymore. They belong to the previous century and do not cope with new identification technologies and market demands for frictionless interactions.

Another way your watch tells who you are



1



2

For years we have been used to carrying keys, cards and memorable passwords and PIN codes to access premises, services and devices. The rise of connected objects allows a new paradigm where a single device replaces them all. Your smartphone? Think different. Your wearable is the key.

Smartphones seem to be the solution when it comes to replacing wallets and keychains or remembering our passwords for us. Even better, the introduction of biometrics such as TouchID fingerprint reader or KeyLemon face recognition API makes the access to the phone and apps more convenient and more secure than ever before.

This said, things could be even more convenient and even more secure with your credentials stored in a wearable rather than in a phone. Why? First, wireless identification to smart objects is more convenient when performed hands-free. Think of paying, entering your office or accessing to your e-banking with a simple tap of your watch. Second, no need to re-authenticate hundred times per day to prove that you are the legitimate one wearing the watch. Persistent authentication is easily achieved by monitoring the clasp.

Now comes the real pain: what kind of strong authentication do I need to secure my wearable? How to be sure that illegitimate users do not gain access to the wearable? Could it be a fingerprint reader such as TouchID? Not that simple. There is a need to authenticate the user's wrist, and a fingerprint does not say much about whose wrist is actually wearing the watch. Here comes Biowatch's product: a wearable wrist vein reader for biometric authentication, incorporating sensors for monitoring

liveness and persistent authentication. Once the wearable user is verified, authentication of the user to digital services is via a Public/Private Key Infrastructure (PKI) and Bluetooth and NFC protocols.



«Biowatch is the TouchID of wearables».

Matthias Vanoni,
CEO & co-founder

Veins forms are unique. Wrist is the sweet spot.

Your wrist vein pattern is a highly discriminative part of your body. Accurately extracted its shape can be compared over time without significant change. These characteristics were first discovered in 1985 by Joe Rice, Biowatch chairman, while scanning & observing vein patterns under infrared illumination. At these wavelengths the blood absorbs much more light than the surrounding tissues leaving the veins more visible. 30 years and millions of successful recognition of individuals later, vein biometrics has proved to be one of the most accurate and convenient authentication methods with a False Acceptance Rate far lower than 0,01% at a False Rejection Rate of 0,01% and sub second matching time. Additionally, vein biometrics are naturally robust to forgery due to their hidden appearance and the complexity of faking pulsating blood.

When considering imaging the wrist vein pattern from a wearable two main issues need to be considered:

- how to sense a large area of the wrist while being very close to the skin?
- how to illuminate the region of interest while being very close to the skin?

Our first answer is simple: mount the sensor and the illumination further from the subjects' skin. In the case of (luxurious) watches this means placing the sensor within a deployant buckle or similar and grabbing images whilst closing the buckle. The camera and the IR illumination are standard micro components, easily sourced and integrated within a re-designed deployant buckle.

Our second answer involves mounting the sensor closer and in contact with the skin. However, the closer to the skin the sensor is placed the larger and more curved the sensing area needs to be, and the more peripheral the lighting the less uniform the illumination will become. We are employing a flexible printed organic IR photo detector and optical waveguide array within a watch strap or buckle. This solution is economical, compact and efficient in terms of imaging. Additionally, a larger area of the wrist can be captured by manually scanning the desired area by moving the watch up and down the wrist. These two solutions, at-a-distance and in-contact, are protected by patent applications.

Biowatch solution is not only a great match for wearables and smartwatches but is a perfect fit for the Swiss watch industry eager to mix & match luxury and connectivity in the raging war for our wrists. A matter of size reduction certainly. A matter of time for sure.

www.biowatch.ch

1. It replaces your clasp and turn your wearable into a biowatch.

2. Scan yourself, close the buckle and access your car, your money, your work...

Switzerland: innovation & reliability.

Since matter entered the fascinating game of complexity and life, innovation has been a question of environments. The one to challenge. And the one that facilitates novelties: the full network of fruitful relationships any organism is engaged in, initiates, develops. The power to innovate in technology is fueled the same way: through challenges and synergies from a rich stimulating environment.

Photo: Lake of La Gruyère from Le Moléson. Fribourg

2015 saw the relocation of a significant part of CSEM's high-tech activities into a modern building located in the heart of Microcity Innovation Park. This building will harbor two state-of-the-art cleanrooms, one dedicated to micro- and nano-technologies and the second focused on photovoltaic activities. CSEM invested in cutting-edge equipment and production tools to benefit the watchmaking, industrial and medical instrumentation, cleantech, and space industries.

CSEM continues to invest in micro and nanotechnologies



1. New cleanrooms – an even stronger bridge between research and industry.

2. Center of Excellence in Characterization: X-ray computed tomography system.

The move to its new building was the opportunity for CSEM to create a unique competence center for micro and nanofabrication serving different fields of activity like MEMS, surface engineering and photovoltaics.

Two cleanrooms in the heart of the building represent an advanced tool at the crossroads of CSEM's research programs and its industrial activities. The challenge was to set up an infrastructure and equipment park bridging the gap between research and industry in an even stronger way.

On one hand, this required high level flexibility and versatility of the tools to allow the development, maturation and industrialization of innovative technologies. On the other hand, CSEM has to establish the ability to offer its industrial partners reliable, reproducible and qualified processes suited for small to mid-scale volumes in a proper industrial environment with stringent quality standards.

The new infrastructure offers modern tools for:

- Photolithography
- Wet etching
- Metal deposition (evaporation, sputtering, ALD ...)
- Various thin film coatings (oxidation, PECVD, LPCVD ...)
- Dry etching (state of art DRIE for silicon, oxide, metals and advanced materials)
- Characterization systems.

The organizational structure was also simplified in order to take better advantage of existing synergies at CSEM by combining the competencies and expertise of the activities in the field of microsystems technology and of nanotechnologies & life sciences. The result: a unique combination of advanced processing equipment and multidisciplinary teams that will serve several research programs at CSEM, especially MEMS, photovoltaics and surface engineering.

CSEM's global mission can be summarized as follows:

- Supply a technology support for the industry spanning from R&D projects to industrialization;
- Industrialize and help ramping up production volumes, including the quality control needed;
- Ensure that high quality standards are reached all along the product creation process;
- Provide system integration support, in particular in the field of optical and biological systems.

The 2015 investments will further reinforce the competitiveness and attractiveness of the Micro- and Nano-Systems cluster developed over the years in the area between Lausanne and Neuchâtel.

CSEM also recently entered a cooperation with HE-Arc (Haute Ecole Arc) in Neuchâtel to bring together the experts and methods from both institutions in a Center of Excellence in Characterization (CEC). The center provides easy access to the instruments used for materials characterization, dimensional measurement and failure mode. The center responds to precise needs by selecting the most appropriate solution from the available techniques, such as: mechanical and tribological tests; characterization of micro- and nanostructures; dimensional metrology and quality control and chemical composition analysis.

Thanks to CSEM's dedicated microfabrication processes and its reliability and testing laboratory, the centre tackles fundamental challenges to benefit the watchmaking, industrial and medical instrumentation, cleantech, and space industries. CSEM constantly optimizes expertise and know-how to maintain its leading position in technology excellence and better serve the needs of Swiss industry.

This facility has been accomplished with the financial support of Neuchâtel's cantonal authorities and the Swiss Government.

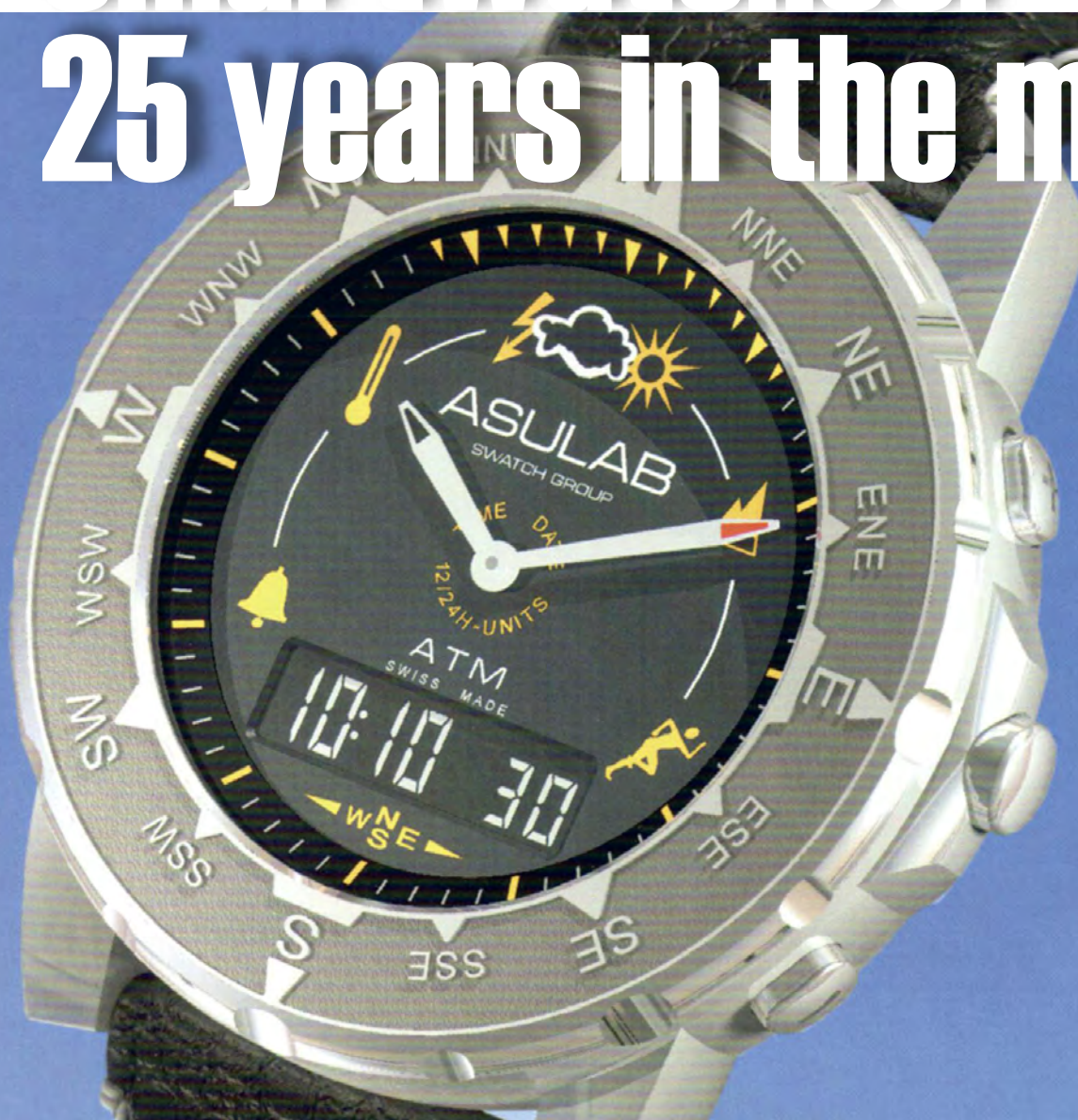
www.csem.ch



The idea of «smartwatches» with the most recent technological tools built-in is not a recent one. Not all technological prowesses in the last 25 years made it to the market but all remain as historical landmarks and are another fine illustration of Swiss mastering in microengineering! Encounter with Professor Pierre-André Farine, EPFL Institute of Microengineering in Neuchâtel, who has contributed to several challenges on that way.

▲▲ BY JEAN-LUC RENCK

Smartwatches: 25 years in the making



1



2

1. ATM Alpinist, 1999.

2. GPS Swatch, 2000.

3. Swatch Talk, 1998 (Watch-phone GSM dual-band).

numerical track through GSM. From that point it appears there would be no more brakes to our capacities and urge to miniaturize devices while applying all the physical principles related to electric signals and their processing I had dealt with many years».

A few time later Global Positioning System (GPS) spreads its wings much larger. «With the war in Persian Gulf the number of satellites was quickly quadrupled. Then specialized services could soon offer geolocalisation permanently instead of a few minutes a day». Here again Sony was a pioneer with its small and cheaper GPS device: a two-element set not larger than two books for 1900 \$ when the standard was then big racks costing 50'000 \$!



«Since 25 years, advances in digital signal processing and in low-power microelectronics open the way for portable devices and smart-watches.»

Prof. Pierre-André Farine,
Head of ESPLAB

An inescapable future foreseen

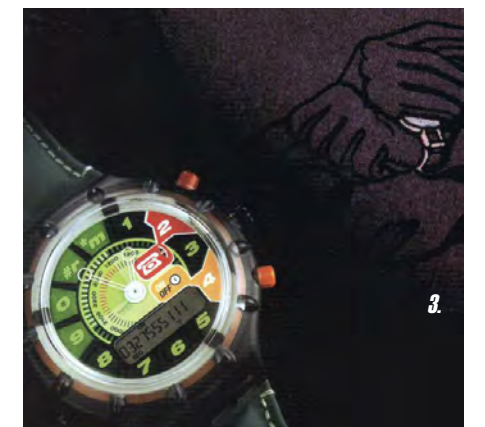
What has all that to do with smartwatches and swiss microtechnology? The link is a direct one: «rise of the numerical age and rapid miniaturization quickly suggested that sooner or later we would have around our wrist watches with much more abilities than just providing us with the passing of time», Prof. Farine explains. And that's precisely around the democratized GPS that ASULAB (Swatch Group R&D Labs, where Prof. Farine was working at that time), CSEM (Centre suisse d'électronique et de microtechnique) and IMT in the University of Neuchâtel joined for a four-

year project that lead in 1997 to a prototypal Swatch with GPS embedded. Then in 1998 Swatch Talk was designed, a waterproof watch with a two-band cellular phone at just 54 x 52 x 24 mm³. «With its tactile touch screen, it paved the way for the Tissot T-Touch line, introduced one year later, initially with altimeter, thermometer, weather previsions, compass, alarm...». There would come later IRIS, a watch with images caption and processing, MODICO, a dictaphone watch with vocal recognition for medical data capture. And a few more...

The low-energy high challenge

Rooted in those pioneering times our technological future grows more and more rich, rapidly! But there is an absolute condition to this growth: getting better and better at consuming less and less energy! «An exploding number of micro & nanodevices though low powered means a global energy consumption we have to master strictly». With ESPLAB's 32 collaborators, Prof. Farine also explores smart ways to reduce energy needs to the limits – see ESPLAB wireless ultra-low & very low power wireless network sensors nicely named «Rose» – and ways to collect small amount of energy from whatever ambient sources: light, warmth, vibrations, radio frequencies... Smart objects – being phones, watches or else – are a continuing challenge!
<http://esplab.epfl.ch>

¹⁾ IMT: formerly attached to the University of Neuchâtel, now to Ecole Polytechnique Fédérale de Lausanne – EPFL in Neuchâtel.



3

The Haute Ecole Arc Ingénierie is the engineering school of the Swiss Jura region. It is one of the regions in Switzerland and Europe which offers the biggest job density in the secondary sector. We educate engineers for this industry and propose our skills to carry out research projects aimed at helping Switzerland remain the most innovative country of the world.

The HE-Arc Ingénierie, serving a unique industry in the world

The Haute Ecole Arc Ingénierie has its origins in the watchmaking schools of Neuchâtel, Jura and Bern cantons which were created in the 1860s to support the industrial development in the Jura region. One hundred years later, the watchmaking industry remains the flagship of this region and its historic microtechnical knowledge has been applied to other sectors like machine construction and medical technologies. Thanks to the acquired skills and to new technologies integration, the Jura region industry is more than ever able to meet the current challenges and spreading its unique knowledge worldwide.

So as to answer the needs, the Haute Ecole Arc Ingénierie has defined four fields of strategic activities which correspond to what the Jura region conceives, produces and values:

- **Smart & micromanufacturing:** the solutions for a flexible, efficient and interconnected production tool



«Our skills want to serve a unique industry in the world by developing directly applicable research, always in direct contact with the economic fabric of the region. And the results from this applied research must permanently be reflected on our education programs. We want our motto to be alive: Dare... Think... Do!».

Philippe Grize,
Head of the Haute Ecole
Arc Ingénierie

1. *Medical technologies: the Haute Ecole Arc Ingénierie is specialized in developing embeddable microsystems.*

2. *Watchmaking & industrial luxury: the Haute Ecole Arc Ingénierie is the heir of the watchmaking schools of the Jura region.*

- **Smart sensing & microsystems:** the solutions which include the Internet of Things, sensors and MEMS
- **Watchmaking & industrial luxury:** from conception to industrialisation in watchmaking manufacturing
- **Medical technologies:** from «serious game» to embeddable microsystem, technologies serving wellness, health and medicine.

Our mission consists of educating engineers who do not have only technical and scientific skills, but who are also aware of their responsibilities toward society. We also work closely with the industrial fabric in the field of applied research and development.

This collaboration enables a bilateral knowledge transfer, confronts us daily with the realities of the industrial world, enables us to adapt our education programs and proposes the firms an access to our skills, cutting-edge equipment as well as to the engineers for a real and efficiently valuable technological transfer. These are the main working modes that we propose to industry:

- (Bachelor and Master) student projects
- Offers of services
- Direct assignments and projects with public cofunding (CTI and European projects, amongst others)
- Ongoing training
- Framework contracts and engineer seedbed.

www.he-arc.ch/ingenierie



Always on the lookout for innovations for their products or their manufacturing processes, companies are increasingly willing to turn to research institutes that offer a wide range of expertise. For start-ups, universities represent an attractive solution that enables them to overcome, sometimes temporarily, the absence or the limitations of their own technical department. Through its School of Engineering, the HES-SO Valais-Wallis recently worked with one such company, Medirio, to develop a new insulin injection system.

Research institutes serving the needs of businesses

1. Colibri prototype of the new insulin injection system.

2. TechnoArk, Sierre-Valais.

II - 2016 Micronarc Magazine



Medirio is a young company based in the TechnoArk premises in Sierre. Irio Calasso, its founder and CEO, spent several years working in the medical field, including the diabetes treatment sector. On the strength of this experience and an innovative idea, he formed his own company in November 2013. The objective was to offer diabetics who use insulin pens a substitute product that would enable the number of injections to be reduced. The device consists of a disposable patch that patients attach to their skin via an adhesive strip. It includes a pump, an insulin reservoir and an injection cannula. A hand-held unit controls the pump and enables the required dose to be injected at the appropriate time.

With financial support from The Ark Foundation and then from the Swiss Federal Commission for Technology and Innovation (CTI), Medirio gave the HES-SO Valais-Wallis the task of developing the first prototype of the patch and the control unit. The technical difficulty lay in the need to keep the cost of the disposable part low, since its lifespan is only a few days. The pump is there-



«Research institutes and public bodies that support the economy provided me with the technical and financial support that I was searching for to launch my start-up.»

*Irio Calasso,
CEO Medirio SA*

fore passive, as the patch does not contain any intelligence or power component – neither motor, nor battery, nor electronics. Movement is provided by the hand-held unit, through magnetic transmission of torque to the pump. This concept required miniaturisation of both parts of the system, the patch and the control unit. The patch not only contains the pump itself, the insulin reservoir and the injection catheter, but also the transmission and the safety systems. The hand-held unit contains the electric motor, transmission, battery, touch screen and electronic module. This electronic module controls the display, injec-

tion and data storage functions, and the transmission of data via a Bluetooth low energy connection.

For the development of the second prototype, Medirio involved another engineering school, the FH Buchs, as well as drawing on the expertise of a Danish company actively involved in the treatment of diabetes. Engineers from both universities added several functions, including failure detection; they reduced the size of the patch and the hand-held unit, then improved the ergonomics of the system and optimised its operation. Medirio is now moving towards small-scale manufacturing of the product, which is due to start in early 2016.

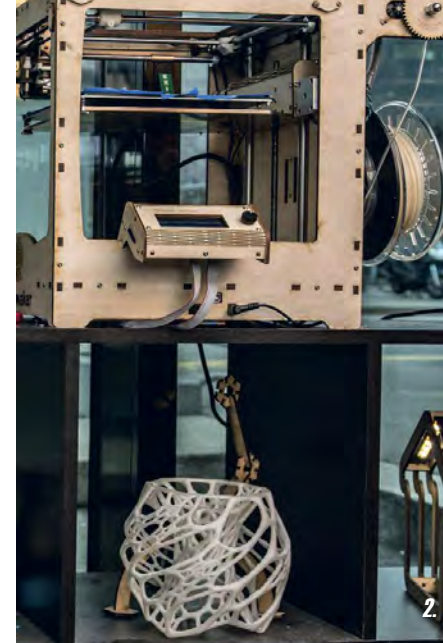
The Medirio patch offers people with diabetes the possibility of replacing 4 to 6 daily injections by one single insertion of the catheter every 3 or 4 days. The system will also allow accurate monitoring of treatment, possibly even remote monitoring by a doctor.

www.hevs.ch
www.theark.ch
www.medirio.com



Can you think of a place where creative objects are developed with the skills of passionate people organised in informal groups, where prototypes are printed in 3D, and where information is freely shared? Stop dreaming and just push the door of the nearest FabLab!

Creativity as a collective skill



1. *Showcase of the Fablab in Neuchâtel.*
2. *3D printers become very accessible in term of usability and cost.*
3. *Laser cutter, the most used technology in the Fablab.*

FabLabs are places where everyone (individuals, students, free-lance professionals, people form companies) can use digital machines (laser cutter, 3D printers, open hardware, etc.) to make almost anything at very low costs. FabLabs are devoted to creativity – both in the arts and technology, rapid prototyping, technology dissemination, teaching and other activities.

FabLabs are places where one can find «makers», passionate people who like to create or hack objects. In the case of hacking, the idea is to redefine the purpose of a given object or group of objects. A spectacular example is how FabLabs have collaborated to build radiation sensors in the post-Fukushima Japan and paired them to GPS devices, drawing up real-time radiation maps that were more accurate than the government ones. Others turn old webcams into low cost microscopes, or make possible for buildings to send tweets, etc.

FabLabs can be of different flavours: nested in large institutions (like the one in Neuchâtel, within the Haute Ecole Arc), associative (La Côte, Zürich, Chêne 20), or even set-up by companies (Bern). What do they have in common? Open-oriented activities. In a FabLab, one cannot escape interacting with others: information is passed between makers, spontaneous help is provided to the newcomers, projects are discussed, machines are shared. It is in the essence of FabLabs to facilitate and encourage co-creation and co-conception... not only

between members but also between different FabLabs.

One essential characteristic of the maker approach is the fact that people make their own objects, i.e. the developer and the end user is the same person. A typical and emblematic project is the development of a professional tool, developed by people involved in the restoration of patrimonial objects. In this particular case, restoration researchers have worked together with engineers of the HE-Arc, at the FabLab Neuchâtel, in order to produce a topic electrolytic cleaning tool to restore millennial silver sculptures and objects.



«The FabLab Neuchâtel is a melting pot of ideas, skills, technology and enthusiasm.»

Jérôme Mizeret,
Coordinateur Ra&D et
Transfert de Technologies
Haute Ecole Arc

of collaborative co-development is initiated: the increasing functionality of the tool then triggers new demand, therefore enlarging the circle of «informal» developers.

This is typical of the collaborative economy, to which the FabLabs belong. By involving large communities of professional people, the creative power reaches levels that one cannot expect from a single small university group. A FabLab is, in essence, a «common», a place where a «capital», both physical (the equipment) and intellectual (the makers' collective mind), is accessed by a community, under some basic rules of management.

Our business model is based on three pillars: half public (our contribution to teaching and research projects, paid by public money), half private (the fees that users pay to use the machines or attend workshops), and half collaborative (the free, informal contribution of all the users toward each other to help in doing a task, give advice, provides training to use a machine, maintain the equipment, etc.).

But the most striking point, compared to most traditional working environments, is that all this is done with pleasure, in a friendly open manner, and in a pleasant atmosphere. Who said one needs to suffer to engineer well-designed objects?

<http://fablab-neuch.ch>

This device is designed to be entirely built in FabLabs: the specs and drawings are freely accessible on the website, and anyone can download them and build their own exemplar. They may, of course, change and adapt the tool to their own practice, increasing the usage value at no extra cost. These improvements are then sent back to the development team which may incorporate them back into the original tool. A cycle



The Office for Promotion of Industries and Technologies' mission is to support the development of innovative industrial SMEs. The office, which was founded in 1976, has been providing a range of services such as promoting expertise, setting business relations, developing collaborations with universities and monitoring new technologies, as part of a program funded in particular by the Department of Security and Economy (DSE) of the Republic and Canton of Geneva.

▲▲ BY PHILIP MAGUIRE

OPI, forty years supporting the local industry



«...Geneva and Swiss industry has never been more innovative than today».

Rolf Gobet,
Director

1. Industry: a dynamic sector of Geneva's economy.

2. The electric bus without contact lines TOSA.

Serving Geneva's industrial ecosystem for nearly 40 years (anniversary to be celebrated in 2016), OPI has been guiding many companies in their growth and development by offering promotion, matchmaking and advisory services. A recognized and appreciated support, expected to evolve within 2016.

As explained by Rolf Gobet, OPI's Director, the local industry is changing and regularly facing new challenges. It is therefore the office's duty to stay connected to its reality. «Nowadays, when we talk about manufacturing industry, we automatically think about the strong Swiss franc, the difficulties to recruit qualified staff or the problems that resulted from the 9th February 2014 vote on immigration. These questions are important, but they are not the only ones. Besides that, the Geneva and Swiss industry has never been more innovative than today» he says, adding that in a globalized economy it becomes extremely complex for smaller businesses to find customers, suppliers as well as strategic information.

Which role does OPI intend to play in the future?

It plans to maintain its core services: fostering businesses and the local industry in general, structuring industrial projects, generating partnerships and offering high profile business consultancy. According to Rolf Gobet, the idea is not to make radical changes, but rather to adapt the structure to better match the reality of the industrial sector: «To be more effective, we will focus on the innovative and industrial SMEs only. We will support the companies' communication activities in a focused and effective manner and work on the overall image of the industry in Geneva, especially through a campaign. Last but not least, our knowledge of the local and regional industrial sectors allows us to be ideally positioned to develop and facilitate the funding of major industrial projects, such as the electric bus without contact line TOSA. We will capitalize on this strength. But we also aim at offering new services, such as business intelligence, that we will develop in partnership with other actors».

What about Industry 4.0?

This revolution is generated by the con-

vergence of digital technologies and traditional industry. Many see it having a major impact on this sector: «We have identified this development and will bring practical support to industrial SMEs by allowing them to better understand this fourth industrial revolution. We want them to be able to anticipate the potential impacts and to translate these into opportunities,» adds the Director, explaining that OPI wishes to federate companies and academic stakeholders to achieve this ambitious goal.

These changes should allow the structure to better guide a sector that, despite a difficult economic environment, continues to have a positive impact on innovation, economic value and jobs creation in Geneva.

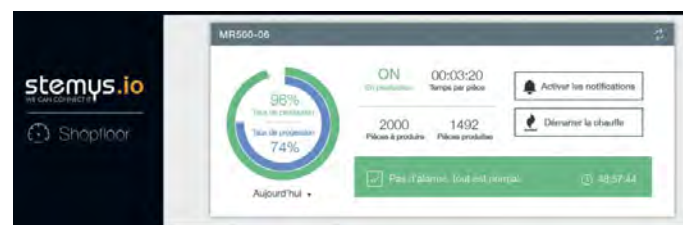
www.opi.ch

OPI in a nutshell

Active in the fields of mechatronics, information and communications technologies, cleantech and renewable energies, the Office for Promotion of Industries and Technologies' mission is to support the development of innovative industrial SMEs. The office is providing a range of services such as promoting their expertise, setting business relations, developing collaborations with universities and monitoring new technologies. On the coaching and business development aspects, the OPI advisory team is mainly active in product and services innovation, organizational innovation, development, distribution and market expansion.



Focused on Industry 4.0, the young technology company Stemys provides hardware and software platform for supervision and control of connected equipment and machines in real time.

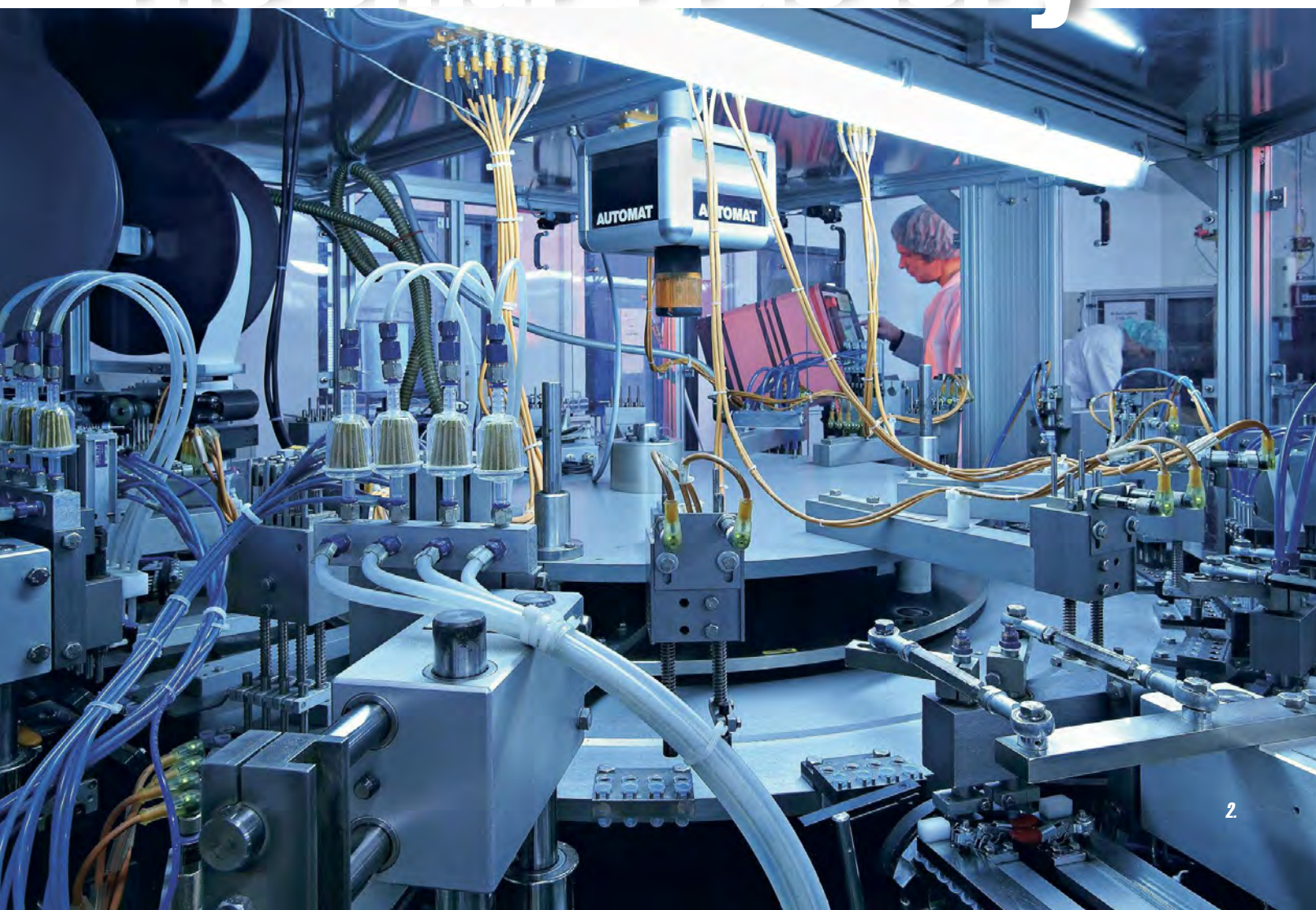


1



1. Dashboard with alerts.
2. Centralized tests with the platform stemys.io
3. Analysis of the process provides several strategic information in real time.
4. Fields of Industry 4.0

The Smart Factory



2

The digital transformation of industry

The concept of industry 4.0 relates to the digital transformation of the industrial companies due to the integration of new technologies of connectivity as for example the Internet of Things (IoT). The objective is a gain in productivity and in agility while supporting the development of new services with strong added value. The industrial middleware developed by Stemys makes it possible to connect, integrate, analyze and visualize in a synthetic way the data coming from heterogeneous equipment and machines, but also to control them. The team is also working on the introduction in a simple way of scenarios of machine learning for the automatic execution of certain actions. An approach which aims to decompartmentalize the services of the company for a better exchange of the useful information to decision making.



«Our strength is the ability to connect everything what are available in terms of sensors and monitoring tools».

Sébastien Etter,
CTO of Stemys

Centralized set-up of experimental station

Industry, whose connectivity needs are steadily increasing, has quickly mani-

fested an interest in this solution. For example, the high precision lathe manufacturer Tornos SA uses this innovative platform for the centralized development of its machines prototypes. When the machine is first switched on, the platform will analyze every second for weeks about twenty parameters such as vibrations, temperatures (oils, tools, etc.) and different values from the numerical control and environmental sensors. Sébastien Etter, technical manager, says: «this kind of tests used previously to be done by pointing and the results were manually introduced into Excel files and analyzed.

This work was not only long and tedious, it was also frequently incomplete due to the lack of data collection during the night». With the platform stemys.io, the customer may collect essential data in real time over hours, weeks or months. These data are automatically shown in graphic form, much easier to analyze and allowing to make quicker the appropriate corrections. The full benefit of this management instrument is effectively measured when it is realized that a 30 hour-long test may provide up to six millions data.

The control of the various parameters would not be complete without the opportunity to display the possible errors. In case of an alarm during the test phase, the platform stemys.io is therefore programmed to send an e-mail, a SMS or a message on smartwatch to the assigned person. He/she can then decide on the procedure to be followed,



4

either by acting directly on the machine, or by letting the test finish if the problem is not critical.

Two hosting options

Over the last few months, an increasing number of manufacturers have opted for this type of solution in order to oversee their machine or equipment park (cleaning, quality control, etc.). According to the customer's requirements, the platform stemys.io maybe installed either in "cloud" mode (on an external server) or in local mode. In both cases, the installation is simple, secured and financially accessible to all industrial companies. In a few hours, the machines are connected and viewable on the platform. Sébastien Etter is reassuring regarding the security aspects in "cloud" mode: «When we developed our solution in "cloud" mode, we obviously integrated a great variety of security functions, either for the Gateway or for the software layers. The elements to be connected are defined in accordance with the client, the actions to be performed remotely are examined and finally the levels of access are established».

www.stemys.io

During the process of designing a new object, one of the essential stages is the realization of the prototype. With 3D printing, Zedax SA is able to produce in a few hours resin prototypes that can be examined from an esthetical, geometrical, functional or technical point of view.

3D printing in the process of developing new products



1



2

1. Watch & glass: design Paul Picot.

2. Objet500 Connex 3 - printed color helmets.

Ten years ago when Lucien Hirschi opened up his 3D printing service company called Zedax, very few even knew what it was.

As we are located in La Neuveville, a little town in the heart of the watch industry, we felt of course a calling for customers in this industry.



«You can already print metallic parts or even human tissue!»

Lucien Hirschi,
Director of Zedax SA

The complexity was to convince professionals that they could change their way of developing products and, of course, to explain not only the technology but all the advantages they could benefit in using 3D printing: save costs and move more quickly from concept to the end product.

After testing different technologies, we decided to buy an Eden 330 from Objet Geometries Ltd, the company that has patents on PolyJet™ technology.

As for all the other rapid prototyping or 3D printing technologies, it's an additive manufacturing technology. Very similar to inkjet document printing, it jets 16 µ or 28 µ layers of liquid photopolymer onto a build tray and cures them with UV lights. All the holes of the CAD designs are filled with a support (gel-like) that will be removed after production.

We chose this technology for different reasons: smooth surfaces, thin walls and

outstanding accuracy, down to the finest details. Ability of building very complexes geometries, with a wide range of materials from rubber (27 ShoreA) to very rigid (ABS-like) - from transparent to opaque.

These materials can also be treated after production (painted, plated, polished, etc.) to obtain very realistic prototypes.

At this point, we started getting customers and the world of watchmakers in particular understood very quickly all the benefits they could get from this way of producing prototypes. It allows fast and effective communication of design ideas, it resolves issues between design and engineering, the validation of design fit, form, and function is more effective, you get a greater design flexibility, with the ability to run quickly through multiple design iterations. The design and development cycles are tightened, it speeds products to the market and reduces costly mistakes. You keep intellectual property onsite and, finally, the end product is as desired.

When the Connex260 with PolyJet Matrix™ Technology was launched, we bought one. This system is able to print parts made of multiple model materials, all in a single built. The Connex family printers introduced «the new concept of on-the-fly fabrication of materials: these Digital Materials (DM) are composite materials that are formulated during the build process and that have preset combinations of mechanical properties unattainable by single materials».

So not only we could now offer more than 80 combinations of DM but in the

meanwhile a great range of new materials (ABS-like, VeroClear, etc) were also available and allowed us to widen our domain, to improve the prototypes and to offer new services as the manufacturing of injection molds for small series or tooling.

In 2012, when Objet Geometries merged with Stratasys, a leading manufacturer of 3D printers, we were able to offer a wider range of 3D printers for we have been resellers of Objet in Switzerland since 2006 in partnership with RTC Germany.

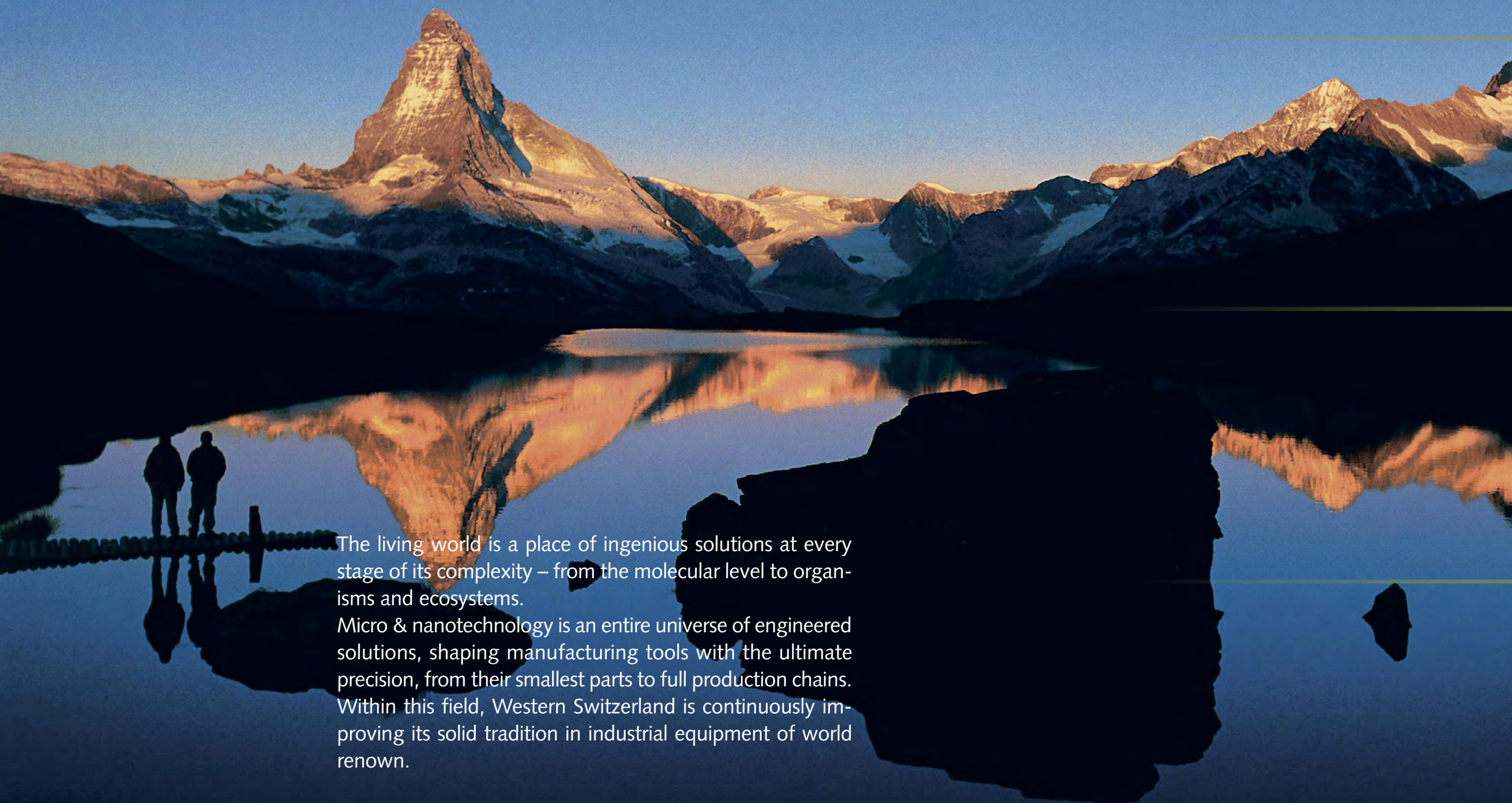
We also acquired a thermoformer machine, the perfect complement to 3D printing and an improvement to our services.

This year, we bought the Objet500 Connex3, a brand new color multi-material printer and a small low cost FDM (Fused Deposition Modeling) machine. So now we have a range of machines which allows us to accommodate the various needs of our customers.

The past decade has seen the rising in popularity of 3D printing especially after the expiration of the FDM patent belonging to Stratasys.

The improvements have been spectacular, in terms of the choice of materials, precision and speed. The different technologies are now moving from prototyping to production. You can already print metallic parts or even human tissue!

We trust that 3D printing will become more and more common in the process of developing new products.
www.zedax.ch



The living world is a place of ingenious solutions at every stage of its complexity – from the molecular level to organisms and ecosystems.

Micro & nanotechnology is an entire universe of engineered solutions, shaping manufacturing tools with the ultimate precision, from their smallest parts to full production chains. Within this field, Western Switzerland is continuously improving its solid tradition in industrial equipment of world renown.

Photo: Cervin-Matterhorn. Valais



Checking watches performance



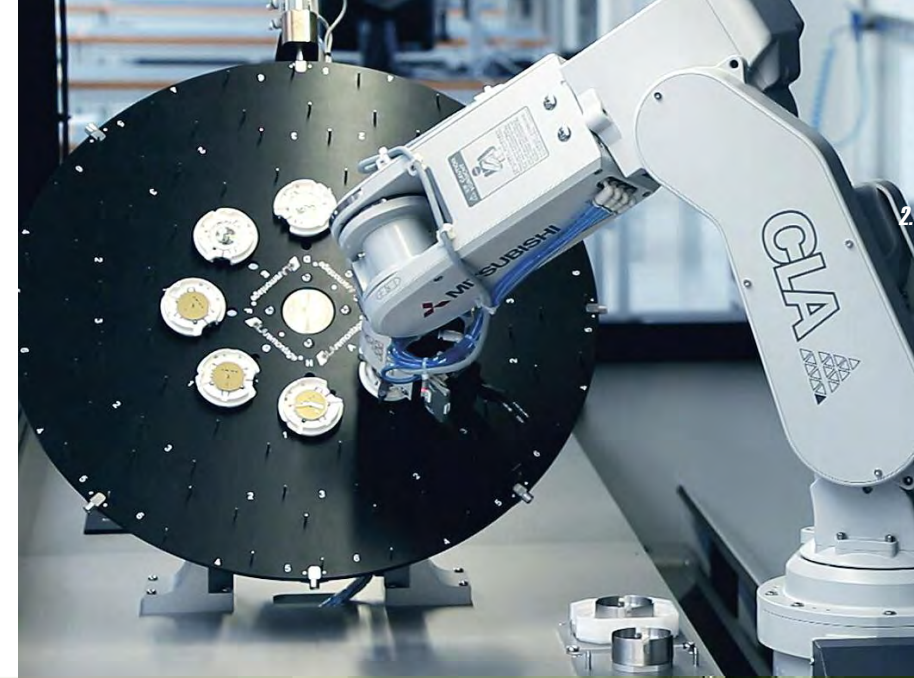
A «one-stop-shop» for machine-tool peripherals



High transparency of UV curable peelable protective coating

From astronomical observations to the most intricate watch complications, our means of measuring the passing of time continue to improve. Robotic and IT-related technology of CLA Clinical Laboratory Automation SA are offering new prospects in terms of checking and adjusting timepieces.

Measuring time



1. The watches are stored in a library for 24 hours to identify any deviation.

2. Automatic winding of the watches.



«The pairing of traditional expertise with new technologies».

Thomas Parietti, Sales Manager, CLA Clinical Laboratory Automation SA

The rotation of planet Earth is an astronomical fact. By observing the passing of stars at the meridian, astronomers have long been able to obtain a very accurate means of calibrating their reference pendulums.

Developments in society leading to a greater organisation of activities have resulted in more and more precision in timepieces. Reading the time on a watch involves referring to a particular measurement. A watch measures the passing of time; it produces very regular mechanical oscillations which accumulate and this accumulation is then affected in the movement of the hands. Concerns about the precision of watches are one of the key focal points of the watchmaker.

Drawing on its new equipment, the CLA company is now making its technical expertise available to the watchmaking industry to offer an automated solution to the chronometric measurement of time. The CLA checking and regulatory device includes a robotics unit to carry out various operations. To guarantee impeccable traceability, all of the items which enter the machine are individually identified. Each reference is

subject to a control protocol which is adapted according to the operating range. Checking quality and productivity are the cornerstones of this cutting-edge technology.

The CLA chronometry device allows different types of timepiece to be checked simultaneously. The cycle generally begins with the winding of the watch. The watch movement is then measured just before the watches are stored in a library for a pre-defined time period, usually 24 hours. Once this time period has passed, the timepiece is retrieved and the watch movement is measured again so as to identify any deviation. Automation of these different stages provides a considerable time saving at a logistical level. The watchmaker therefore gains time which can be dedicated to creative tasks.

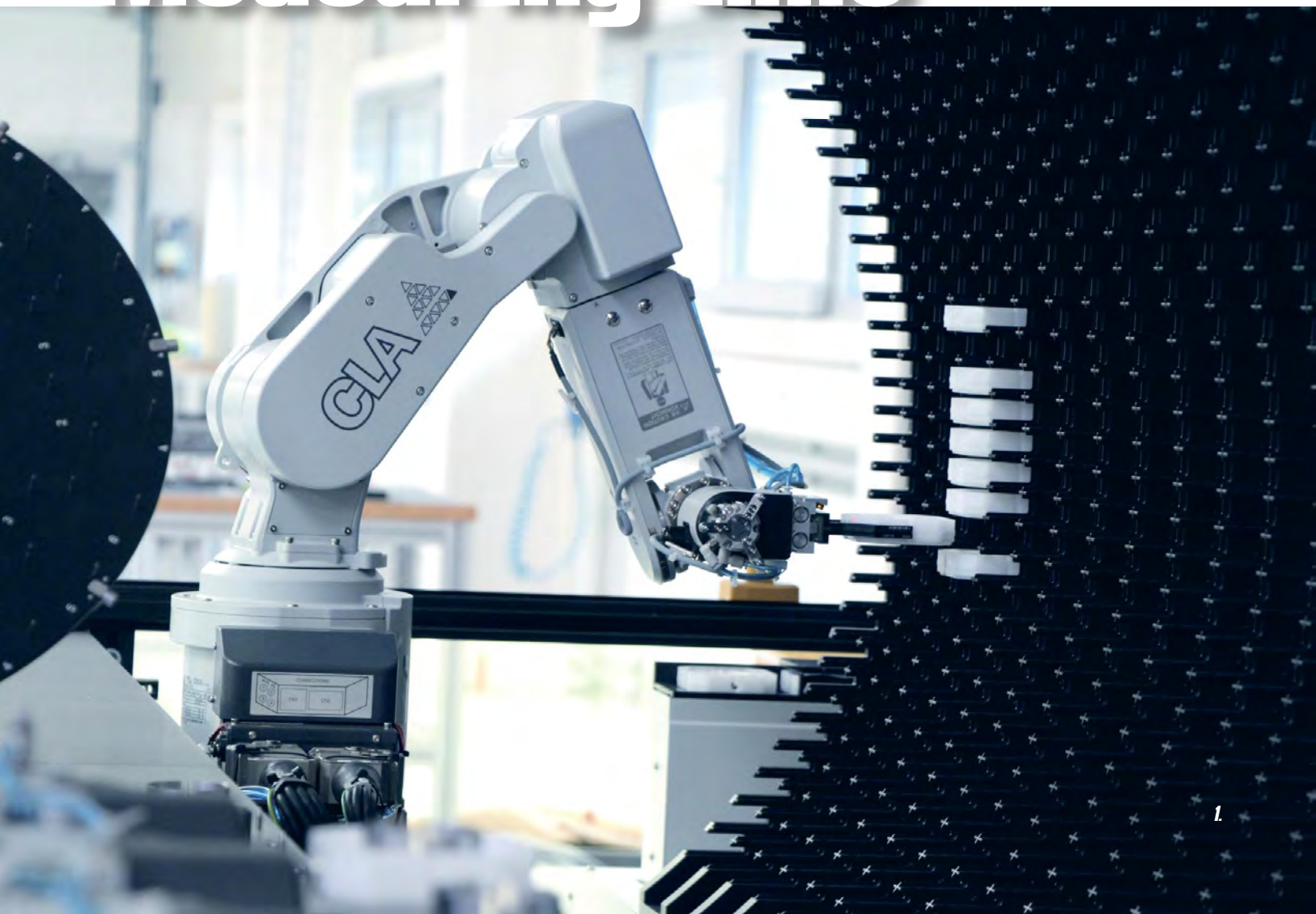
The solutions offered by CLA are developed in collaboration with the client to meet their expectations more closely. It is also possible to add checking and adjustment operations as required, for ex-

ample: telling the time by sight or activating and checking the watch functions. In the same way, the power reserve can also be controlled using this equipment.

Just like the astronomers of the past, watchmakers too are very keen to perfect their tools. Developments in the field of automation are offering new possibilities in the world of watchmaking and CLA firmly believes in the pairing of traditional expertise with new technologies.

www.cla.ch

- Multi-calibre chronometry device for the checking and adjustment of movements or automatic watches
- Provided in the form of an independent checking device or integrated into the assembly line
- Rewinding, movement and power reserve checks
- Checks of the functions of the watches
- Traceability guaranteed by the OMS monitoring software
- Reduction in lead times due to 24-hour operation.



For over 40 years, LNS has been based in the commune of Orvin, Canton of Bern, a perfect location in the heart of Switzerland's Jura region, hub of the bar turning industry.

Raising performance & reliability of machines



1



Since it was founded, LNS has been devoted to helping optimize the performance of their machine tools whilst increasing their productivity and safeguarding their operators.

Our group has become a world leader in the domain of peripherals for machine tools. Our worldwide presence with 9 production sites, strategically located across the globe, offers us proximity to the market. This allows us to position ourselves as a local supplier of reliable products and to offer a quick service. Market coverage is ensured by a network of subsidiaries and exclusive agents we have built up over the years.

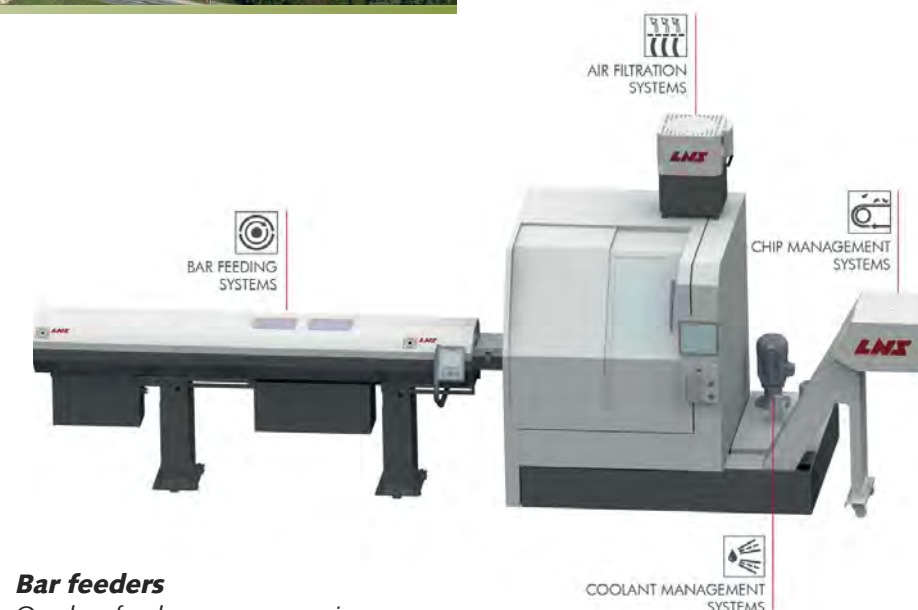


«LNS offers a wide range of products to enable you to maximise your productivity and your return on investment»

Gilbert Lile, Chairman of the Management, LNS Group

LNS currently employs over 800 collaborators, inventing, manufacturing, assembling, promoting, selling and maintaining a large range of products designed to equip machine tools. The common denominators of these products we group under the heading «peripherals» are: performance, quality, reliability and ease of use.

Thanks to the efforts made by all of our employees and the continuous investment in innovation, we will continue to offer unrivalled value to all our customers by providing the most advanced technology at the best price for many decades to come.



Bar feeders

Our bar feeders ensure maximum productivity on all types of fixed or sliding headstock lathes, even in the most varied applications.

From entry level solutions to sophisticated equipment, our vast range of products cover all manufacturing approaches (short bars, long bars or half-bars), whilst offering unbeatable reliability and flexibility thanks to systems which enable the quickest diameter changes in the world.

Chip conveyors

LNS designs and produces chip conveyors and complete chip removal systems for all types of machines.

With more than 250,000 units installed, LNS conveyor systems are available in a large range of models for all types of materials and all kinds of chips. They can be fitted with coolant filtration systems effective to 50 microns.

Coolant management

LNS supplies a complete range of coolant management systems which guarantee optimal performance of your coolant system.

LNS high-pressure cooling systems significantly increase machining speeds, extend the service life of the cutting tool and reduce expenditure on tooling.

1. With more than 120,000 units installed across the world, LNS bar feeders are universally recognized for their exceptional quality and performance.

2. Headquarter, Orvin, Switzerland.

3. LNS, your «one-stop-shop» for machine-tool peripherals.

Air filtration systems

LNS designs, produces and commercializes a complete range of air filtration systems designed to counter contamination problems experienced in the workshop. Thanks to their ultra-resilient construction and high level of reliability, oil mist collectors eliminate any mist, vapors and smoke, thereby helping to ensure a safe and healthy working environment and protect your production equipment.

www.lns-europe.com

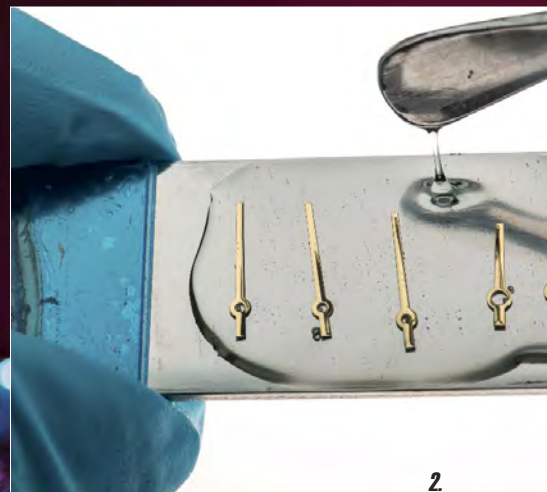
Through its research and development work focusing on innovative processes using photopolymerization, the Horlovia Chemicals company, based in La Chaux-de-Fonds, provides the luxury watchmaking industry with solutions that are not only highly efficient but also environmentally-friendly.



«We use our creative genius where there is no existing solution to answer specific needs of our customers.»

*Dr Khalid Zahouily,
CEO Horlovia Chemicals*

Creative added value in the watchmaking sector



3.

1. High transparency of UV curable pelable protective coating.
2. Temporary adhesives.
3. The 3D dropjet printer H-cube.
4. Bally flexometer test for UV curable inkjet on leather.

His collaboration with leading watch manufacturers made Dr Khalid Zahouily - who holds a PhD in chemistry and phopolymers and is recognized as international expert in photopolymerization and nanotechnology materials - realise how limited the range of chemical solutions available to this sector was, in terms of innovative chemistry - inks, coatings, solvent-free adhesives- etc. And so, to address this gap in provision, the research and development facilities of Horlovia Chemicals were set up in La Chaux-de-Fonds (Switzerland). The company's founder-director has made it his mission «to give the watchmaking industry access to the solutions it needs in order to develop innovative and environmentally-friendly products that uphold the quality image of the Made in Switzerland trademark.»

Know-how developed at the CNRS

Through his extensive expertise developed at France's National Centre for Scientific Research (CNRS) and his work with household names in the luxury, aeronautical and optical sectors, he has a clear understanding of the needs of watch manufacturers in the land of watchmaking. Horlovia Chemicals' team of engineers and researchers provide in-depth chemical consultancy in chemical expertise. As skilled craftsmen and pioneers of their trade, they sell and if necessary develop tailor-made solutions that not only meet but also exceed and anticipate client requirements - solutions that are being implemented by the greatest names in watchmaking.

Watchmakers now have access to tailor-made bonding, inks and coating solu-

tions based on new generation of hybrid sol-gel technology, a mixture of mineral and organic molecules. This extremely thin coating, invisible on metal, is resistant to both corrosion and abrasion. It also ensures that the item can be displayed and handled without leaving fingerprints, a crucial asset in selling luxury items.

Temporary peelable coatings for selective area protection

Another option is a temporary peelable protective UV curable coating, the result of four-years' research by Horlovia Chemicals. This patented peelable high transparency film is applied using the dropjet 3D H-Cube digital printer. It comes in the form of an ultra-transparent photopolymerizable coating. Applied selectively on watch cases, it provides valuable protection during inspection by consumers. The 3D H-Cube - unveiled as a world first at the recent EPHJ trade fair in Geneva - is in the form of a cube of only 80 cm x 80 cm x 80 cm. Small though it is, it also supports the application of a temporary protective coating on the polished parts of the housing during assembly. Horlovia Chemicals has also developed other selective application solutions to apply protection to, for instance, engraved components.

Development and marketing of new solutions

In order to maximise Horlovia Chemicals' contribution to their business, several manufacturers of top-of-the-range Swiss watches have entered into ongoing technical support agreements. Projects undertaken to date include the

development of solvent-free temporary adhesives for the gluing of sapphires, fixed with a few microns of solvent-free glue using photopolymerization techniques. Another technology being pioneered is the inkjet dropjet system, a sophisticated version of the ink-jet, which is ideal for functionalizing and customizing watches produced in small series.

Dr Khalid Zahouily, who continues to build on his own expertise and that of his team, says: «Horlovia Chemicals' primary strength lies in our ability to use our creative genius where there is no existing solution, in order to formulate new processes tailored to the specific needs of our customers.» These solutions are not only innovative but are also respectful of the environment, making them fully synonymous with creative added-value for the Swiss watchmaking industry. The manufacturers of the land of watchmaking, major players in the 21st century's luxury sector, now have another asset that will add strength to their quality image.

www.horlovia-chemicals.ch





CPAutomation SA supplies turnkey systems based on standard programs and platforms. Its customers have the benefit of a large range of competencies in the fields of micro-assembly/micromanipulation, laser machining and automatic visual inspection.

High accuracy micro-assembly and micromanipulation



2

1. Semi-automatic laser micro-welding machine (TLase).

2. High-rate palletizing of clockwork micro-components.

3. Automatic inspection module (V30).

From sizing to lifting, from a dial to an applique, from a pacemaker to a microchip, CPAutomation offers its expertise in the micron for the benefit of industries requiring high competencies in micromechanics. CPAutomation offers equipment rich in varied robotic technology, extending from cartesian structures to anthropomorphic robots, so as to offer ultra-quick and ultra-accurate solutions. CPAutomation expertise in industrial vision offers the following high value-added functions, in order to ensure economical quality production: localization of parts, dimensional measurements, quality and conformity checking.

The intuitive human-machine interfaces are focused on the ultimate user, the operator is central to the design! No need for long hours of training.

CPAutomation guarantees a high-performance, reliable and robust result, to the greater satisfaction of its customers for several years.

A unique laser micro-welding solution for resolving the most complex challenges

The principal advantages of this semi-automatic laser micro-welding machine (TLase) are its ease of use and its high accuracy. It is easy to effect welds on the level of a micron!

The intuitive operating interface offers high image resolution. It is very easy to master with faultless accuracy and welding minute parts becomes child's play. In order to ensure impeccable quality for the weld seam, real-time automatic aesthetic checking is possible.

A typical application is pinning up to the collet/stud in clockwork; the welding of rotating parts is possible by integrating an axis of rotation. Oxidation of the weld is avoided by adding shielding gas as well as by aspiration of the smoke.

The ergonomics of the machine have been designed to offer the operator only ideal conditions, such as a good working position, a perfect view of the screen, as well as optimal viewing of the welding zone.

Automatic inspection based on the entirely new «self-learning» technology

Industry is more and more demanding regarding the aesthetic criteria of its products. Certain materials and complex textures are still inspected by operators, causing a loss of economy and quality. CPAutomation has developed a unique solution, capable of assisting or replacing manual inspection. It offers automatic or semi-automatic checking stations (stand-alone).



«We satisfy the most diverse needs: laser micro welding, driving, screwing, gluing, palletizing, selective sorting and positioning.»

Marcel Dubey,
Sales & Marketing Director

How does it work?

1. Teach the system good and bad examples for reference (~30 min),
2. Let the system «self-learn» to create its reference models (~30 min),
3. Start up production; the system detects anomalies.

The unique V30 turnkey vision system is «self-learning». It is easily integrated into any machine or production line. The inspection and the classification of material and of textures, which has been very complicated to program up until now, become extremely easy; possibilities are unlimited.

The advantages of the integration of a «self-learning» vision system are multiple: it surpasses the best quality controller, it is rapidly configurable by any operator, the consistency of checking criteria is verified, the cycle time is reduced and the traceability of your products is ensured.

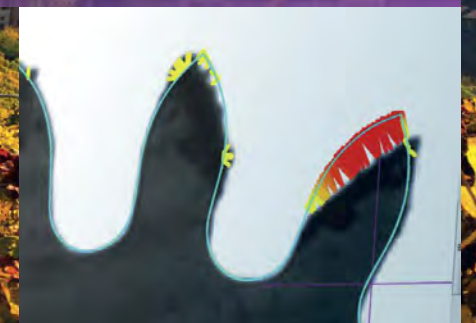
The visual inspection solutions supplied by CPAutomation are used, among others, in applications for checking clockwork components, welding/micro-welding, injection-moulded plastic parts, materials in continuous flow, food products and character recognition.

www.cpautomation.ch

As a breathtaking landscape hides all the infinite elements that contribute to make it impressive, much of our daily life masks the myriad of interconnected tiny parts which make it efficient... informed... comfortable... For but a moment, think of the intense activity behind all of this!

In Western Switzerland – birthplace of micro & nanotechnology - thousands of researchers and developers are continuously bringing ideas to light, contributing to making both local and global worlds smarter.

*Photo: Lake of Bienne,
Saint-Pierre Island, Ligerz. Berne*



Quality control equipments integrating vision systems



Highly-stable laser-pumped rubidium atomic clock developed at University of Neuchâtel

In the future more accurate geolocation and faster data exchanges will require improved time-keepers. The Time and Frequency Laboratory at the University of Neuchâtel (LTF) develops techniques for tomorrow's high-precision atomic frequency standards, metrology, lidars and other sensors.

Mastering atoms for precision



1



2

In addition to its teaching and fundamental research activities, LTF is involved in several research projects encouraging technological transfer and innovation.

Very precise clocks are required on board GPS (global positioning system) satellites: for 1-meter precision, the instability must be below 3 ns on time-scales of one day, which is only achievable by atomic clocks. In the European global navigation system Galileo, each satellite carries two types of atomic clocks, hydrogen passive masers and rubidium clocks, manufactured by the company Spectratime SA in Neuchâtel and initially developed in the Neuchâtel Observatory with the participation of LTF scientists.

At LTF, the team of Professor Gaetano Mileti anticipates future generations of rubidium clocks, aiming to achieve the performances of the passive maser, the best-performing clock ever on a satellite, but with a clock of much less weight, volume and consumption. To reach this objective, Christoph Af-folderbach and colleagues work along two lines. Firstly, they replace the discharge lamp used to prepare the rubidium atoms by a laser diode. Secondly, in collaboration with EPFL, they have developed a new microwave cavity for interrogating the atoms, providing improved field geometry combined with significantly reduced size.

While aiming for state-of-the-art clocks for space, LTF still keeps a foot firmly planted on the ground. Jointly with in-

dustrial and public partners, it imagines and develops solutions for atomic clocks for ground applications. Important features of such clocks are superior stability compared to quartz oscillators, a small form-factor, operation over an extended temperature range, low power consumption, and low fabrication costs, in order to access existing, emerging, and future markets like telecommunication networks and power smart-grid synchronization. Either rubidium or caesium atoms act as frequency references and are confined in small cells made of glass or other materials.



«We use our scientific and technological expertise for conceiving future high-precision time-keepers.»

Prof. Gaetano Mileti,
LTF deputy director

The expertise of LTF in the fields of atomic physics, optics and metrology, combined with the unique local know-how in micro-technology (in particular in Microcity/EPFL and CSEM) has already resulted in the development of key components of future industrial chip-scale atomic clocks. Laser diodes are also very useful in caesium beam frequency standards, to replace the traditional magnetic beam selectors and improve clocks' performances. LTF is also involved in this field of research, in collaboration with another regional industrial partner, Oscilloquartz SA.

1. Highly-stable laser-pumped rubidium atomic clock developed at University of Neuchâtel.

2. Cell-confined rubidium atoms are at the heart of ultimate precision atomic clocks and sensors.

LTF has developed very compact frequency-stabilized laser modules. With the lasers' excellent frequency stability over long time intervals – as required for atomic clocks – this technology can also serve other purposes such as lidars (laser remote sensing). Recently, a team led by Renaud Matthey successfully demonstrated how to transfer the stability achieved at rubidium wavelengths (red light) to the near infra-red wavelength range. In particular, a highly stable rubidium-based optical frequency reference has been realized, under a mandate from the European Space Agency. This enables calibrating space-based measurements of variations in CO₂ concentration in the atmosphere with a precision of 0.5 ppm (1 molecule among two million), with the aim to refine the predictions about the climate change evolution.

«It is very rewarding that we can use our scientific and technological expertise for conceiving future high-precision time-keepers, and also for other precision measurements, like lidars, and compact sensors» rejoices Gaetano Mileti.

www.unine.ch

A swiss company founded in 1989, Qualimatest is the leader in developing quality control equipment integrating vision systems for industrial sectors including watchmaking, medical, rail and automotive. In 1995, Qualimatest was first awarded for its innovative system for the characterization of materials using an automatic system embedding digital imaging technology. Since then, Qualimatest has never ceased to innovate in providing its customers with the best solutions.

The sensitivity
of man,
the rigour of
the machine



1

1. New application QMTCalqueControl, the profile projector simpler and more accurate.
2. New quality control device the QMTProjector-100 – Optical Equipment with high precision measurement, compact, simple and without programming.
3. QMTSound: the Hardware and software platform for acoustic and vibration analysis.



2

In 2015, Qualimatest was awarded with the first Prize of Innovation in the Canton of Geneva...

For many years, Qualimatest and its team have developed, both in-house and with the collaboration of major schools such as HES or EPFL, many innovations in the field of digital imaging. These applications have allowed us to develop a wide range of products that perform contactless high precision dimensional measurement or aesthetic control of parts.

Could you briefly tell us about aesthetic control?

The aesthetic quality control aims to set aside faulty parts with bumps, scratches, stains... These operations are usually carried out visually and remain highly subjective. Qualimatest has developed the hardware platform QMTSubFace, the first automatic system that respects human criteria in the aesthetic control, a particularly appreciated asset in watchmaking.

What is the QMTCalqueControl application?

QMTCalqueControl is a simple measurement solution without programming; quick to implement, flexible and accessible to all. Historically, quality control was often performed with profile projectors. These devices used optical technol-

ogy and parts were drawn on tracing papers: this measurement was time consuming and imprecise. During the last 15 years, the use of computer systems has allowed the simplification of these controls through computer overlay drawings of parts after camera capture of an image. Nevertheless, the alignment of the «digital layer» on the part was visually performed by the operator with a risk of error and a lack of repeatability.



«Innovation for growth.»

Laurent Brulport,
Commercial director

To increase the efficiency of monitoring, a CAD file overlay, with detection and automatic alignment on the workpiece, as been proposed since 2010. This feature has been widely appreciated by the industry but the final decision, based on the visual gap, remains the decision of the controller. The measurement of the output gap was also a top expectations of customers.

QMTCalqueControl is now available in the platform QMT Vision Inspector. It allows the automatic control of the variation between the drawing and the shape of the part.



3

What are your prospects for the future?

Qualimatest is part of the QMTGroup following the acquisition, at the end of 2014, of the SAPHIR Company based in Barraux (France). SAPHIR are experts in acquisition and signal processing for embedded systems, test stands and supervision, especially in acoustic and vibration fields. From this collaboration, the QMTSound platform was born.

QMTSound allows non-destructive testing by acoustic and vibration analysis. This technology is a logical complement to QMT Vision Inspector that operates optical control. QMTSound control includes material selection, scanning signal, digital filtering, detection of transient phenomena and time-frequency analysis. QMTSound now offers new features; the acoustic control or a combination of sound and vision.

www.qmt.ch

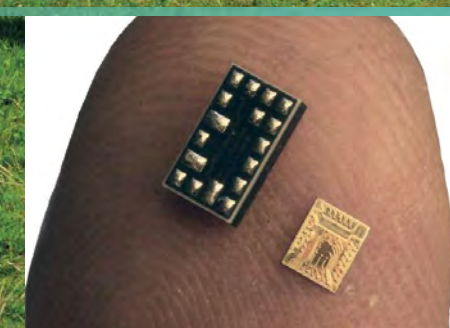
Life is about balance and fine tuning of innumerable fast invisible processes. Technologies at the smallest scales associated with digital data processing are tackling the challenge to master further and further the «innumerable», the «fast» and «invisible». To have us enjoying quietly a balanced life in the visible...



First anatomic finisher for root canal treatments



A concentration of micro-technology including thin-film manufacturing, micro-bonding, micro-molding and electrical testing



Open programmable digital hearing aid

Photo: «Les Franches-Montagnes». Jura



«To dare
is to do.»

Thierry Rouiller, CEO

Flexible, quick to react and above all, innovative: FKG Dentaire is a mid-sized company that remains close to its markets and plays in the big leagues. Thierry Rouiller, CEO since 2011, is surrounded with a highly qualified and motivated team and has built partnerships with the best universities in the world.

Always one innovation ahead!



1



2

1. Training Center.

2. Clean room.

3. Production.



3

In just 20 years, FKG Dentaire has seen a six-fold increase in turnover, with a staff that has quadrupled and an average annual growth rate of between 15 and 20%. FKG Dentaire manufactures around 15 million products each year, 95% of which are exported to over 100 countries. In 2012, the enterprise was named by the Swiss Venture Club as the most innovative Western Switzerland company of the year.

Fusing watch-making precision with materials science

Founded in La Chaux-de-Fonds in 1931, the company initially produced parts for dentures as well as dials for watches. Then, when Jean-Claude Rouiller, the founder of FKG Dentaire, who had joined the company a few years earlier, took over the reins of the dental branch in 1994, he changed its focus to endodontics (treatment of the dental pulp) and gave it the name of FKG Dentaire.

A technological revolution

Back then, dental reaming instruments were made of stainless steel. But because the root of the tooth can sometimes be very narrow or have strong curvatures, the steel tools were simply too rigid and could lead to breakage inside the root canal. In an effort to simplify the work of practitioners, Jean-Claude Rouiller turned to an alloy of nickel and titanium (NiTi) and exploited its exceptional qualities: namely, its shape-memory effect and superior flexibility and elasticity. The instruments would also undergo an electro-chemical

treatment to improve the surface condition and resistance to torsion.

Innovation in its DNA

FKG has invested heavily in innovation, opening a new production site in 2007 and bringing a host of new products to market. Indeed, over the years the R&D team has submitted several patents.

As the production of these instruments grows ever more complex and sales numbers increase, FKG has stepped up design and development of its own machines. At the same time, the company regularly undergoes a certification process in accordance with the principal quality management systems and medical norms of the industry.

Launch of the first anatomic finisher for root canal treatments

This year, the latest innovation from FKG Dentaire lets practitioners treat complex root canal systems and clean once impossible-to-reach areas with minimal impact on the dentine. Made with a highly flexible NiTi-based alloy, the XP-endo Finisher follows the contours of the canal with an improved reach of 6 mm in diameter - or 100-fold that of a standard instrument of the same size.

With the XP-endo Finisher, FKG Dentaire finally solved a common problem for dentists. They are now able to reduce the risk of future infection by offering patients a deeper cleaning for a better root canal treatment.

International reach

To market its products worldwide, FKG attends the biggest international trade fairs, where it offers product demonstrations. But the company is also involved in training local dentists at four training centres (La Chaux-de-Fonds, Oslo, Dubai and Mexico), as part of its belief in transferring knowledge on the optimal use of these ultra-sophisticated tools. Furthermore, FKG has set in place a network of distributors that are carefully selected on the basis of their structure and compatibility with its own strategies.

www.fkg.ch

With its capabilities in design, development, industrialization and manufacturing, Valtronic is a vertically integrated supplier of high-quality medical devices and high-reliability products in active implants, complete medical systems, medical robotics, aeronautics and other markets.

Mastering the very small and complex to serve a variety of domains



2

«Valtronic is committed to designing and manufacturing innovations that empower our medical device customers to create improved patient care and outcomes».

Platz Rainer, CEO
Valtronic Technologies SA



What sets Valtronic apart from other micro-electronic contract manufacturers?

Valtronic is a supplier with strong engineering capabilities for medical products. Several characteristics set us apart from traditional contract manufacturers. Our focus and experience are in complete medical systems and smart money investments.

Microelectronics is becoming smaller and more intelligent as medical/consumer wearable's and the «internet of things (IoT)» market continues to grow. Our teams of engineers have the required competencies to take an idea or current prototype and re-engineer it for manufacturability, quality, cost efficiency and of course, our number one value, miniaturization.

Next, we consider our agile footprint something that stands out from our competition. With a facility in Switzerland and the U.S.A., our footprint is global. We can offer to european customers high quality at an offshore price, production flexibility in low to high volumes, as well as the ease of product transfers among Valtronic sites. Our offering is endless to ensure best cost solution to our customers.

By offering co-development and industrialization services, our capabilities allow us to manufacture implants, high precision robots complex products and complete systems.

And finally, our business development effort was launched in late 2014 and has come full circle bringing exciting new proprietary projects on board. With Smart Money Investments into young technologies or ventures, we have grown a fully integrated team of

scientific, technical and business experts that are focused on building strategic partnerships, bringing projects to the next level of innovation. Focus is on working with inventors, researchers, start-ups and/or investment partners on a variety of business development transactions from R&D to global product development and engaging in transactions such as ventures, investments and more.

Give us more information about your medical experience

Valtronic has been active in medical market for over 30 years. Our business is focused on active implants, from neurostimulation to glucose monitoring systems. Currently we are venturing into the animal health market. As for medical devices, our experience ranges from drug delivery devices to imaging, and so forth.

What do our readers not know about Valtronic?

The part that *many people don't really know about Valtronic* is the entry of business growth in areas of aerospace and industrial markets, security & communications, automotive, sensors and system assembly. Valtronic is making the shift with the market and joining the trend of IoT and competing for this business. For example, sensors are the hot item right now, as sensors are in everything and everywhere. Sensors are a great project for Valtronic due to our miniaturization expertise and high quality efficiency.

It is an exciting time to open up our sites to new markets and take our experience of «miniaturized» down an entire new path! Guiding innovation to success.

www.valtronic.com

1. Bonder programming in clean room.

2. DirectSTIM lead: the assembly of the distal tip of the lead is done at Valtronic is a concentrate of micro-technology including thin-film manufacturing, micro-bonding, micro-molding and electrical testing.

3. DirectSTIM Implantable Pulse Generator: once connected to the lead, the system is used as adjunctive therapy aimed at reducing some of the symptoms of advanced Parkinson's Disease (PD).



3

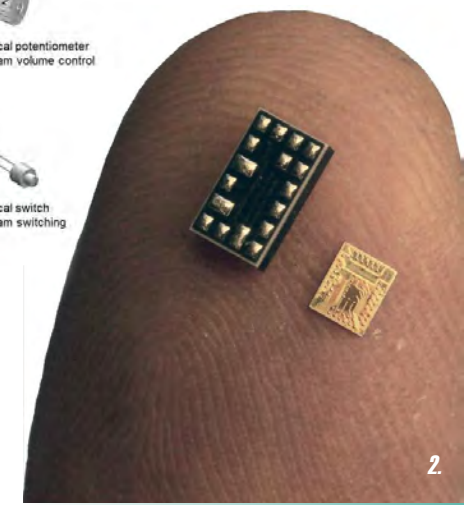
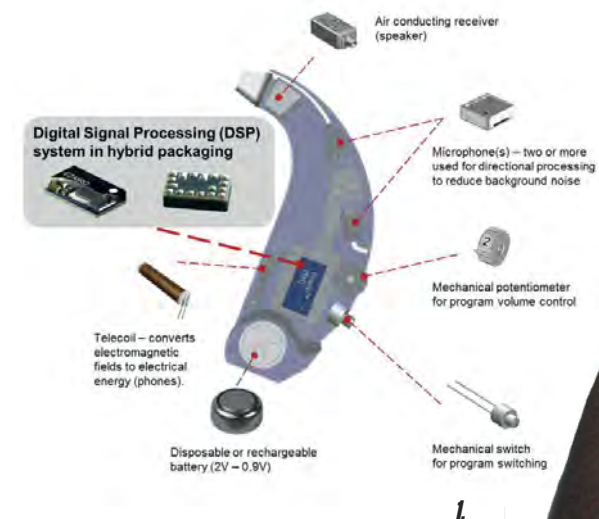
1

Whether implanted or worn on the body, medical products using ultra-low-power chips from ON Semiconductor Switzerland change the lives of millions of people worldwide.

Powering a difference in people's lives



1. The structure of a typical behind-the-ear hearing aid.
2. Ezairo® open programmable digital hearing aid Silicon-in-Package and System-On-Chip.



ON Semiconductor is an integrated device manufacturer (IDM) based in Phoenix, Arizona, U.S. with a wide portfolio of energy efficient solutions for the automotive, computing, communications, consumer, military/aerospace, industrial and medical markets. As part of the Medical and Wireless Products Division, the Marin, Switzerland site has roots in a startup called dspfactory and the Institute of Microtechnology (IMT) in Neuchâtel (which is now part of the Ecole polytechnique fédérale de Lausanne (EPFL)).

Core Expertise

ON Semiconductor Marin specializes in the design of ultra-low-power integrated circuits for medical applications. This expertise relies on an industry leading low-power analog-to-digital converter technology (ADC), a strong experience in low-power analog and digital design techniques, a deep knowledge in digital signal processing (DSP), and integration know-how to fit this technology into a single System-on-Chip (SoC) for miniature, optimized products.

Hearing Aids

Our team first focused on hearing aids, and developed the world's first open-programmable digital hearing aid back in 2001. At the time, most hearing aids were still analog in nature and the few that were processing sound digitally were made of fixed function blocks due to power consumption constraints. dspfactory, as the company was called at

the time, revolutionized this landscape by developing fully programmable digital signal processors, allowing the same chip to run different programs, and be upgraded according to the latest advances in hearing loss recovery algorithms, all this at a power consumption competitive with other more traditional hearing aid chips lacking that flexibility. This technology was so successful that it triggered the acquisition of dspfactory by AMI Semiconductor in 2004, and later ON Semiconductor in 2008.

Medical Applications

Being part of a bigger entity opened up new product development opportunities in the Medical area. Over the years, ON Semiconductor Marin has developed chips for applications such as electrocardiogram (ECG) monitoring, heart rate monitoring for pacemakers, transdermal drug delivery, continuous blood glucose monitoring, pill ingestion monitoring, and counts today many of the world's biggest medical equipment manufacturers amongst its customers.



«We provide low-power silicon solutions for the medical market to improve people's lives.»

Philippe Bourban,
Site manager
ON Semiconductor

Our team is driven by the innovation aspect, the technical challenges, and the impact that our chips have on people's life. We help people hear better and reconnect with their relatives and friends, relieve pain quickly with the aid of a patch diffusing painkiller through the skin, allow diabetics to control their blood sugar level automatically and continuously without the need to take blood samples, and help doctors know if their elderly patients took their medicine as prescribed. All of these things truly make a difference in people's lives, and keep the development staff highly motivated.

Latest and future products

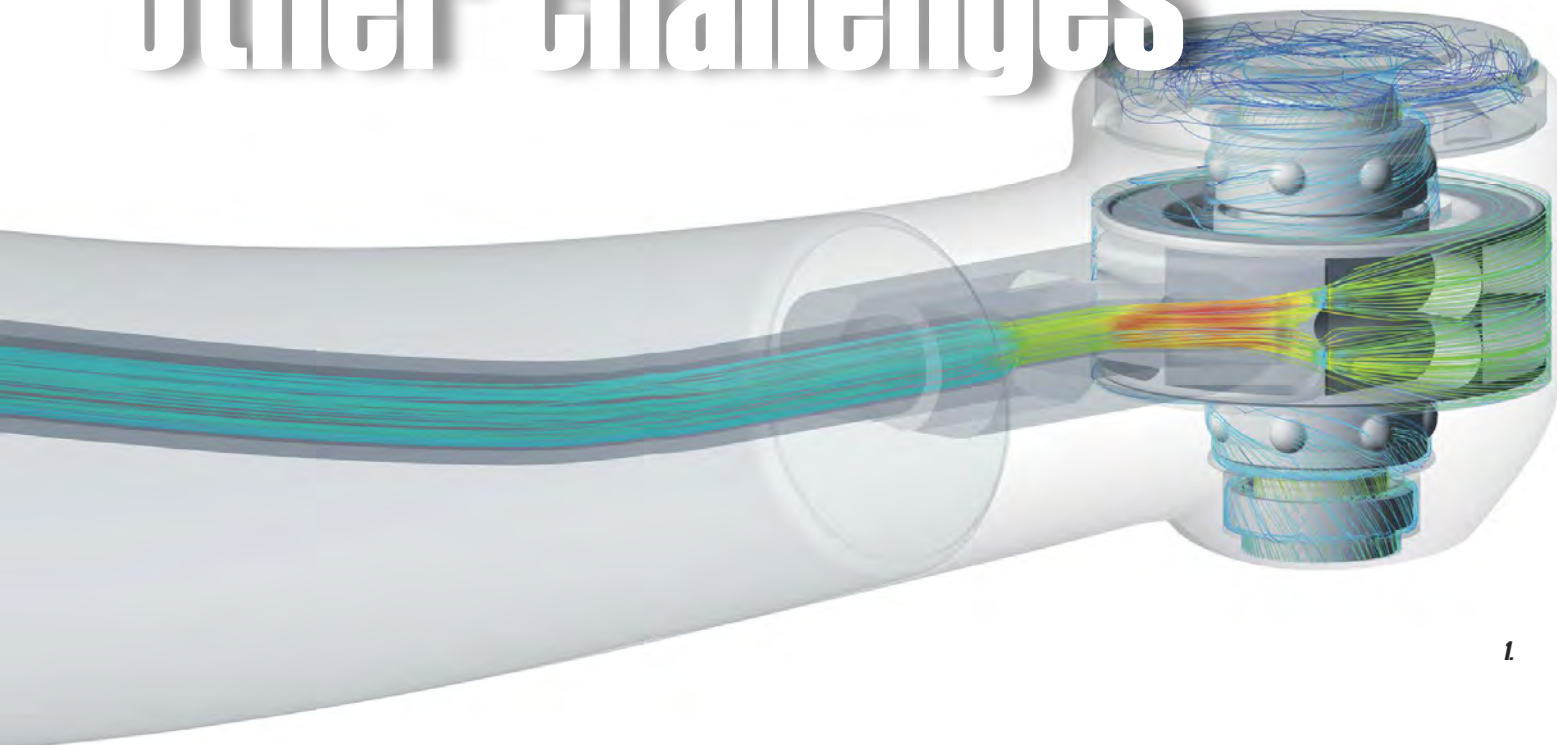
In October 2015, we launched Ezairo® 7150 SL, an open-programmable DSP-based Silicon-in-Package (SiP), which enables wireless connectivity in hearing aids and cochlear implants. This allows users to control their hearing aids wirelessly from their smartphone, or to stream stereo audio directly from their TV. With our know-how in analog front-ends, digital signal processing, low power design, and system integration, ON Semiconductor is well-equipped to address booming markets such as portable medical and consumer health.

www.onsemi.com

A leading designer and manufacturer in dental equipments located in Bienne/Biel near Bern, Bien-Air was founded in 1959 by David Mosimann. This inventive precision mechanic with high entrepreneurial skills installed the company on a way of continual expansion. Today, the Bien-Air group consists of two specialized companies, Bien-Air Dental and Bien-Air Surgery. More than 350 employees in Switzerland and worldwide enjoy the continuity, full independence, stability as well as flexibility of this family run company.

▲▲ BY JEAN-LUC RENCK

400'000 rpm on a tooth... and other challenges



1



2.

1. The rotor's micron-precise design coupled with optimal air pressure distribution and exhaust flow, warrant the TORNADO an unrivaled 30-watt power output.
2. The implantology system iChiropro using an iPad paves the way for a new generation of medical equipment.

Bien-Air has behind its high end dental and surgery equipment the experience of more than a half century in the rich and dense environment of microengineering expertise qualifying the «Watch Valley» area. The company has its head office in Bienne and an assembly plant in the Jura region. No better place to have Bien-Air's cultural heritage of research, high precision and practical ingenuity prospering. Creation and manufacturing of all of its products are done locally. «Local partnerships are an important part of our efficiency», CEO Edgar Schönbächler says. Products are distributed worldwide through a network of subsidiaries and retailers that ensure also a superior after-sales service.

Stimulating technical challenges

The engineering challenges in dental equipments are numerous. To operate comfortably in small spaces, instruments must be of limited size despite their constant needs in water, air, light... There are also safety challenges regarding the patient, starting with the cooling of micro-rotors that can revolve 400'000 times a minute! Bien-Air has patented a unique system named CoolTouch+ that keeps the instrument head at human body temperature in all situations.

It is no accident that Bien-Air Dental is among the world leaders for powered

dental instrumentation. The company can proudly promote for instance its TORNADO turbine – with an outstanding power of 30 Watts – as the number one instrument in its category; the speediest as well as the most silent on the market! All this implies the deepest expertise in frictions, weight and noise control, resistance of materials, durability, corrosion... «In short: many and sometimes contradictory challenges in the smallest possible space» says Edgar Schönbächler.



«Longlasting local partnerships are an important part of our efficiency».

Edgar Schönbächler,
CEO of Bien-Air Dental SA

«At the same time, from a dentist's point of view, tools have just to be reliable and simple to use», the CEO points out. Bien-Air has evolved through years from just an instruments manufacturer to a customized line designer – their aims being a reduced number of instruments and devices to ensure the full array of operations and an optimized time schedule for the practitioner.

Dental surgery goes digital

Improving the efficiency of instruments also goes along today with an increase

in the capacity of their electronic controls and the development of integrated systems. New challenges have been set by digital technologies. «Much further than just storing and instantaneously retrieving patient's informations on a tablet without the need of paper anymore, a dentist can now prepare virtually an operation after 3D modelization of a patient's mouth through scanning. All the parameters – rotation speeds, angles... – assessed during the simulation can be stored and applied to the instruments for the real intervention», Edgar Schönbächler explains. That is to say that tools have now to be designed for an integration in a digital environment. Bien-Air tackled this integrative way with its iChiropro system as a core tool for digitally controlled operations in implantology and surgery or its iOP-TIMA system for restorative and endodontic procedures.

Technologies change, infinitely promising, but human values remain the focus: since 1959, Bien-Air has been committed to independence and excellence, to practitioners' efficiency and patients' comfort through simple and reliable equipment. This will not change.

www.bienair.com

Two and a half centuries ago, as the industrial revolution was spreading, timekeeping started to inspire Western Switzerland. Some brilliant technical skills awoke which matured toward micro and now nanotechnologies of the highest demands. These investments in early innovation and technology are giving back. Western Switzerland has the most accomplished and prestigious watchmaking industry in the world.

Photo: «Le Creux-du-Van». Neuchâtel



Progressive stamping tool



The most complicated watch in the world



Rolex's 5-year warranty on all models

Located in Le Brassus, a watchmaking jewel in the canton of Vaud, Meylan Frères SA has specialized in progressive stamping / die blanking since 1972. The company offers a reliable, precise and cost-effective solution for the production of highly technical micro-mechanical parts.

The specialist for your micromechanical parts



1. Parts on stripe.
2. Large variety of applications.
3. Progressive stamping tool.
4. Factory in Le Brassus, Switzerland.

Our specialty area, progressive tooling, enables a wide range of highly diverse and complex operations to be carried out without reworking, depending on the geometry of the part. In watchmaking, but also in other sectors such as electronics, medicine, etc., Meylan Frères SA works with many tips of material, with thicknesses of ~ 0.01 to 1.3 mm.



«We shape your project, even the most ambitious one!»

Christian Meylan,
CEO of Meylan Frères SA

Based on the customer's design, we will carry out a study of a progressive tool and its complete fabrication, taking full responsibility for production, including the maintenance of tools. A quenching and polishing workshop as well as a control and metrology department complete our services.

The integration of various production processes allows us to ensure optimal management of the quality, costs and deadlines for any product.

Carrying out ambitious projects through stamping, considered by many to be im-



possible, has greatly contributed to the success and international renown of the company. Our clients include prestigious watchmaking brands as well as renowned industrial groups.

Meylan Frères SA also manufactures micro-mechanical parts with wire or die-sinking EDM. Meylan Frères SA continually invests in new equipment in order to remain at the cutting edge of technology and offer you the highest possible quality.

www.meylanfreres.ch



As far as chronometry can go

Bovet 1822's recent unveiling of the Amadeo Fleurier BraveHeart presents a timepiece that pushes the boundaries of chronometric precision. The result is an exceptional creation, a limited edition of course, for which five patents have been filed.

▲▲ BY CHRISTOPHE ROULET FOR WTHERJOURNAL



Hotel Beau-Rivage, with its breathtaking vista of Geneva's lake-front, welcomed us for this meeting with representatives of Bovet Fleurier. An appointment made early in the year and which would, as always, serve to present the latest timepieces from the brand. It therefore came as something of a surprise to hear Christophe Persoz asking «how much time do we have?» If the answer had been «thirty minutes», no doubt we would have been sent packing. After all, among the Bovet watches waiting to make our acquaintance was the Amadeo Fleurier BraveHeart, a mechanical and artistic gem that cannot be hurried. Whetting our appetite, Christophe Persoz declared that «in chronometric terms, as a Maison that stays true to traditional watchmaking, hence which does not have recourse to alternative, high-tech materials, I believe we have reached the ultimate limit of what can be achieved and imagined. I don't see how it would be possible to go any further.»

Vertical integration

First on the list for perusal were the Amadeo Fleurier Monsieur Bovet and Amadeo Fleurier Virtuoso V, both equipped with the Virtuoso II calibre, the first movement without a tourbillon regulator to be entirely developed and manufactured by Bovet. Having made its debut last year in two models, it is now set to extend across the collections, with the one exception of the Grandes Complications range, aided by the fact that it was designed to integrate numerous functions. «Last year we equipped 50% of our watches with in-house movements,» commented Christophe Persoz. «We expect to increase this proportion to 75% this year, and probably 90% in

II - 2016 Micronarc Magazine

2016. In a word, we are carrying on our vertical integration. When we took over Dimier in 2006, it only manufactured tourbillons. We began by increasing quality, while at the same time developing a new calibre, one that wasn't a tourbillon. As you can see, it has taken us eight or nine years to get there.»

There was nothing fortuitous about this introduction. The Virtuoso II, which displays hours and minutes on both sides of the movement, features a patented seconds carriage with the unique feature of a double-coaxial mechanism. Seconds are shown on each side of the movement by hands which share the same axis. However, the direction of rotation is reversed. Enough to get the designers of the Amadeo Fleurier BraveHeart movement thinking... with the additional difficulty that this dual display must fit around a tourbillon carriage. A world first. «This is generally how we work,» Christophe Persoz confirmed. «We start out with a drawing or an idea, regardless of its feasibility. Solutions come later. The advantage of this method is that it encourages creativity.»

Highly rated

Bovet's watchmakers clearly had creativity to spare in finalising this new calibre, codenamed 17BM02Al22J, comprising 722 parts and intended to stretch the limits imposed by the tourbillon while improving timekeeping precision. Without going into detail, certain aspects of this innovative mechanism command attention. First the choice of a flying tourbillon, for transparency. But not any flying tourbillon: the carriage is «held» at the centre of its axis, so that the escapement can be positioned below this fixation point, and the balance and spring assembly above it. A further improvement to the timekeeping precision of this innovative construction comes from the balance wheel itself - Bovet has developed a three-spoked felly balance in aluminium for optimum inertia - and from the in-house manufactured cylin-

drical balance spring: Bovet is one of just five manufactures producing its own balance springs.

Energy transmission has also come under the spotlight, particularly as Bovet had decided against a constant-force regulator. Its solution takes the form of three-dimensional toothing for more efficient energy consumption and a massive power reserve, bearing in mind that power transmitted to the regulating organ is more constant over time. The Amadeo Fleurier BraveHeart is equipped with two barrels that deliver 22 days of power reserve, and a spherical differential gear thanks to which the watch can be fully wound with just 55 turns of the crown, compared with 30 turns for a standard ETA 2892 calibre having just 42 hours of power reserve. Bovet has filed five patents for the innovations brought to this watch which, insists Christophe Persoz, comes well within the criteria required by any chronometric rating. Needless to say, the decoration lavished on this timepiece does justice to the technical innovations it has inspired. Bovet spent fifteen years bringing its idea to maturity and a further four years to develop the watch, which is a study in the manufacture's expertise. It will be produced as a limited edition of 80, at a rate of no more than 30 pieces a year.

www.bovet.com



>> WATCHMAKING

Israeli supermodel Bar Refaeli is Hublot's new glamour girl. The brand's new female ambassador was officially named in New York. With her stunning smile and infectious good humor, she pursues her passions guided by one point of reference: her *Big Bang Broderie*. Two minutes of charming spontaneity – ready, set, go!

▲▲ BY MATHILDE BINETRUY FOR WTHEJOURNAL

Bar Refaeli, two minutes of your time!

Hublot's very first female ambassador:
model Bar Refaeli.



Do you tend to be on time or late?

On time. I'm always two minutes early, even!

What is your motto?

«To live is the rarest thing in the world. Most people exist, that is all.» Oscar Wilde

What is your power reserve?

My sofa is the most comfortable place in the universe (laughs).

If you could stop time, what would you do?

Architecture studies. Unfortunately, it takes seven years. I've been working since a really young age and I'm afraid I won't have enough time to do it.

You can always spare 10 minutes for...?

Cuddling my loved ones. I am a very warm person and I grew up in an affectionate family. For me, being close to people is a regular part of life.

On the other hand which activity do you never have time for?

Enough cuddles! (laughs)

Who would be your ideal dinner guests?

Alan Turing. I've just seen his latest film *Imitation Game* and I loved it.

What is your guilty pleasure?

French fries!

Which is your favorite season?

Spring. It's too hot in Israel in summer.

If you were a watch, which would you be?

I would be a Hublot *Big Bang Jeans*... with 28 hours on the dial (laughs).

Where will you be one hour from now?

At my gym class.

Who with?

With my coach.

If you had to pack up and drop everything right now, what would you do?

I would go to the beach (laughs).

www.hublot.com

RM 19-02: Tourbillon Fleur by Richard Mille

Rolex now offers a 5-year warranty on all its models. This is a first in watchmaking and says a lot about the brand's confidence in its products – and how far its competitors have to go to catch up.

▲▲ BY MICHEL JEANNOT / BIPH

5 Years Guaranteed – Rolex leads the way



It may not be standard practice in the watchmaking industry quite yet, but that day might come. Beginning on July 1st 2015, Rolex offers now a 5-year warranty (up from 2 years previously) on every model in its collection. This means that from now on the 2,000 or so Rolex watches sold daily by authorised dealers around the world will carry a 5-year guarantee from the brand with the crown.

Rolex has kept this new extension of its standard warranty relatively quiet, only announcing details to its sales network. According to one authorised dealer, this is because the company considers that «extending its guarantee to 5 years goes hand in hand with the constant advances the brand has achieved since its inception, a result of its total focus on reliability and performance». The dealer also corroborated something that is no secret in the trade: Rolex is undeniably among the brands to cause the least worries for the After-Sales Service.

Constant Innovation

The fact that one of the leading brands in Swiss watchmaking is extending its guarantee period across its entire output clearly shows unshakeable confidence in the reliability of its products. Because at that level of production (around 700,000 watches sold each year), any issues of reliability 3 or 4 years down the line generating a flood of returns would have disastrous repercussions on a brand's finances. No major watchmaking company could shoulder that kind of risk, which probably explains why most warranties on Swiss watches run out after 2 years. But now, with this bold move from Rolex, new lines in the sand are being drawn for the future. It's worth noting that Breitling also offers a 5-year guarantee on all models with proprietary manufacture movements and Omega gives a 4-year warranty on its models fit-



1. Rolex Global Headquarters in Geneva.

2. Like all Rolex models, the Cosmograph Daytona now enjoys a 5-year warranty.

ted with Co-Axial movements. In both cases, however, the guarantee does not cover the brand's entire production. At another level altogether – 3,000 watches produced per year at the very peak of the watchmaking pyramid – Richard Mille has been offering 5-year guarantees on its timepieces for several years already.

With this new 5-year warranty, Rolex takes the lead in an area that very naturally has a direct impact on consumers (and their bank balances). The brand has consistently focussed on advances in

water resistance, accuracy and reliability and this latest move reflects those developments. This spring it unveiled its latest mechanical movement in Basel, the most technically impressive ever certified by a brand, with 5 patents and accuracy to +/-2 seconds per day. Seen in this light, the new 5-year guarantee is unlikely to be considered an end in itself for Rolex – which would explain the lack of big noise about it – but simply as another stage in the process of differentiating itself from the competition.

www.rolex.com

Vacheron Constantin has just unveiled the most complicated watch in the world. This concentration of mechanical watchmaking, commissioned by a private collector, took eight years to develop and includes a total of 57 complications.

▲▲ BY MICHEL JEANNOT / BIPH

The most complicated watch in the world



1

Jean-Marc Vacheron, 260 years ago, signed up his first apprentice. This desire to pass on expertise has taken on a whole new meaning 260 years later, as the Geneva Manufacture can not only boast the title of the world's oldest watchmaking brand in continuous operation, but it has also just unveiled the most complicated watch ever produced.

«The race for a record-breaking watch wasn't an end in itself – the interest of the project lay in the challenge it represented,» explains Juan Carlos Torres, CEO of Vacheron Constantin. In reality, the request came from a leading watch collector and connoisseur who came to Vacheron Constantin nearly ten years ago to order «the most complicated watch of the 21st century». A handshake later, the order was signed and sealed for everyone involved. All that remained was to design, develop, perfect and produce the watch in question...

Eight years of hard work in Vacheron Constantin's bespoke pieces workshop were required of the manager Dominique Bernaz and three highly experienced master watchmakers to meet this challenge, during which time the collector extended his requirements further, suggesting the addition of an unprecedented complication: a perpetual Hebrew calendar.



Thus, earlier today, in its Manufacture in Plan-les-Ouates, Vacheron Constantin unveiled the results of this extraordinary

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first that necessitated the solving of impressive mathematical and technical problems. It also gives a few clues as to the origins of the buyer.

So what is the price of this piece that is unique in every way? «No comment» from Vacheron Constantin, who simply confirms that the price was set at the start of the adventure, even before all the properties of the piece had been defined. But these unique and exceptional «image» pieces are not the most profitable from a strictly accounting perspective. It is rumored that Johann Rupert, CEO of the Richemont group, in ecstasy the other day over the finished watch, remarked that it was... too inexpensive!

www.vacheron-constantin.com

1. Vacheron Constantin Ref. 57260 - Back.
2. The three master watchmakers who designed the Reference 57260 by Vacheron Constantin. Jean-Luc Perrin, Yannick Pintus, Micke Pintus.
3. Vacheron Constantin Ref. 57260 - Front.

adventure in the form of the world's most complicated watch, the Reference 57260, featuring 57 complications – some of which are unprecedented at this level of creation and complexity – and integrating 2,800 components. In sum, a pocket watch weighing almost a kilo incorporating nearly a dozen world firsts in terms of watchmaking functions and patents filed. For the record, the previous title holder, the Calibre 89 by Patek Philippe presented 27 years ago, included 36 complications.

Originating as a commission from a private collector, Vacheron Constantin's Reference 57260 – produced as a one-off piece – includes just about every major complication known to watchmaking, as well as new developments. Retrograde dual display flyback chronograph, Westminster chime, grande sonnerie, petite sonnerie, alarm, night-time silent mode, perpetual calendar with a host of indications (including, as well as the usual features, sidereal time, zodiac constellations, and more), equation of time, a new type of 12-hour second time zone and a spherical tourbillon! But the most remarkable is, without doubt, the perpetual Hebrew calendar, a world



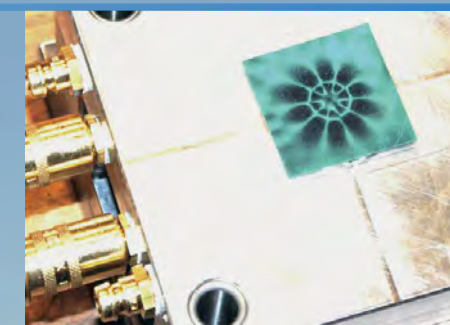
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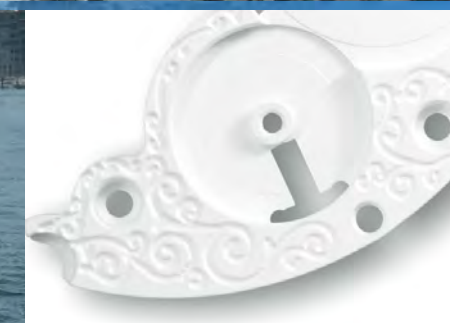
To allow creatures to swim, walk, fly, and to interact with matter and energy, protect themselves... nature has invented so many materials, finely designed and tuned to such a variety of functional surfaces... Countless games have been played naturally out rewardingly with innumerable molecules.

Still, engineers in Western Switzerland continue to imagine and design new innovative materials at the micro & nano-scale for applications that reach into every part of society.

Photo: Geneva



Nanoplastics with megaproperties



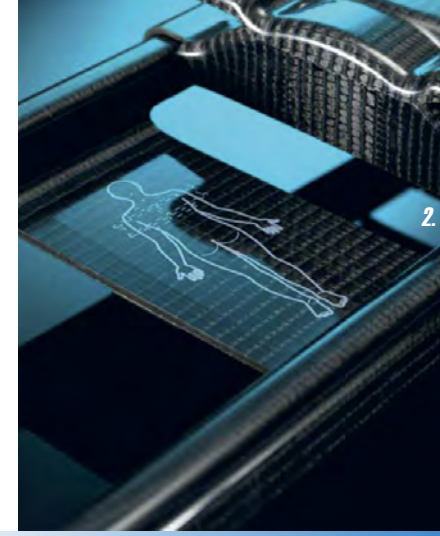
New treatment «BLANC» (Beluga-Like Advanced Nanotec Coating)



Patient positioning element for spinal surgery

With an ISO 13485 certification and more than 25 years of experience in the development and production of complex composite material parts, Composites Busch has emerged as a powerful OEM supplier for the manufacturing of medical devices.

Medical solutions go composites



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1. Hand layup of carbon fiber prepregs.
2. Patient positioning element for spinal surgery.

By adapting to the needs and requirements of customers, surgeons and patients, the company has been able to capitalize on its expertise for the development of innovative products destined for a variety of applications: external fixation elements for osteosynthesis, patient supports and positioning systems, handles and other components for surgical and dental instruments, single-use ancillaries, patient-specific surgical guides, ...

«Think right, think composites!»

Dr. Nicolas Bernet,
General manager
BU Medical

Fiber reinforced polymers

Major advances have been made during the past three decades in the development of organic matrix composites. This type of material consists of a polymer matrix which is reinforced with short or long, continuous or discontinuous fibers, which enable to gain a high resistance against ruptures and a high rigidity at the same time. Polymer matrix composites are usually divided into two categories:

- reinforced plastics
- high-performance (also called advanced) composites, which contain a large volume percentage (more than 50%) of long and highly resistant fibers, such as carbon fibers, glass fibers or aramid fibers.

The aerospace industry in the US and in Europe has been the predominant driver in the research of advanced composite

materials because of their excellent mechanical properties and their very light weight. Weight savings lead to improved fuel efficiency and allow the construction of larger aircrafts, capable of transporting more passengers at greater speeds. A substantial research effort has therefore been achieved by the aerospace industry, as well as governmental and academic communities, in order to develop this class of materials. This means that these materials are well characterized now and given the broad spectrum of polymers and reinforced fibers available, these have been applied to other industrial sectors, such as the medical technology.

Benefits for medical devices

The composite materials used in medical applications must meet extremely stringent standards and respond perfectly to end-use requirements with regards to performance and reliability. If these criteria are met, composite materials can become an interesting alternative to metals and metal alloys traditionally used in medical devices. In order to compete with materials like stainless steel, titanium and aluminum alloys, particular composites (mainly based on carbon fibers) have been developed specifically for surgical instruments, orthopedic products and implants. The fast progress of composite materials in the medtech field has come to a large extent from the following advantages:

- light weight, combined with mechanical properties which can be modulated
- anisotropic behavior, allowing different properties and functionalities to be obtained in different part areas or directions
- resistance to repeated sterilization cycles without deterioration of performance, aesthetic aspect and dimensional characteristics
- approved biocompatibility of certain matrices and fibers, suppressing the risk of allergic reactions caused by the release of metal ions
- x-ray transparency, thereby allowing optimal interpretation and visualization of radiographic images

- pleasant to the touch, providing a feeling of warmth when in contact with the skin
- visually and aesthetically appealing.

Risk control

Once benefits and costs have been assessed, and both technical and economic feasibility have been demonstrated, realistic and profitable implementation of composites is conceivable. However, for successful implementation, yet another important parameter needs to be considered. This parameter is the risk factor. The risk of introducing a new technology must be acknowledged, understood, assessed and perfectly managed, especially when it comes to public health. Increased product performance and quality assurance help minimize risk, but come at a cost premium.

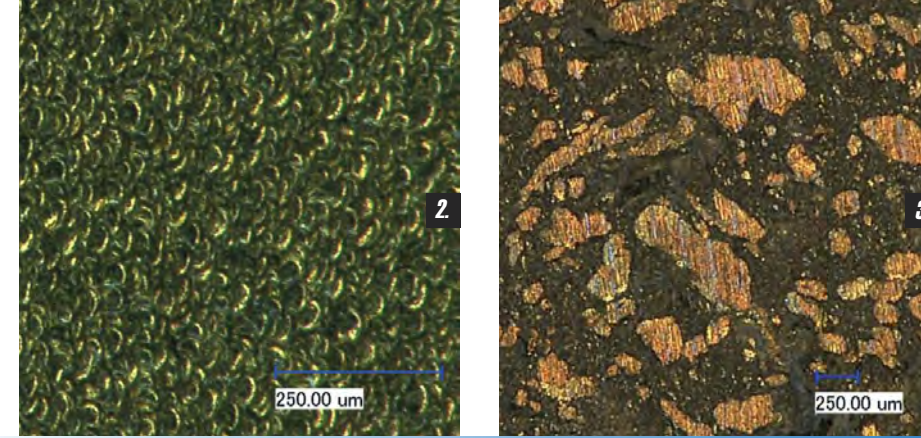
Advantages, costs and risk are thus closely linked to each other and will all have to be considered, not only from a technological point of view (including mechanical performance, biocompatibility, durability, disposal after use and so forth), but also from a strategic point of view (including composite engineering skills, supply chain management, regulatory trends and so forth).

Therefore, the wish to replace a metallic component by a component made out of composite material will have wide-ranging implications. Contributions and advices from specialists involved in the development and manufacturing of composite materials are thus essential for maximizing the success of integrating these materials into medical products.

www.compositesbusch.ch

The Institute for Applied Plastics Research (iRAP) in Fribourg deals with most activities in polymer processing, with a concentration on two main areas: materials with high added value, their improvement and selection, and the processes linked to developing ecodesign in plastics with a focus on injection molding.

Nanoplastics with megaproperties



1. Injection mold with an integrated magnetization technology. The lines on the blue piece visualize the magnetic field of an injected composite magnet.

2. Laser texture on a mold surface. The effect of textures and coatings on demolding of the polymer was analyzed. The blue bar corresponds to 250 micron.

3. Network formed by electrically conductive fillers (bright red) in a plastic matrix (brown). The blue bar corresponds to 250 micron.

The iRAP Institute at the School of Engineering and Architecture in Fribourg has several key projects in the domain of micro and nano materials.

What is the Eurostar «Superslip» project for instance?

In the context of an European project, we evaluate the influence of surface coatings and surface textures on plastic parts sticking to the injection mold. A specific test mold was conceived in order to install cylindrically shaped inserts and to measure the force arising during the ejection phase. The ejection force is directly correlated with the polymer sticking to the mold's surface; this was used as criterion for the effect of a surface treatment. Figure 2 shows a typical laser surface texture that was characterized in this project. The Superslip project brought to light a new generation of CrN-based surface coating that was combined with ion implantation.

What about «SigmaPlast» project?

The «SigmaPlast» project represents indeed one of the main strategic axes of the iRAP Institute and is carried out in collaboration with eight industrial partners. It falls within the field of polymers with high added value. We have assessed the potential and durability of highly electrically conductive hybrid polymers for a potential application for circuit boards in electronic or mechatronic products. Hybrid conductive polymers are systems composed of a plastic matrix with a network of electrically conductive fillers (see Figure 3) capable of conducting electric currents and/or thermal heat fluxes as well as serving as an electromagnetic shield. An important outcome of the SigmaPlast project was the development of a new hybrid poly-

mer suitable for conducting high electric currents of several amperes.

In your «**Dielectric and magnetic nanofillers**» project, using nanoparticles allowed you to greatly increase the **dielectric response of a polymer**?

Polymers are systematically used as insulating components in electric storage media such as capacitors. However, polymers commonly show a very low dielectric response that therefore lowers the electric storage capacity. In this project, we demonstrated that silica-coated iron oxide (hematite) nanoparticles integrated in a PMMA matrix were able to increase the dielectric response by a factor of 15. Furthermore, the iron oxide provides a tunable magnetic response that enables control of the dielectric and magnetic properties of polymers by integrating one single filler material.



«**Polymers with high added value are one of the main strategic directions of the iRAP Institute.**»

Dr Stefan Hengsberger, professor of physics and nanotechnology, member of the institute iRAP

A similar principle in your «Magplast» project involving nanomagnets?

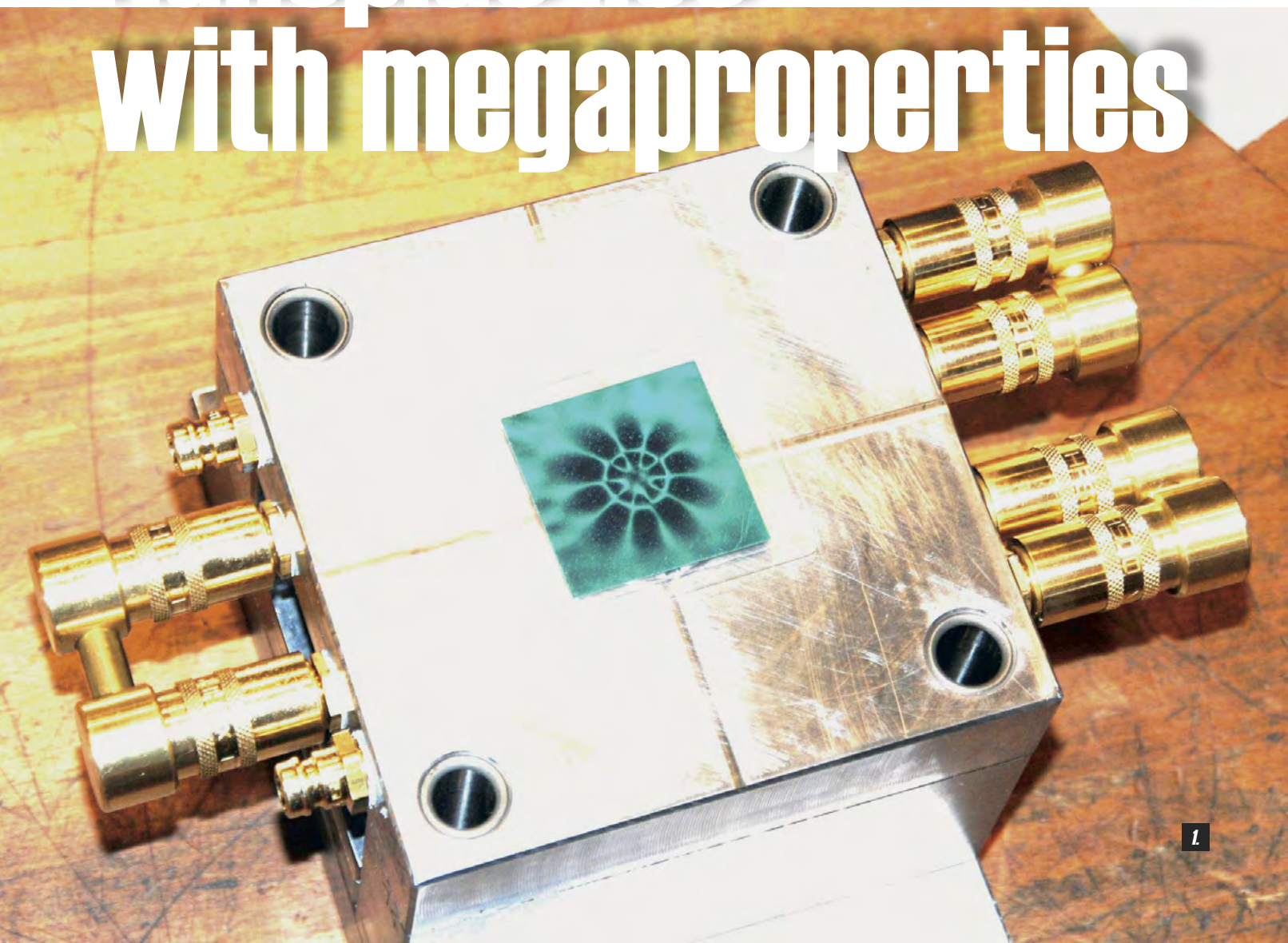
The objective of the Magplast project was to inject polymer pellets into the mold that were highly filled with ferromagnetic particles in combination with a magnetization of the plastic part (see Figure 1). One of the project's main challenges was the conception of the mold with an integrated magnetization

technology that can withstand the injection pressures and temperature. Nowadays, we manage the production of composite magnets with our partner's specifications and the technology is now integrated into their production line.

Also a start-up developed a new technology for micro-/ nanostructuring tools used in **injection molding**?

The micro-/ nanostructuring of polymer surfaces offers tremendous potential for added functionality to be integrated into plastic products, such as holographic optical effects for security features. The start-up company Morphotonix (www.morphotonix.com) faced the challenge of developing a new technology for the direct micro-/nanostructuring of tools used in injection molding. The quality of the grating reproduced on the plastic part was investigated by changing the different parameters of injection molding and of the grating. In this project we could demonstrate that the quality of the plastic reproduction depended greatly on mold temperature, viscosity of the plastic, injection speed and direction, and back pressure.

<http://irap.heia-fr.ch>



Founded in 2004, Positive Coating SA is characterized by the development of innovative solutions in the field of decorative surface treatments for luxury goods based on the PVD (Physical Vapor Deposition) and CVD (Chemical Vapor Deposition) technologies.

Patented white treatment called «BLANC»



1

1. New treatment «BLANC» (Beluga-Like Advanced Nanotec Coating).

2. CVD & PVD treatments

Nowadays, Positive Coating SA counts more than 20 qualified collaborators on its production site and an infrastructure at the forefront of technology. It uses industrial PVD and CVD equipment of variable sizes and capacities, allowing to treat large or small series with economically advantageous conditions.

With an experience of more than 10 years, its expertise and its know-how are recognized by the most famous watch-making brands and by market leaders in the fields of leather goods, jewelry, writing instruments and the medical sector.

Placed in the heart of a prestigious microtechnical industry, Positive Coating elaborates premium technological products which contribute to the renown of the Watch Valley.

PVD technology (Physical Vapor Deposition)

Sputtering is the technology used by Positive Coating to coat luxury items with decorative and/or functional thin films. Layers with a thickness of about 1 micron can be deposited with a perfect control of color, adhesion, hardness and durability. The mechanical structure of surfaces (polished, glossed, sanded, etc.) are preserved after treatment.

It is a deposition process under vacuum

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2



functioning in a gas, maintained with reduced pressure. Application of an electrical field leads to a cold luminescent plasma which allows to deposit every type of material on various metals and ceramics: steel, titanium alloys, copper alloys, yellow/white/red gold, sintered tungsten, zirconia, alumina, sapphire.

range of perfectly reproducible colors and are applicable on complex three-dimensional parts. Moreover, tiny extra thickness ensures intact preservation of the mechanical surface structure.

CVD NanoDeCo treatments guarantee an excellent protection against corrosion of metallic substrates. In spite of a very strong chemical stability, processes are reversible.

Taking advantage of exceptional technical characteristics, CVD NanoDeCo technology offers a superior quality and irreproachable esthetics, fulfilling the requirement of the watchmaking sector.

Innovation and R&D

Mainly active in the decorative treatment of watchmaking components, Positive Coating develops novelties, in terms of coatings color, by combining dry- and wet-way technologies.

As an example, the R&D department recently developed a patented white treatment called «BLANC» (Beluga-Like Advanced Nanotec Coating).

Unceasingly in search of innovation, the R&D department of Positive Coating is committed to remain at the forefront of technology and to offer its customers a quality and a variety of top-of-the-range services.

www.positivecoating.ch



«Innovation is our prime motivation which leads us to always get a step ahead.»

Pierre-Albert Steinmann,
President Director

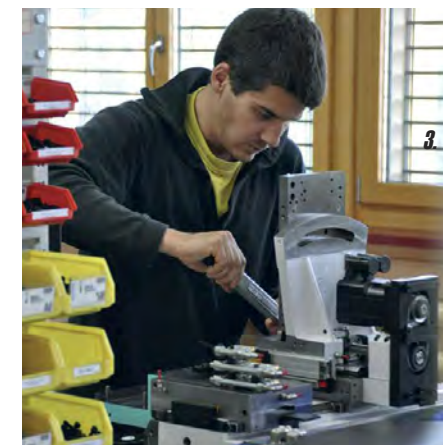
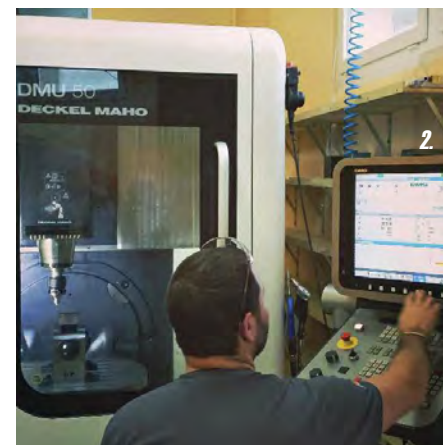
CVD technology (Chemical Vapor Deposition)

In 2014, the company has revealed a new family of treatments, called «NanoDeCo», resulting from the CVD technology.

These metallic oxide coatings apply to the internal components of the watch. The main applications of this new technology are the coloring of movement elements, the colorless protection against oxidation/tarnishment of silver plated dials and the realization of two-colored parts without shielding. Thanks to a nanometric thickness control, CVD layers of oxides offer a wide

The development of new products can become a puzzle for SMEs. Engineering – related to product, process or documentation – consumes great resources and sometimes small businesses with good ideas can simply not implement them. A company located in Valais, Mecatis offers the dose of oxygen they need. A meeting with Samuel Vuadens founding associate of Mecatis.

Broad engineering resources at your convenience



1. Mecatis engineering: concept, programming and schematic proposal.
2. Fabrication: complex part machining.
3. Industrialisation: mounting & wiring series of machines.
4. Maintenance: curative and preventive maintenance.

Located at Isérables, just at the arrival of the cable car, Mecatis' premises extends to 1000 m² and includes offices as well as prototyping and assembly workshops. This company of 15 people works with a network of independent professionals and offers its expertise in engineering to companies active in microtechnology. As of today 80% of its customers are in the Jura region. First customer of the company: Affolter technologies in Malleray, canton of Bern. Mr. Vuadens remembers: «I worked at Affolter's R&D office and when I decided to follow the path of independence, the management encouraged me and gave me my first mandate: the development of a loading device. Results being very positive, our collaboration continued».

nesses often miss: first a mastery of the complete design chain and secondly, a point of view from the outside. We always start from our customers' need, we help clarify it and then we develop an answer».

Process engineering

As in the example above, Mecatis can function as a genuine contractor that manages the entire process (research suppliers and subcontractors, follow-up,...). Here again, listening to the needs is paramount. The company may implement processes and deliver them in the hands of customers or keep them (whole or in part) internally. Mr. Vuadens says: «The answer we provide really depends on our customers. Therefore we generally start with a "small" project and once our customer convinced by a good development, we can offer more».



«Day after day, our team tries to innovate to bring our clients complete solutions that will make them more competitive.»

Samuel Vuadens,
founding associate of
Mecatis

Documentation engineering

Once a product completed and industrialized, its public life can start ... and other challenges await the entrepreneurs. Documentation must accompany the life of the product. Mecatis also provides a complete service at this level. Having developed the product, engineers can create adhoc documentation for certification and for customers.

Product engineering

At the level of product design, Mecatis offers different services. From complete design based on specification (often created by Mecatis discussing with customers) to risk analyses. The company's engineers are highly sensitive to design for series products. Mr. Vuadens says: «We offer two elements that small busi-

Mounting of prototypes and more...

In addition to all aspects related to research and development, Mecatis has its own premises intended for assembly of prototypes or small series in subcontracting. Assembly of prototypes can also be carried out in customer's plant with the help of a Mecatis engineer or

specialist. The company also offers possibilities for product testing and validation.

From need to functional product

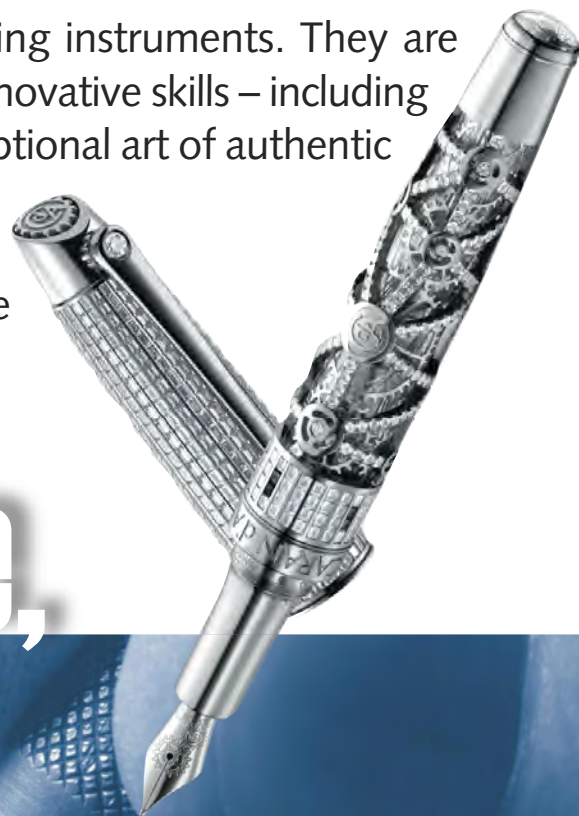
Subcontracting all or part of its engineering on some projects may seem «dangerous» for SMEs, but this operation allows them to have a specialized resource used punctually. Mr. Vuadens concludes: «The know-how of our network allows us to allocate resources perfectly adapted to each project, we offer a clear and transparent process and of course our ethics ensures confidentiality. The perceived risk is a barrier, but once the contact made and the customer informed in detail, this barrier reduces». The references list of Mecatis is getting longer day after day and proves Mr. Vuadens right. Are you facing an engineering problem? Do not hesitate to contact Mecatis.

www.mecatis.ch



Located in Geneva since its inception in 1915, Caran d'Ache is committed to creating and developing writing and drawing instruments. They are combining the finest materials with the most innovative skills – including some that are extremely rare, such as the exceptional art of authentic Chinese lacquer done by hand in the ancestral manner. Today, and ever since the creation of the Maison, all Caran d'Ache products have been produced in its Geneva workshops.

Caran d'Ache, 100 years of continuous innovation



1



2

1. *Savoir-faire SwissMade: Caran d'Ache 1010 Diamonds. The most expensive pen in the world? Priceless: pièce unique.*
2. *Applying Chinese lacquer.*
3. *Caran d'Ache first manufacture.*

Since its beginnings, when the Swiss watchmaking and jewellery industries were enjoying major growth, Caran d'Ache has been part of this same lineage of excellence, technical quality and craftsmanship. Today, it embodies the same high quality standards, while fostering continuous innovation and improvement.



«Our company's sustainability is the result of hard work, passion and above all a refusal to compromise on anything which is not in line with our mission and our values.»

*Carole Hubscher,
Caran d'Ache Chairwoman*

Every Caran d'Ache product is subject to the strictest quality controls, applied both to raw materials and their sources, as well as to the processes used by the Maison. This approach is an essential component of the Swiss Made quality label and the control system in place ensures compliance with the strictest criteria and standards. Colour pencils and inks are systematically tested for their lightfastness, while fountain pen nibs and ballpoint or roller pen tips are checked in terms of their priming quality and writing flow. Individual controls are conducted regularly in accordance with requirements and product types. Strin-

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gent regulatory requirements are applied to all Caran d'Ache products in order to ensure safe use, even by our youngest customers.

Through its commitment and ethical responsibility, the Maison Caran d'Ache works to preserve the natural environment and its resources, while placing human beings at the very core of its development. The production facilities consistently incorporate best practices in terms of the social, environmental and economic life of its internal structures, as well as in its regular exchanges with suppliers and partners.

Respect for the environment is reflected in activities aimed at optimising energy efficiency and closed-cycle processing of metals. In the last 30 years, improvements in the thermal insulation of the

production plant have reduced heating costs by 50%. The installation of 800 m² of solar panels on the roof has reduced CO₂ emissions by 23 tonnes. 1 million litres of oil have been saved over 50 years through the incineration of recovered wood shavings. Each year, almost 50 tonnes of shavings are collected, compacted into briquettes and used as fuel for the factory's central heating system. This produces an important reduction in waste, cuts heating costs and disposes of unusable materials. By the same token, the Manufacture has given up the use of solvents for lacquers based on volatile organic compounds (VOCs), which have been replaced by new water-based lacquers. In keeping with this resolutely long-term vision, the Maison Caran d'Ache ensures a careful equilibrium between an ethical environment and sustainable quality.



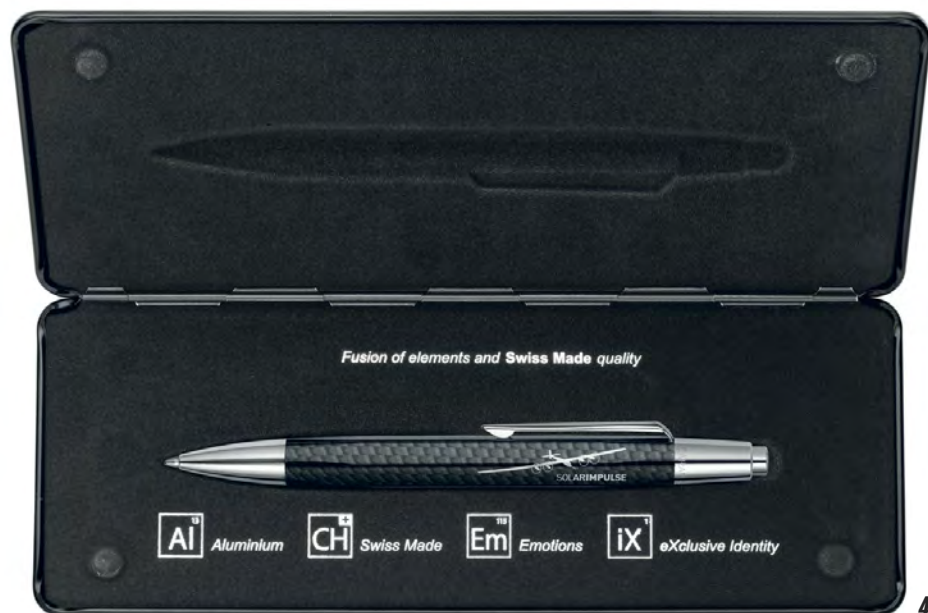
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>> SPOTLIGHT ON... CARAN D'ACHE 100TH ANNIVERSARY

Caran d'Ache gets involved in the fascinating adventure of Solar Impulse

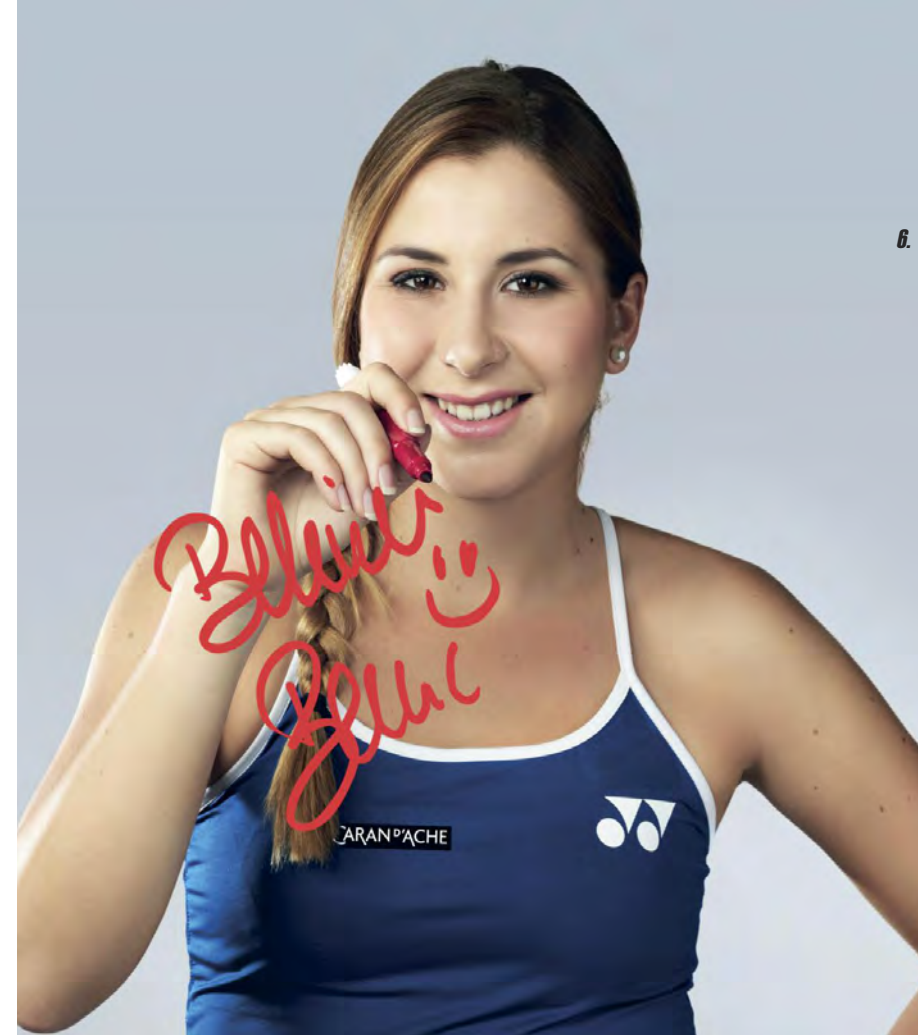
Solar Impulse is making history, with a little help from Caran d'Ache. The iconic Swiss brand is involved in this fascinating adventure for two years as a specialized partner. As part of this initiative, Caran d'Ache became the official supplier of the pens used by the two pilots. A big favorite with travelers because of their incomparable writing quality and high resistance to atmospheric pressure, these writing instruments are used primarily for making entries in the precious log-books.

As a specialist partner, Caran d'Ache now enjoys the tremendous privilege of counting Bertrand Piccard and André Borschberg among its brand ambassadors. The mutual appreciation which exists between Solar Impulse and Caran d'Ache is based on three shared values:



a spirit of innovation, «Swissness», and a strong commitment towards sustainable development. This wonderful relationship is set to flourish further with a

focus on more technical developments, particularly research into the kinds of high-tech components and materials needed to produce innovative pens.



4. Limited edition Alchemix Solar Impulse.

5. Caran d'Ache: Spirit of Switzerland. Limited Edition 2015, 100th Anniversary: 100 pieces.

6. Caran d'Ache is proud to announce its new role as principal sponsor of Belinda Bencic (18 years), Swiss tennis player.

7. Caelograph Edition Alpha: an ingenious and sophisticated instrument to gaze at the stars at a given time and place.

2010: Launch of the *Luminance 6901*, the colour pencil with the highest lightfastness certification.

2010: Creation of the most expensive writing instrument: *1010 Diamonds* Fountain Pen. This unique creation in white gold with more than 850 pure diamonds is a genuine masterpiece of craftsmanship.

2012: Invention, development and production of the *Caelograph*, the first writing instrument that allow to read the sky.

2014: Development and production of the 825 Antibactérien, a 100% Swiss Made pen that eliminates 99.9% of all bacteria.

2015: Caran d'Ache 100th anniversary. www.carandache.com

KEY MILESTONES

1915: Foundation of the «Fabrique Genevoise de Crayons» in Geneva

1924: Acquired by Arnold Schweitzer, the «Fabrique Genevoise de Crayons» is renamed «Caran d'Ache», in honour of the famous French artist Emmanuel Poiré.

1920's: *Technograph*, a cedar wood graphite pencil decorated with fine gold lettering, has symbolised the expertise of Caran d'Ache in graphite since the 1920s.

1929: First designed in 1929, *Fixpencil* is the first mechanical pencil in the world equipped with a patented gripping mechanism.

1931: Caran d'Ache revolutionises the world of design and colour when it invents *Prismalo*, in its Geneva workshops, the world's first water-soluble colour pencil.

1952: Caran d'Ache starts developing a new formula for wax oil pencils. And so *Neocolor I* is born and became an essential fine arts product.

1953: At first dedicated to high quality mechanical pencils, the collection *Ecridor* welcomes in 1953 precious ballpoint pens.

1969: Instantly identifiable, the 849 ballpoint pen has a hexagonal shape and the ultra-comfortable proportions of an iconic model.

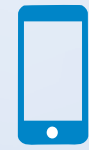
1970: Launching of the *Madison* collection, the first to include a fountain pen.

1983: The Maison Caran d'Ache develops its unique know-how with Chinese lacquer.

1999: The *Modernista Diamonds* fountain pen enters the Guinness Book of Records as «the world's most expensive pen».



The Micronarc network: an example of 7 innovative companies, in the 7 cantons of Western Switzerland



Kizy Tracking SA, Neuchâtel

Locate and trace objects everywhere, for weeks or months, without running out of battery (no GPS), and without any additional investment.
www.kizytracking.com



Geosatis SA, Le Noirmont

A GPS ankle bracelet that fulfils the real needs of society.
www.geo-satis.com



SwiSS-9 GmbH, Nidau

Development, production and commercialization of surface functionalization products (hydrophobic, superhydrophobic, superoleophobic coatings).
www.swiss-9.com



Nanolive SA, Lausanne

A revolutionary tomographic microscope to look instantly inside living cells in 3D.
www.nanolive.ch



MICRONARC

Micro-nanotech Cluster of Western Switzerland

www.micronarc.ch



Bcomp Ltd., Fribourg

Development and patenting of technologies allowing the fabrication of superior products from natural fibres.
www.bcomp.ch



Plair SA, Geneva

Solutions for real-time airborne allergen monitoring.
www.plair.ch



Biowatch SA, Martigny

Highly secure, highly convenient, biometric authentication that recognizes your wrist.
www.biowatch.ch

Micronarc

c/o FSRM – Swiss Foundation
For research in Microtechnology
Ruelle DuPeyrou 4
CH-2001 Neuchâtel - Switzerland
Tel. +41 32 720 09 00



Micronarc is an initiative of the Cantons of Bern, Fribourg, Vaud, Valais, Neuchâtel, Geneva and Jura. Supported by the Swiss State Secretariat for Economic Affairs (SECO) under the NPR.



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Federal Department of Economic Affairs FDEA
State Secretariat for Economic Affairs SECO

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A mission at the heart of micro and nanotechnologies

A unique hub of competence

Micronarc covers a region with a highly developed industrial culture that has evolved into a centre of excellence in micro and nanotechnologies. Solidly anchored in a centuries-old tradition, the passion for innovation and extreme precision is reflected in a dense network of educational, research and business institutions. This translates into optimum performance in terms of symbiosis in research and applications, transfers of technology, and innovation cycles.

A communication platform

Micronarc is a communication platform created by the governments of the seven cantons that constitute Western Switzerland (Berne, Fribourg, Vaud, Valais, Neuchâtel, Geneva and Jura). Its mission is to contribute towards:

- developing and promoting a regional scientific, technical and economic base in the micro and nanotechnology sectors, as well as related educational structures, R&D facilities, technology transfers, inward investment and business structures;
- encouraging seamless interaction between all participants;
- attracting other creative and innovative forces, generating jobs and ensuring

future generations of a qualified workforce;

- acting as a source of reliable and accessible information, serving as an instrument for the dissemination and exchange of knowledge, both in the professional and public arenas.

To achieve these objectives, Micronarc:

- manages and operates the internet portal www.micronarc.ch;
- establishes a strong presence at the international level, notably through the organisation of grouped stands at industry trade shows;
- organizes professional and public events;
- provides information, networking structures, and business introductions.

Executive Office

FSRM – Swiss Foundation
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CH-2001 Neuchâtel - Switzerland
Tel. +41 32 720 09 00
www.micronarc.ch



The Micronarc team

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The Micronarc Expert Committee was set up in 2008. Its mission is to establish strategy guidelines for the Micronarc platform, to direct the platform, initiate new activities, and serve as liaison between the various participants.

The constituent members are:

Vincent Rivier, **President**
Director of the Registre du Commerce

Serge Amoos
Administrative Coordinator, The Ark Foundation

Dr Stefan Hengsberger
Professor, EIA Fribourg

Antonio Rubino
Secretary-General GIM-CH

Alain Codourey
Managing Director Asyrl SA

Frédéric Chautems
Plant Manager MPS Watch

Philippe Fischer
Director FSRM

Jacques Jacot
Professeur honoraire EPFL

Reynold Jaquet
Member of the Berne Precision Cluster Committee

Georges Kotrotsios
Vice President CSEM SA

Rolf Gobet
Director, Office for the Promotion of industries and Technologies, Canton of Geneva

Fabienne Marquis Weible
Director of the Association Suisse pour la Recherche Horlogère

Max Monti
Research Director, Haute Ecole ARC

Martial Racine
ad personam

Micronarc is managed by its Executive Secretariat, the Swiss Foundation for Research in Microtechnology (FSRM) in collaboration with the GIM-CH / Swiss-mechanic.

Contacts
Danick Bionda
Secretary General




MICRONARC
Micro-nanotech Cluster of Western Switzerland


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Micronarc Alpine Meeting

7th edition

mAm 2016

The Microproducts Annual Meeting

Microsystems have entered the age of high volume production for consumer applications, especially **mobile phones, ICT, watchmaking and medical disposable devices**. The issues associated with the production of these are of continued interest to manufacturers. These include tooling in high volume fabrication of precision parts, making highly efficient and reliable automated assembly lines and test systems for microproducts. There is a fast growing market for such components and products.

Following in the success of the first 6 editions, The Micronarc Alpine Meeting 2016 will continue its focus on equipment and innovative processes and technologies for manufacturing microproducts. This 2-day conference intends to stimulate networking and discussions in the casual atmosphere of Villars, a charming village and ski resort located at 1250 meters of altitude. The event is a high-level, niche workshop which provides participants with an excellent overview of state-of-the-art manufacturing technologies. **More information at: www.mam2016.ch**

EARLY PROGRAM

See web site for the most up-to-date information

Sunday 31 January 2016

18:00 **Registration open**
Welcome drink at the hotel (dinner afterwards on your own)

Monday 1 February 2016

09:00-09:30 **Welcome Session**
Danick Bionda, Secretary General, Micronarc
Prof. Dr. Volker Saile, Chief Science Officer, Karlsruhe Institute of Technology (Germany), President, Mancef
09:30-10:00 **Invited Keynote on the Future of Micro-manufacturing I**
Prof. Richard Leach, Professor in Metrology, Faculty of Engineering - The University of Nottingham
10:00-10:30 *Coffee break + exhibition visit*
10:30-12:15 **Micro-manufacturing Applications I – Watchmaking** 1 keynote + 3 speakers
+ Exhibitor elevator pitch (3 min)
12:15-13:30 *Lunch in the hotel*
13:30-15:00 **Micro-manufacturing Applications II – Medtech** 1 keynote + 2 speakers
+ Exhibitor elevator pitch (3 min)
15:00-15:30 *Coffee break + exhibition visit*
15:30-17:30 **MEMS** 1 keynote + 3 speakers + Exhibitor elevator pitch (3 min)
17:30 *Adjourn for the day*
19:00 *Conference Dinner – Meet in hotel lobby at 19:00*

Tuesday 2 February 2016

08:30-10:00 **Novel Manufacturing I – Energy Harvesting** 3 speakers + Exhibitor elevator pitch (3 min)
10:00-10:30 *Coffee break + exhibition visit*
10:30-12:00 **Novel Manufacturing II – Printing Technologies** 1 keynote + 2 speakers + Exhibitor elevator pitch (3 min)
12:00 *Lunch in the hotel*
13:30-15:00 **Novel Manufacturing III – Assembly and Laser Methods** 1 keynote + 2 speakers + Exhibitor elevator pitch (3 min)
15:00-15:30 *Coffee break + exhibition visit*
15:30-16:15 **Invited Keynote on the Future of Micro-manufacturing II** 1 keynote
16:15-16:30 **Final Remarks**
16:30 *Conference adjourns - Farewell reception in hotel lobby*


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31 January – 2 February 2016
 Villars-sur-Ollon, Switzerland



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A Micronarc event organised with
MANCEF Micro and Nanotechnology Commercialisation Education Foundation ®
www.mancef.org
as a COMET conference

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Events 2016

You are cordially invited to exhibit with Micronarc at our 2016 events, or simply to drop by and visit our stand.
Contact us at +41 32 720 09 00 or by e-mail at events@micronarc.ch

24 to 28 January 2016 Event abroad
IEEE MEMS 2016. 29th International Conference on Micro Electro Mechanical Systems. Shanghai, China.
www.mems2016.org

27 to 29 January 2016 Event abroad
NANOTECH JAPAN - International Nanotechnology Exhibition and Conference. Tokyo. www.nanotechexpo.jp

31 January to 2 February 2016 Regional event
MAM 2016 - Micronarc Alpine Meeting 2016. The Microproducts Annual Meeting . 7th edition.
Villars-sur-Ollon, Switzerland. www.mam2016.ch

9 to 10 March 2016 Event abroad
SSI 2016. Smart Sytems Integration. Munich, Germany. www.mesago.de/en/SSI/

12 to 14 April 2016 Event abroad
Medtec Europe - New Medical Technology Device Events & Exhibitions. Stuttgart, Germany. www.medteceurope.com

19 to 22 April 2016 Regional event
SIAMS 2016 - The trade fair for microtechnology production tools . Moutier, Switzerland. www.siams.ch

20 to 22 April 2016 Event abroad
Medtec Japan - Asia's largest exhibition for medical equipment. Tokyo, Japan. www.medtecjapan.com/en

18 May 2016 Regional event
STI Industry event. Lausanne, Switzerland. <http://sti.epfl.ch>

10 June 2016 Regional event
RobotYx - Y-PARC - Swiss Technopole . Yverdon-les-Bains, Switzerland. www.y-parc.ch/events/robotyx-2016

14 to 17 June 2016 Regional event
EPMT-EPHJ-SMT - Professional Microtechnology Exhibition. • Medtech Microtechnology Day with HEPIA at EPMT.
• *Microtechnics Alliance Interclusters Event at EPMT.* Palexpo, Geneva, Switzerland. www.epmt.ch

30 June to 1 July 2016 Regional event
SWISS NANOCONVENTION 2016. Basel, Switzerland. www.swissnanoconvention.ch

6 to 8 July 2016 Event abroad
iCan 2016 Contest of Applications in Nano-micro Technology. Paris, France. www.ican-contest.ch

8 to 10 september 2016 Regional event
Micro16. Neuchâtel, Switzerland. www.micro16.ch

September 2016 Regional event
Carrefour des Créateurs. Lausanne, Switzerland. www.carrefour-createurs.ch

19 to 23 September 2016 Event abroad
MNE 2016. 42th Micro and Nano Engineering conference. Vienna, Austria. www.mne2016.org

September 2016 Event abroad
COMS 2016. 21th annual conference on commercialization of micro- and nano-systems. Houston, USA.
www.mancef.org/coms/coms-2016

27 to 30 September 2016 Event abroad
MICRONORA. International Microtechnology Trade Fair. Besançon, France. www.micronora.com

October 2016 Regional event
Events with Micronarc. Cantons of VS, BE, JU, Switzerland. www.micronarc.ch

Events 2016

November 2016 Event abroad
Grenoble Innovation Fair. Grenoble, France. www.grenoble-innovation-fair.com

November 2016 Regional event
SICHH - Swiss Integrative Center for Human Health. Fribourg, Switzerland. www.sichh.ch

November 2016 Regional event
Micro and Nanotechnologies in materials and processes for European polymer industry. Fribourg, Switzerland.
<http://swissplastics-cluster.ch>

7 to 9 November 2016 Regional event
NanoBioTech. Montreux, Switzerland. www.nanotech-montreux.com

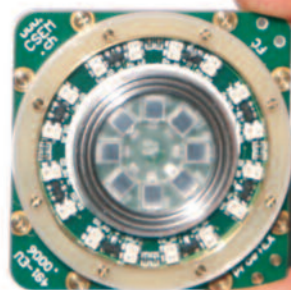
14 to 17 November 2016 Event abroad
Compamed. Düsseldorf, Germany. www.compamed-tradefair.com

15 to 18 November 2016 Regional event
Swisstech, International Fair for Materials, Components & System Assembly. Basel, Switzerland. www.swisstech-messe.ch





technology integration
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Neuchâtel
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